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Editors:
Siti Rochmah Ika
Tomi Suryo Utomo
Ferry Wahyu Wibowo

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FOREWORD

In the early of the industrial revolution, the colonies demanded goods, textiles, and brought to the agriculture sector in the agriculture revolution. This revolution was also to make a stable government favorable to business within the capitalism or free-market system and have an effective banking system since it required capital for investment. In this case, the industrial revolution impacted every sector even the transportations transformed the economy in reducing the cost to ship goods. Not only that, but these activities required also the factories, skilled labor, energy to supply the power, etc. Nowadays, until it has become the era of the fourth industrial revolution, these activities are still having an impact not different with before but rather complex and modern. From this background, the International Conference on Applied Science, Engineering, and Social Sciences 2019 (2nd ICASESS 2019) has the theme "The Fourth Industrial Revolution and Its Impact on The Development of Jurisprudence, Social Sciences, and Sciences". This conference is to conduct the transition from cottage industries changed life in factory towns, work in factories, labor conditions, and eventually, processes within smart factories. The industrial revolution has caused rapid urbanization in every country. In the cities, people have a problem with pollution, noise, and nasty smells which are not in healthy conditions. In some countries and cities, farming activities have changed because the demand of workers led people to move from farms to the cities so small towns near natural resources like coal, iron ore, rivers, and cities near factories have boomed instantaneity while in the other conditions, they have problem with low infrastructure, less regulation of factories, pollution, waste, etc. The industrial revolution has created two classes of people i.e. the entrepreneurs and industrial working classes. Along with time, the industrial revolution also benefited many working-class people and the factory systems changed the world of work while the further changed how the people work in factories and life with the modern era with the information technologies growth. On the other side, the industrial revolution has changed in the delivery of goods in the market whether at home and abroad.

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CONTENTS

XIV

PAPERS

FULL PAPERS

The Effect of Licensing through Online Single Submission (OSS) on the Establishment of the Company

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Keywords: Company, Licensing, Integrated, Establishment, OSS.

Abstract: The business actor must obtain a permit in the form of an agreement that is stated in the form of a letter / decision or fulfillment of the requirements and / or commitment to start and run a business and / or activity. With this agreement, the business actor is given a Business Registration Number (NIB), namely the identity of the Business Actor issued by the OSS Institution after the Business Entity registers through Online Single Submission (OSS). The Business Actor must enter the business data when establishment the company to be able to access the OSS in the AHU Director General of the Ministry of Law and Human Rights, in accordance with the Indonesian Standard Industrial Classification (KBLI). The method used is normative research methods, by reviewing several documents, applicable regulations, and company establishment documents. The conclusions of the problems are as follows: 1. Enforcement of integrated business licensing services through on line or OSS has an effect, that each company establishment must enter company data specifically in the business field of the AHU Director General of the Ministry of Law and Human Rights, through a process of ratification or registration, namely for business entities in the form of legal entity is using ratification, while a business entity that is not a legal entity is using registration. 2. Business actors in determining business fields for business activities carried out in the business establishment process must adjust to the Indonesian Standard Industrial Classification (KBLI) as stipulated in the Regulation of the Head of the Central Statistics Agency. 3. For companies that have been established before the OSS is applied, they must adjust their activities according to the business fields listed in KBLI 2017 by amending their articles of association, especially concerning the purpose of putting business data into the Public Law Administration Director General of the Ministry of Law and Human Rights' system and registering to OSS Institution to obtain a company registration number (NIB).

1 INTRODUCTION

In order to improve the national economy through business development efforts in all fields, the government has issued regulations relating to business licensing, by simplifying business licensing through Government Regulation Number 24 of 2018 concerning Electronic Integrated Licensing Services or Online Single Submission (OSS). So far, business actor in managing permits have been done manually by knocking on doors one by one starting from the district / city Integrated One-Stop Services or in Indonesia is called as PTSP, provincial PTSP, to the central PTSP (Investment Coordinating). The one-stop service policy which aims to make it easier for the public to take care of all needs related to licensing is considered not optimal.(Bagijo, 2010)

The ease of licensing services is not only for the interests of domestic investment business activities but is also intended to facilitate foreign investors to run their businesses domestically in the form of foreign investment, which licensing problem has been a problem that has hampered the establishment of businesses. Some incentives and conveniences for foreign investors who will invest their capital in a country are increasingly mixed attractively. The juridical sector is no exception, which is also demanded to not become a hindrance, or not to be left behind by the juridical sector in competing countries.(Fuady, 1996)

Through this online integrated business licensing regulation, business licensing is carried out online through a single system called OSS. This policy is expected to provide convenience and accelerate business licensing, while at the same time increasing the development of investment and business which in

itself will increase business growth and the national economy. Business Licensing is registration that is given to Business Actors to start and run a business and / or activity and is given in the form of an agreement outlined in the form of a letter / decision or fulfillment of requirements and / or commitments. With registration to obtain this agreement, the business actor is given a company registration number, hereinafter abbreviated as NIB, is the identity of the Business Actor issued by the OSS Institution after the Business Actor registers.

In the management of licensing registration through OSS, it is integrated with several agencies which are related on business actor's data, including company data at the Public Law Administration Director General of the Ministry of Law and Human Rights, population data at the Ministry of Home Affairs of Director General of Population and Civil Disputes, Tax Identification Number at the Director General of Taxes even labor data that must be registered with the Social Insurance Administration Organization or in Indonesia is called as BPJS.

To be able to access OSS, company data is needed at the Public Law Administration Director General of the Ministry of Law and Human Rights, so that all business actors must enter company data either through endorsement or registration, depending on the legal status of the company which is a legal entity or not and requires approval or registration. So far, there are several forms of business entities, both legal entities such as Limited Liability Companies as stipulated in Law number 40 of 2007, while forms of business that are not legal entities such as the form of partnership *(maatschap)*(Prasetya, 1995) as the main federation form which are regulated in the Civil Code, while General Partnership and Limited Partnership are regulated in the Code of Business Law.

In addition, when applying for registration or ratification of legal entities through the Public Law Administration Director General of the Ministry of Law and Human Rights, data must be put in line with the Indonesian Standard Industrial Classification (KBLI) as stipulated in the Central Bureau of Statistics Regulation number 95 of 2015 concerning Indonesian Standard Industrial Classification (KBLI) as has been amended by Regulation of the Head of the Central Bureau of Statistics number: 19 of 2017, hereinafter referred to as KBLI 2017. Thus the business actors who will carry out a business activity in their establishment must adjust KBLI 2017 so that data on business fields registered with the Public Law Administration Director General can be accessed through OSS when managing business permits.

In accordance with the consideration of regulations concerning integrated business licensing services, it is intended to facilitate business activities and development, as well as facilitate the business establishment process. From the description of business establishment before the issuance of the regulation on business licensing through OSS, the obligation to approve business entities of legal entities through the Public Law Administration Director General of the Ministry of Law and Human Rights only applies to business entities with legal entities, especially Limited Liability Companies. However, but with the enactment of business licensing services through OSS, this requires that businesses that are not legal entities such as alliances must also be registered through the Public Law Administration Director General of the Ministry of Law and Human Rights. This is so that company data can be accessed through OSS Institutions when submitting licensing applications through OSS with business fields that are in accordance with ISIC 2017. From this description, several problems can be stated as follows: 1.What is the effect of applying business licensing services through on line or OSS on business establishment procedures? 2. How do business actors determine the business sector for the business activities carried out in the business establishment process? What about the companies that have been established before the enforcement of the OSS?

2 RESEARCH METHODS

We strongly encourage authors to use this document for The method used is normative research methods, by reviewing several documents, applicable regulations, and documents on the registration process and / or endorsement of the establishment of the company, including:

1. Presidential Regulation Number 91 of 2017 concerning the Acceleration of Business Execution
2. Government Regulation of the Republic of Indonesia Number 24 of 2018 concerning Electronic Integrated Business Licensing Services
3. Regulation of the Minister of Law and Human Rights of the Republic of Indonesia Number 17 of 2018 concerning Registration of the Limited Partnership, General Partnership, and Limited Liability Partnership
4. Regulation of the Minister of Law and Human Rights of the Republic of Indonesia number 1 of 2016 concerning Amendments to Regulation of the Minister of Law and Human Rights of the

Republic of Indonesia number 4 of 2014 concerning Procedures for Submitting Requests for Ratification of Legal Entities and Approval of Amendments to Articles of Association and Submission of Notices of Amendments to Articles of Association and Amendments to Data of Limited Liability Companies.

5. Regulation of the Head of the Central Bureau of Statistics number: 95 of 2015 concerning the Indonesian Standard Industrial Classification (KBLI)

6. Regulation of the Head of the Central Bureau of Statistics number: 19 of 2017 concerning Amendments to the Regulation of the Head of the Central Bureau of Statistics number: 95 of 2015 concerning Indonesian Standard Industrial Classification (KBLI)

By analyzing in depth several regulations relating to business licensing services through electronic or Online Single Submission (OSS), and supported by data in the form of registration process documents and / or authorization of establishment of companies, it can be produced conclusions that can be accounted for academically.

3 RESULT AND DISCUSSIONS

3.1 The Effect of the Application of Business Licensing Services through on Line or OSS on the Business Establishment Procedure

In order to achieve a prosperous society, a mechanism must be created to facilitate business activities that can increase the economic growth of the community. One of which is ease and simplification in the field of business licensing. By providing convenience and simplification of business licenses, it is hoped that business activities can grow and develop so that it can increase the economic growth of the community and by itself will improve the welfare of the community. Economic development needs to be developed to create jobs, enhance sustainable economic development, increase national technological capacity and capabilities, and encourage people's development and realize public welfare in a competitive economic system.(Bagijo, 2010)

Some countries implement licensing intended to provide protection to the public and business actors themselves. Like the provisions of the regulations imposed in the United Kingdom, Its further recommendations went on to include creation of personal and premises licences, exible opening hours, consistent nationwide conditions to protect the public from nuisance and disorder, and greater controls and sanctions for authorities dealing with liquor licensing. It also, controversially, suggested that liquor licensing should be transferred from magistrates to local authorities.(Poppleston, 2001)

Licensing in company activities is very important, because a permit owned by a company will give trust to the third parties or the consumers. The licensing effect was demonstrated in various consumer contexts focusing on consumers' self-behaviors.(Toder-Alon et al., 2017)

In connection with efforts to increase business ventures, the government has issued a number of new regulations, including Presidential Regulation Number 91 of 2017 concerning the Acceleration of Business Execution. One of the considerations of issuing the Presidential Regulation was stated in its consideration that business licenses issued by ministries / institutions and regional governments to start, implement and develop business activities need to be reorganized in order to become a supporter and not otherwise become an obstacle to the development of business activities. In order to accelerate and simplify business services, need to implement the use of information technology through an Integrated Electronic Integrated Business Licensing System (Online Single Submission) or OSS.

Then followed up with the issuance of Government Regulation of the Republic of Indonesia Number 24 of 2018 concerning Business Licensing Services to be Integrated Electronically. One of the considerations for issuing the Government Regulation is stated in its consideration, that in the context of accelerating and increasing investment and business, it is necessary to apply Business Licensing Services to be integrated electronically. Article 1 point 5 states that Electronic Integrated Business Licensing or Online Single Submission, hereinafter abbreviated as OSS, is Business Licensing issued by OSS Institutions for and on behalf of ministers, heads of institutions, governors, or regents / mayors to Business Executors through integrated electronic systems.

Business Licensing is obtained through registration given to the Business Actor to start and run a business and / or activity and is given in the form of an agreement as outlined in the form of a letter / decision or fulfillment of requirements and / or Commitments. Business Actors are individual or non-individual business actors who conduct business and / or activities in certain fields. Business License is a permit issued by OSS Institutions for and on behalf of

ministers, heads of institutions, governors, or regents / mayors after the Business Entity registers and starts a business and / or activity prior to commercial or operational implementation by fulfilling the requirements and / or Commitment. Commercial or Operational Permits are permits issued by OSS Institutions for and on behalf of ministers, heads of institutions, governors, or regents / mayors after the Business Entity obtains a Business License and for conducting commercial or operational activities by fulfilling the requirements and / or Commitments. Commitment is a statement of Business Actors to fulfill the requirements of a Business License and / or Commercial or Operational Permit. Management Institutions and OSS Organizers, hereinafter referred to as OSS Institutions, are non-ministerial government institutions that administer government affairs in the field of investment coordination. The Company Registration Number, hereinafter abbreviated as NIB is the identity of the Business Actor issued by the OSS Institution after the Business Actor registers, which includes the registration of business and / or activities by the Business Actor through OSS.

Company Registration Certificate hereinafter abbreviated as TDP is a letter of approval issued by the OSS Institution to Business Actors who have registered. The OSS Institution issues NIB after the Business Actor registers through filling in the complete data and obtaining the Tax Identification Number. This NIB is a business identity and is used by Business Actors to obtain a Business License and Commercial or Operational Permit, including the fulfillment of the requirements for Business Licenses and Commercial or Operational Permits. NIB is valid as long as the Business Actor runs his business and / or activities in accordance with the provisions of the legislation.

The NIB also applies as a Company Registration Certificate (TDP) as referred to in laws and regulations in the field of company registration certificate (as stipulated in the Law Number 3 of 1982 concerning the Company Registration Requirement). The NIB is an endorsement of the TDP valid for the term of the NIB. NIB also applies as an API as referred to in laws and regulations in the field of trade, and the NIB also applies as customs access rights as referred in legislation in the customs sector.

Business licenses must be owned by business actors who have obtained NIB, in accordance with applicable regulations. NIB can be revoked and declared invalid by OSS Institutions in case: Business Actors conduct business and / or activities that are not in accordance with NIB, and / or declared null or invalid based on a court decision that has permanent legal force.

The types of business licenses consist of: Business Licenses, and Commercial or Operational Licenses. Applicants for Business Licensing are submitted by: Individual Business Actors and Non-Individual Business Actors.

Compared to individual businesses, business activities in the form of business entities will be easier to develop with greater capital support, because it involves several parties. The number of traders as an individual company that aims to obtain profits that are generally used to fulfill their daily living decreases annually compared to companies such as Limited Liability Company, Cooperatives, Limited Partnership and General Partnership. This shows that the establishment of an individual company is not so passionate compared to the establishment of a business entity.(Hasbi, 2016) Business entities that carry out business activities in the economic field have certain forms, such as trading companies, General Partnership, Limited Partnership, Limited Liability Companies, Public Companies, cooperatives.(Kansil, 1996)

In carrying out a business, entrepreneurs need a place to be able to act in legal actions and interact. The choice of type of business or legal entity that will be used as a means of business depends on the needs of its founders.(Amanda et al., 2018)

Establishment of Business Entity & NIB

To be able to access the OSS in order to obtain an NIB, the business form that is established must be authorized and / or registered electronically (on Line) through SABH to ratify the establishment of a legal entity business entity or SABU to register the establishment of a business entity rather than a legal entity at the Public Law Administration Director General of the Ministry of Law and Human Rights. Ratification of the establishment of a Legal Entity Company such as a Limited Liability Company (PT) based on the provision of law which regulates the form of business concerned through the Legal Entity Administration System (SABH) at the Public Law Administration Director General of the Ministry of Law and Human Rights. Whereas registration of establishment of a business entity which is not a legal entity such as

Limited Partnership, General Partnership and Civil Partnership is submitted by the Applicant to the Minister through the Business Entity Administration System (SABU) at the Public Law Administration Director General of the Ministry of Law and Human Rights.

Both the establishment and amendment to the articles of association must be stated in a notary deed, and an approval for a legal entity company or registration for a company that is not a legal entity which is submitted to the Ministry of Law and Human Rights through an electronic system (on line). The form of a partnership in Indonesia has not yet been considered a legal entity (Hadhikusuma, 1996), so the founding process does not require endorsement, but rather registration.

The Limited Partnership (*commanditaire vennootschap*) is a Limited Partnership that has been registered with the Central Government. Registration of Limited Partnership *(commanditaire vennootschap)* to the Government includes registration of deed of establishment, amendment to the articles of association and dissolution of the Limited Partnership (commanditaire vennootschap) by the ministry that administers legal affairs.

General Partnership (*venootschap onder firma*) is a General Partnership (*venootschap onder firma*) that have been registered to the Central Government. Registration of General Partnership (*venootschap onder firma*) to the Central Government includes registration of deed of establishment, amendment to the articles of association and dissolution of the General Partnership (*venootschap onder firma*) by the ministry that administers legal affairs.

The civil partnership is a civil partnership which has been registered to the Central Government. Registration of a civil partnership to the Central Government includes registration of a civil partnership deed, amendment to the constitution of a civil partnership, and the dissolution of a civil partnership by the ministry that administers legal affairs.

Application for registration of establishment of Limited Partnership, General Partnership, and Civil Partnership is submitted by the Applicant to the Minister through the Business Entity Administration System (SABU), by first ordering the name of the and making a deed of establishment.

Limited Partnership, General Partnership, and Civil Partnership that have been registered in the District Court based on laws and regulations, within 1 (one) year after the enactment of this Ministerial Regulation is obliged to register the registration in accordance with the provisions of this Ministerial Regulation. Registration of the registration is allowed to use a name that has been used legally by the Limited Partnership, General Partnership, and Civil Partnership that has been registered in the Business Entity Administration System.

From the description of business establishment before the issuance of the regulation on business licensing through OSS, the obligation to enter company data when filing approval through the Public Law Administration Director General of the Ministry of Law and Human Rights only applies to business entities with legal entities, especially Limited Liability Companies, but with the implementation of licensing services that are integrated through OSS. The establishment of a company that is either a legal entity or not a legal entity such as a partnership must enter company data specifically in the business field in accordance with KBLI 2017 at the Public Law Administration Director General of the Ministry of Law and Human Rights. This is so that the data on the business sector of the company can be accessed and integrated through the OSS Institution when submitting a licensing application to determine the type of permit needed and obtain the Company Registration Number (NIB).

With this business licensing service through electronic or online, the business actor in registering his business and obtaining a Company Registration Number (NIB) does not need to deal with several licensing agencies that have been valid, but enough to put data through an application provided by the OSS Institution, following the commitment to fulfill business licenses according to their business fields.

In some countries, licensing involves various parties and agencies, such as in the state of Israel. According to the 1968 Business Licensing Law and bylaws enacted, any legal entity defined as ''Business'' can't operate without a license issued by an official authority.Granting a business license involves several national government agencies: the police department, the Ministry of Health, fire and rescue services, the Ministry of the Environment, the Ministry of Labor and other organizations. Each business must receive approval from relevant government agencies in order to obtain a business license.(Friedberg et al., 2004)

With this integrated licensing service, licensing is simpler, more effective and efficient, so that it makes it easy for businesses to immediately carry out their business activities. Thus business activities will be more developed and by itself improve the economy and the welfare of the community.

3.2 Determine the Business Field of Business Activities Carried Out in the Process of Establishing a Business

The business actor when establishing a company must determine in advance the business activities that will be carried out, then from the business activities look for the list of KBLI 2017 regarding any business fields that are in line with the business activities to be carried out in the deed of establishment and put in place at the time registration or endorsement of the Public Law Administration Director General.

The line of business carried out must be in accordance with KBLI 2017. In the establishment and / or amendment to the articles of association the company must include the company's goals and objectives, covering business fields and activities by adjusting to Regulation of the Head of the Central Bureau of Statistics number 95 of 2015 Jo. number 19 of 2017 concerning the Indonesian Standard Industrial Classification (KBLI 2017). At least, it states the business fields listed in the two-digit numbers on the ISIC, and business activities listed in the five-digit number in KBLI 2017. The mention of business fields that are in accordance with the activities carried out is included in the deed of establishment and put on the system on line to the Data from the Public Law Administration Director General of the Ministry of Law and Human Rights when registered or at the time of ratification depends on the legal status of the established company requiring approval or it is sufficient with a registration.

The data on business sectors that has been put in the Public Law Administration Director General of the Ministry of Law and Human Rights that will later be connected in an integrated manner with the OSS Institution when registering the licensing application to obtain the Company Registration Number (NIB). With such procedures, there are fundamental differences in the procedures for establishing a company. In relation to the business sector, the business actor must first determine what business activities will be carried out, then look for business data in the list of ISIC 2017 to find out what business sectors are in line with the business activities to be carried out.

Whereas, regarding to the establishment procedure by establishing a deed of establishment, all business forms must be registered or ratified according to the form of business in the Ministry of Law and Human Rights by including data on business fields to be integrated with OSS Institutions when registering business license applications to obtain NIB. In the previous provisions, ratification through the Ministry of Law and Human Rights was only a business entity with a legal entity such as a Limited Liability Company, while a business entity that is not a legal entity was registered with the local District Court, such as Civil Partnership, General Partnership and Limited Partnership.

Limited liability companies as legal entities are affirmed in Law number 40 concerning Limited Liability Companies, in article 1 number 1, among others, it is stated that Limited Liability Companies are legal entities which are capital alliances. As a legal entity, Limited Liability Company has the legal subject position. This position has legal consequences that Limited Liability Company becomes a supporter of rights and obligations in legal traffic.(Budiyono, 2011)

For companies that have been established before the OSS is applied, they must adjust their activities according to the business fields listed in KBLI 2017 by amending their articles of association specifically concerning their purpose and objectives and putting business data into the Public Law Administration Director General of the Ministry of Law and Human Rights' system and registering to OSS Institution to obtain a Company Registration Number (NIB). This is as regulated in Government Regulation Number 24 of 2018 concerning Electronic Integrated Business Licensing Services (OSS) and Minister of Law and Human Rights Regulation Number 17 of 2018 concerning Registration of Limited Partnership, General Partnership and Civil Partnership, as well as Limited Liability Companies.

In the event that registration of licenses to obtain a NIB is not carried out, it will be suspended (freezing) or revocation of business licenses (Article 81 Government Regulation number 24 of 2018). This is important and must be fulfilled because business activities that do not have permits can be subject to administrative sanctions and even criminal acts (for example article 106 of Law Number 7 Year 2014 concerning Trade).

4 CONCLUSIONS

1. Enforcement of integrated business licensing services through on line or OSS has an effect, that every company establishment must enter company data specifically in the business sector to the Public Law Administration Director General of the Ministry of Law and Human Rights, through the process of ratification or

registration, namely for legal entities with endorsement, while business entities which is not a legal entity is through registration.

2. Business actors in determining business fields for business activities carried out in the business establishment process, must adjust to the Indonesian Standard Industrial Classification (KBLI) as stipulated in the Regulation of the Head of the Central Bureau of Statistics.

3. For companies that have been established before the OSS is applied, they must adjust their activities in accordance with the business fields listed in KBLI 2017 by amending their articles of association, specifically concerning their business objectives and inputting business data into the Public Law Administration Director General of the Ministry of Law and Human Rights' system and register to the OSS Institution to obtain a Company Registration Number (NIB). In the event that registration of licenses to obtain a NIB is not carried out, it will be suspended.of your submission.

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The Pattern of Development Strategies for Small and Medium Enterprises in Sleman Regency, Special Region of Yogyakarta

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Keywords: Small and Medium Enterprises (SMEs), location quotient, diamond cluster model.

Abstract: Small and Medium Enterprises (SMEs) are potential sectors which need to be developed. The objects of this research are a number of Small and Medium Enterprises (SMEs) in Sleman Regency. As for the objectives are as follows: 1) analizing superior sectors of SMEs which are the most potential to be developed; 2) identifying the competitive advantage of SMEs; 3) formulating development strategies for superior sectors of SMEs. The research problem is how to develop strategies of SMEs in Sleman Regency. This research tries to make a development strategy of SMEs which integrates superiority or local potency of SMEs with its existing external opportunities. On a macro basis, the strategy formulated in this research is begun with conducting analysis of potency and problem towards every sector of the existing SMEs, in order to be able to identify which SMEs sectors are more potential and appropriate to be developed, then it is formulated its development strategy based on qualitative and quantitative approach. The development strategies of SMEs is based on integration of two methods, namely location quotient and diamond cluster model. The calculation result of LQ is obtained that the business sector or scope of SMEs that is superior in Sleman Regency is business service sector (coefisien of LQ value is 1.6). Next, it is conducted identification of the advantages of SMEs of business service which refers to Diamond Cluster Model. The result is that several superiority instruments of SMEs of business service have potency to be developed in the form of input factors, demand conditions, supporting and related industries, and company strategies and competitors.

1   INTRODUCTION

Development of SMEs becomes a crucial thing in view of that SMEs have such an important roles for the economic growth of a country, including Indonesia (Husband, 1999; Tambunan, 2005). As an illustration, SMEs in Indonesia have given contribution towards employment absorption as many as 99.74% from total of national absorption and given contribution towards GDP as much as 1.013,5 trillion rupiah or 56.73%. This big contribution refers that SMEs have ability to strenghten the structure of national economy (Tambunan, 2005). Although SMEs economically have significant contribution towards economic growth, however, in their development, they face up many problems. Based on this research (Winarni, 2006) and (Situmorang, 2008), the problems which are faced by SMEs are extracted as follows: (a) lack of capital, (b) difficulty in

marketing, (c) simple organizational structure with non-standard divison of labor, (d) low management quality, (e) limited Human Resources and their low quality, (g) Most of them do not have financial reports, (h) weak legality aspects, and (j) low quality of technology. These problems conduce weak business network, limited in market penetration ability and market diversification, economical scale is too small so that it is difficult to reduce cost, profit margin is very small, and even farther, SMEs do not have competitive advantages. Recognizing several problems faced in developing SMEs, therefore, it is needed a development strategy for SMEs in order that development of SMEs in Indonesia is able to run quickly, problems faced by SMEs are able to be reduced, and SMEs have more competitive advantages (Hafsah, 2004). Thus, all problems faced by SMEs had better to be made as input or consideration in formulating development strategy so that it becomes comprehensive strategy and can work

effectively and efficiently. Various kinds of research about development strategy of SMEs in Indonesia have been conducted, among them by (Winarni, 2006; Situmorang, 2008; Hafsah, 2004). Basically, strategies of SMEs development that are proposed by the researchers are not based on its advantages or local potencies (SMEs potencies) and external opportunities, as well as the development strategies proposed are still based on qualitative approach.

Although there are many in number, SMEs encounter the main problem, namely additional value of their products is relatively small. It is because of their small capital so that the opportunity to expand is limited. Secondly, human resources are relatively low, thus, level of creativity and product innovation is low as well. The third, marketing network that they have is limited. The fourth, the system of organization management has not work well yet. Therefore, the process of development and coaching of small and medium enterprisesis is a must to be carried out by local government in the era of regional outonomy if it does not want to be left behind and knocked out from economic development in the period of upcoming free market. The objectives of this research are 1) Analyzing sectors of superior SMEs that are the most potential to be developed; 2) Identifying competitive superiority of SMEs; 3) Formulating development strategies for superior sector of SMEs.

2 RESEARCH METHOD

Types and Data Sources
Data used in this research were subject data, namely the data that were in formed of opinion, attitude, experience or character of person or group who became research subjects (respondents) (Hasanah, 2018). Data sources in this research were primary data, that was the research data which were obtained directly from the data sources that were particularly collected and directly related with the problems observed. The primary data in this research were obtained through dividing or distributing questionnaires that were given to the respondents who in this case were businessmen in category of micro small business. Besides that, the data sources in this research were secondary data, that was, the data that were generally collected by institution of data collector and published for data user community (Kuncoro, 2005). The data collections that were going to be conducted by using *multiple source of evidence,* were interview, archive study and direct observation. Interview was used as main data sources. The *stakeholders* who became respondents in order to gain the research data were representatives of Disperindagkop in Sleman Regency, owners, managers and employees of SMEs.

Population and Sampling
Population in this research were businessmen who were grouped entreprenuers in the category of SMEs. The detail in Sleman Regency for the total number of SMEs were as many as 112 businesses and the total number of small business were as many as 90 businesses (Disperindagkop, 2014). Determining the sampling in this research was based on formulation of Slovin namely $n=N/1+Ne^2$ in which n is the number of sampling; N is the number of population and e is fault tolerence which is set. The smaller fault tolerance set, the more accurate the sampling describes the population. By using level of the fault tolerence as much as 10 percent thus it was obtained the number of sampling of micro business in Sleman Regency as many as 52.8 business (rounded to 53). For the sampling number of Small Business, by using the same formulation thus it was obtained the sampling number for small business as many as 47.3 (rounded to 48).

Methodology of Data Collection
Data used in this research were primary data that were collected by open and closed questionnaires, with the purposes for getting data about dimension of developed construction in this research.

Technique of Data Analysis
Location Quotient
Formula of LQ with basic value of GRDP is as follow:

$$LQ = \frac{V_x^R/V^R}{V_x^N/V^N} \qquad (1)$$

In which:
V_x^R = sum of GRDP on a sector x in region R V^R = sum of GRDP on all sectors in region R
V_x^N = sum of GRDP on a sector x in refernce region N V^N = sum of GRDP on all sectors in reference region N

Diamond Cluster Model
Cluster is interpreted as "geographic concentrations of firms, suppliers, related industries, and specialized institutions that occur in a particular field in a nation, state or city." Another definition about clusters is "geographical concentration of industries that gain performance advantages through co-location". Cluster show the relationship among companies which provide complementary service, including consulting service, education service provider and training,

financial institutions, professional associations and goverment institutions (Porter, 1990).

3 RESULT AND DISCUSSION

Data Analysis

The approaches developed in this study are: (a) identifying the leading sectors in SMEs with the LQ index; (b) identifying competitive advantages for SMEs using the Diamond Cluster model. The competitive advantages are going to include input factor, demand condition, supporting and related industry, and strategy company and competitor (c) classification of competitive advantages of SMEs becomes internal and external factors. (d) formulating strategy based on the combination of strength, weakness, opportunity, and threats, and (e) Determining development strategy of SMEs, and (f) implementing strategy chosen (Hasanah, 2018).

Identification of Superior Sector of SMEs

Based on information from the Sleman Regency Gross Regional Domestic Product (GRDP) as a basis for determining the leading sectors for SMEs, there are some changes in the GRDP calculation carried out by the Central Bureau of Statistics (CBS) which originally used 2000 base years to be eliminated starting in February 2015 and as instead, it uses the 2010 base year, so that the classification of sectors or business fields that were originally 9 sectors becomes 17 sectors or business area.

The following is the identification of the superior sectors of SMEs consisting of 17 sectors or business area that are possible to potentially be developed in Sleman Regency. As for these sectors are (1) Agriculture, Forestry, and Fishery; 2) Mining and Excavation 3) Processing Industry; 4) Procurement of Electricity and Gas; 5) Procurement of Water, Processing Waste and Recycling Waste; 6) Construction; 7) Large and Retail Trade, Car and Motorcycle Repair; 8) Transportation and Warehousing; 9) Provision of accommodation and food beverage; 10) Information and communication; 11) Financial Service and Insurance; 12) Real Estate; 13) Business Service; 14) Government Administration, Defense and Social Security; 15) Education Service; 16) Health Service and Social Activity; 17) Other Services. To calculate the superior or potential SMEs sector from the 17 sectors, the LQ Index is used. LQ calculations and analysis basically by comparing the GRDP data of each SMEs sector with the accumulation of GRDP data in all sectors in Sleman Regency then compared with the

reference areas, namely the GRDP of Special Region of Yogyakarta. The GRDP value which is the basis of the calculation is used by the GDP value with a constant price of 2010. The results of the calculation of the LQ value in the form of index values are presented in table 1.

Table 1: Value LQ of Sector/Business Area of GRDP Sleman Regency in 2013-2014

No	Sector/Business Area	LQ Value	
		2013	2014
1	Agriculture, Forestry and Fishery	0.8033	0.7800
2	Mining and Excavation	0.7383	0.7282
3	Processing Industry	1.0180	0.9983
4	Procurement of Electricity and Gas	0.8336	0.8142
5	Procurement of Water, Processing Waste and Recycling Waste	0.4692	0.4686
6	Construction	1.1816	1.1845
7	Large and Retail Trade Car and Motorcycle Repair	0.9071	0.0243
8	Transportation and Warehousing	1.1461	1.1582
9	Provision of Accomodation And Food Beverage	1.0458	1.0360
10	Information and communication	0.9619	0.9699
11	Financial Service and Insurance	0.8120	0.8263
12	Real Estate	1.1315	1.1353
13	Business Service	1.6413	1.6471
14	Government Administration, Defense and Social Security	0.8025	0.8061
15	Education Service	0.0305	1.1065
16	Health Service and Social Activity	0.9242	0.9253
17	Other Services	0.8660	0.8684

Data processed

4 CONCLUSIONS

The results of the 2014 LQ index calculation (table 1.) that the SMEs sectors that can be developed are the Corporate Services sector of 1.6471. The SMEs Services Company LQ index value is the largest index value compared to other sectors. Furthermore, the SMEs sector that has the potential to be developed is the Transportation and Warehousing sector at 1.15 and then the Education Services sector with the LQ index of 1.1065.

Competitiveness Identification of SMEs

The core of Diamond Cluster Model is to effort in grouping core industries which are related each others, whether supporting industries, related industries, supporting service, economic infrastructure, research, training, education and others. The cluster is also intended to arrange

several activities of economic development. This cluster is able to be formed in city, regional distric and even country.

Before doing identification, it is going to be explained the intended context of business service. A business service is a company that does not produce goods or products, yet it produces output in the form of service. The business service characters are as follows:

1. Do not sell goods or products but sell in form of service.
2. Do not have inventory of goods
3. The purpose is to obtain profit set.
4. Do not determine the cost of goods
5. Do not need in making a report on the cost of production

Sub-sectors of this business service include service of lawyer, service of accountant, architectural bureau, service of data processing, service of advertisement and others. Identifying competitive advantages in SMEs area of business service is in four Diamond Model clusters, namely input factor, demand condition, supporting and related industry, company stategy and competitor. The next stage, the competitive advantage of SMEs is classified to be internal factors which consist of its strength and weakness, as well as external factors including opportunity and threat factors. The result is that SMEs of business service are potentially developed.

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Porous Concrete using White Cement as Binding Agent

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Keywords: Porous Concrete, White Cement, Compressive Strength, Porosity, Unit Weight.

Abstract: Porous concrete is made by mixing Portland cement, coarse aggregate, with or without fine aggregate, additives, and water. Concrete that uses white or colored cement creates a highly contrasting visual and enhances traffic safety. A study was carried out on porous concrete using white cement as a binding agent. There are 6 types of gravel/cement ratio by mass used, namely 4, 4.5, 5, 5.5, 6, and 6.5. There are 2 types of water/cement ratios used, namely 0.27 and 0.30. SicaCim concrete additives are used as chemical admixtures. The total test specimens were 36 pieces, and 3 pieces for each variation. The results show that increasing gravel / white cement ratio decreases compressive strength and increases porosity. Compressive strength of wcr 0.27 is smaller than wcr 0.30. Porosity of porous concrete in general with a wcr of 0.27 is greater than a wcr of 0.30. The effect of water cement ratio (wcr) and aggregate / white cement ratio is not too significant on the unit weight of porous concrete.

1   INTRODUCTION

Building construction and pavement in urban areas causes increase the impermeable areas so that surface runoff cannot infiltrate into the ground and cause flooding. The existing drainage system only floods downstream so that the urban drainage system leads to search for new technologies aimed at increasing infiltration and reducing surface runoff.

Pervious concrete is concrete with a slump near zero, uniform gradation, which is made by mixing Portland cement, coarse aggregate, with or without fine aggregate, additives, and water. Pervious concrete has interconnected pores and water can pass through it easily. Pervious concrete has porosity between 15 to 35%, and compressive strength between 2.8 to 28 MPa. Drainage levels vary depending on aggregate size and density of the mixture. Pervious concrete serves to reduce surface runoff, improve surface runoff quality, refill groundwater, and reduce the effects of urban heat islands (ACI Committee 522, 2010).

Other names for pervious concrete are porous concrete. Porous concrete can be used for parking lots, driveways, sidewalks, and greenhouse floors (NRMCA, 2004).

No-fines concrete pavement has several positive aspects such as increased slip resistance and high permeability but do not have the high strength required for high traffic areas. No-fines concrete have been shown to have properties suitable for use in low volume traffic areas (Harber, 2005).

The strength of no-fines concrete is lower than normal concrete, but it is sufficient for structural use. Because of the high continuous void ratio, this concrete has a high permeability (Abadjieva and Sephiri, 1988).

Water cement ratio for pervious concrete between 0.27 to 0.30 including proper chemical admixtures. The relation between water-cement ratio and compressive strength is clearly seen in conventional concrete, whereas in pervious concrete is not clear because the total pore is more than the total paste (Tennis et al., 2004).

Generally in pervious concrete, the mass ratio between aggregate and cement is 4 to 4.5 (Tennis et al., 2004), The greater the maximum aggregate size in porous concrete, decreases the compressive strength and increases porosity (Ginting, 2019).

For floors and walkways, decorative concrete can be used completely or only for surfaces. Decorative concrete floors made with white cement can be specified as a substitute for top-grade coatings because they are durable and attractive. For transportation projects, concrete that uses white or colored cement creates a highly contrasting visual and enhances traffic safety (PCA, 2014).

White Portland cement is white hydraulic cement and is produced by grinding white Portland cement slag which is mainly calcium silicate and milled together with additives in the form of one or more crystalline forms of calcium sulfate compounds (BSN, 2004). White cement can be used to make concrete because the compressive strength of concrete produced is high enough (Temiz et al., 2013). Fresh concrete slump using white cement is greater than Portland cement type I. Initial setting time and final setting time using white cement is smaller than Portland cement type I . Compressive strength using white cement is greater than Portland cement type I at ages 1 and 28 days (Hamad, 1995).

Based on the description above, a study was carried out on porous concrete using white cement as a binding agent.

2 METHODOLOGY

The main material is white cement and gravel from the river Progo, Yogyakarta, Indonesia. Gravel has a maximum size of 40 mm. There are 6 types of weight ratio of gravel/white cement, namely 4, 4.5, 5, 5.5, 6, and 6.5. Water cement ratios (wcr) of 0.27 and 0.30 were used. The dosage of SicaCim Concrete Additives as admixtures is 7.5 ml per kilogram of white cement. The total cylinder specimens are 36 and 3 cylinders for each variation as shown in Table 1.

Some types of tests carried out include testing: gravel, compressive strength, porosity, and unit weight. The results of the gravel test are presented in Table 2 and Figure 1.

The equipment used is: concrete mixer, concrete compression machine, and falling head test apparatus.

Concrete cylinder mold diameter of 150 mm and height of 300 mm. Concrete mixture is placed in 3 layers, each layer is consolidated with tamping rod 25 times, after consolidation is complete the surface of the concrete is leveled, then the specimen mold is sealed with plastic. Specimens removed from the mold after 24 hours, then soaked in a soaking tub filled with water of 25 ° C (BSN, 1990).

Concrete compressive strength testing refers to (ASTM C 39, 2009). The testing procedure is as follows:

1. Compression tests are carried out after the test specimens have been removed from depository.
2. The moisture of the test specimen must remain stable until the test is carried out.
3. Placing the specimen.
4. Apply the load continuously and without shock.

5. The load is applied increasing until it reaches the maximum load and is stopped after the load has decreased and the crack pattern is clearly visible.
6. The compressive strength of concrete is obtained by dividing the maximum load by the average cross-sectional area.

Table 1: Concrete cylinder specimens.

Gravel/White Cement Ratio	wcr	Numb. Cylinder Specimen
4.0	0.27	3
	0.30	3
4.5	0.27	3
	0.30	3
5.0	0.27	3
	0.30	3
5.5	0.27	3
	0.30	3
6.0	0.27	3
	0.30	3
6.5	0.27	3
	0.30	3
		36

Table 2: Gravel test results.

Types of tests	Unit	Results
Water content	%	1.48
Density (SSD)	-	2.47
Absorption	%	3.38
Unit weight	gr/cm^3	1.71
Fineness modulus	-	7.25
Abrasion	%	43.70
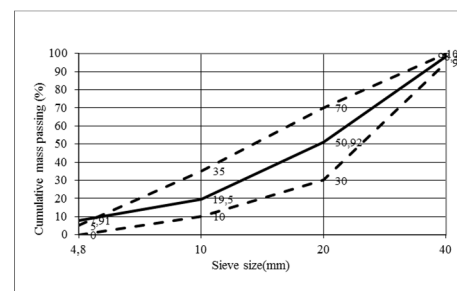
Figure 1: Gradation of gravel.

The porosity testing can be seen in Figure 2.

Figure 2: Porosity testing.

Testing porosity of concrete with falling head method steps as follows:
1. At the bottom of the porosity test apparatus is placed the concrete cylinder.
2. A pipe with a length of 1m is connected to the bottom of the porosity test apparatus, so that concrete cylinder is inside the pipe.
3. The drain pipe is closed, fill the water as high as a concrete cylinder.
4. Water is added to the pipe up to 1 m, then open the drain pipe.
5. Measured time for water to fall to 0.5 m.
6. The flow rate is obtained by dividing the volume of water that reduces with time.

3 RESULTS AND DISCUSSION

Compressive strength is shown in Table 3 and Figure 3.

Table 3: Compressive strength.

Ratio of gravel / white cement	wcr	Compressive Strength (MPa)
4.0	0.27	16.08
	0.30	17.30
4.5	0.27	8.36
	0.30	13.44
5.0	0.27	8.49
	0.30	13.68
5.5	0.27	3.30
	0.30	8.54
6.0	0.27	2.72
	0.30	8.05
6.5	0.27	2.22
	0.30	7.39
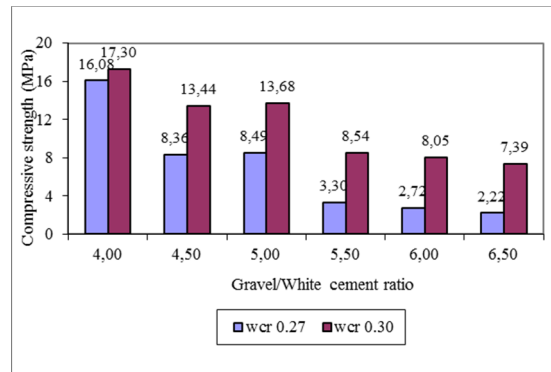
Figure 3: Compressive strength.

Table 3 and Figure 3 show that at the same water cement ratio (wcr), compressive strength decreases with increasing gravel/white cement ratio. This is because the amount of white cement decreases with increasing gravel/white cement ratio. The highest compressive strength will occur at the maximum amount of cement as long as the cement used has not reached the optimum limit.

In all white gravel/cement ratios, compressive strength of porous concrete with wcr 0.27 is smaller than wcr 0.30, theoretically the highest compressive strength will be obtained at the lowest wcr. At water cement ratio (wcr) 0.27 compressive strength is smaller than 0.30 due to the amount of water that is too few so that the hydration process does not work perfectly.

Porosity is shown in Table 4 and Figure 4.

Table 4: Porosity.

Ratio of gravel / white cement	wcr	Flow rate (lt/sec/m^2)
4.0	0.27	25.25
	0.30	18.23
4.5	0.27	44.27
	0.30	18.03
5.0	0.27	43.55
	0.30	38.27
5.5	0.27	74.82
	0.30	44.26
6.0	0.27	71.57
	0.30	52.82
6.5	0.27	69.87
	0.30	78.01
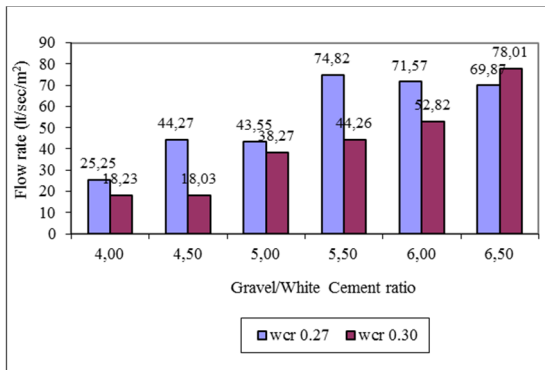
Figure 4: Porosity.

Table 4 and Figure 4 show that at the same water cement ratio (wcr), in general an increase in the ratio of gravel/white cement results in an increase in porosity of porous concrete. This happens because the greater the ratio of gravel/white cement results in less amount of cement. A small amount of cement will produce a small amount of paste, so that the cavity covered by the paste is not too large so that the porosity is still high.

In all gravel/white cement ratios, porosity of porous concrete in general with a wcr of 0.27 is greater than a wcr of 0.30. This happens because porous concrete with wcr 0.27 is thicker than wcr 0.30. A mixture that is too liquid causes the cement paste to flow to the bottom resulting in sedimentation and a decrease in porosity.

Unit weight is shown in Table 5 and Figure 5.

Table 5: Unit weight.

Ratio of gravel / white cement	wcr	Unit weight (kg/m^3)
4.0	0.27	2037
	0.30	2018
4.5	0.27	1808
	0.30	1746
5.0	0.27	1800
	0.30	1997
5.5	0.27	1685
	0.30	1870
6.0	0.27	1715
	0.30	1713
6.5	0.27	1679
	0.30	1773
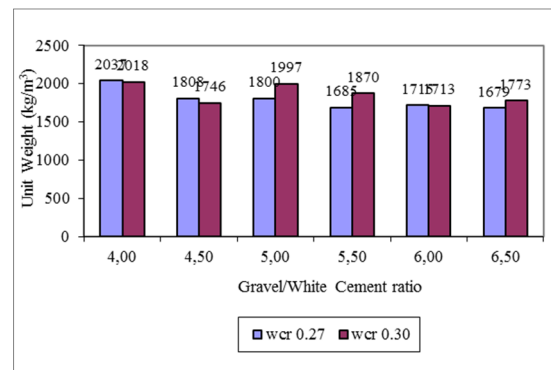
Figure 5: Unit weight.

Table 5 and Figure 5 show that the unit weight varies between 1679 to 2037 kg/m^3. Porous concrete has a lower unit weight and some are higher than lightweight concrete in general, which is around 1800 kg / m^3. The effect of water cement ratio (wcr) and aggregate/white cement ratio is not too significant on the unit weight of porous concrete.

4 CONCLUSION

From the study porous concrete using white cement as binding agent be obtained that compressive strength decreases with increasing gravel / white cement ratio. At water cement ratio (wcr) 0.27 compressive strength is smaller than 0.30. Increase in the ratio of gravel / white cement results in an increase in porosity. In general, porosity with a wcr of 0.27 is greater than a wcr of 0.30. The effect of water cement ratio (wcr) and aggregate / white cement ratio to unit weight is not too significant.

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The Practice of Letter of Attorney in Land Sales

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Abstract: The research with the title the Practice of Letter of Attorney in Land Sales is a normative study conducted in Bantul Regency by taking resource persons of Notary-Conveyor in the Bantul Regency. The results of the study were analyzed descriptive-qualitatively. Based on the results of the research, there were several reasons for making a power of attorney to sell in land sales was because the requirements for the sale and purchase of Land Title Deed are not complete but the price has been paid in full, or because the seller cannot attend the sale certificate before Land Deed Official (Conveyancer/PPAT). Therefore, in order to provide a guarantee to the buyer, a Sales and Purchase Agreement is made which is accompanied by a Power of Attorney of Selling. The seller cannot attend directly to sign the sale and purchase deed before the Land Deed Official and also because the purchased land will be sold to another party. The power of attorney to sell relating to the Sales and Purchase Agreement is included in the Sales and Purchase Agreement deed whose purpose is to sell to himself (recipient of the power of attorney) as the buyer who has already settled, while the ordinary power of attorney is made separately to sell to other people who are basically intended to represent seller for various reasons the seller cannot attend to sign the sale and purchase deed directly before the Conveyancer. The legal strength of the power of attorney to sell with paid off within Sales and Purchase Agreement Lunas is strong, because the power of attorney to sell is basically to provide legal protection to the recipient of the power of attorney, that is, the buyer who has paid in full the land price, so that the sale and purchase has already occurred. Whereas the power of attorney to sell to other people is basically really intended to represent the seller, the risk resulting from the sale and purchase remains the responsibility of the seller.

1 INTRODUCTION

The transfer of rights in the form of buying and selling land is a form of transfer of land rights that is mostly carried out by the community. Land sales is one of the legal actions that must be carried out by making a sale and purchase deed by the Conveyer as stipulated in Article 37 of Government Regulation Number 24 of 1997 which states that the transfer of land rights and ownership rights to apartment units through buying and selling, exchange, grants, income in the company and other legal deeds of transfer of rights, except the transfer of rights through auction can only be registered if proven by a deed made by the authorized Conveyancer according to the provisions of the applicable legislation.

Sometimes the land sales cannot be carried out properly due to various reasons, such as the price has not been paid in full or there are requirements that have not been fulfilled. Nevertheless there are also other reasons why buying and selling is not done as it

should, namely through a sale and purchase deed by Conveyancer.

If the sale and purchase cannot be carried out according to the applicable provisions, namely with the Conveyancer deed, what is often done is to make a deed of the Sale and Purchase Agreement (PPJB). There are two kinds of PPJB, namely *PPJB Lunas*, in the sense that land prices have been paid in full but there are other requirements that have not been fulfilled and PPJB has not been paid off. In the PPJB paid off accompanied by a Selling Power of Attorney. The power of attorney to sell will be used by the buyer for the buying and selling process before Conveyancer. Selling Power of Attorney which will be used by buyers for the sale and purchase process by Conveyancer, without having to be present the buyer is often made for various reasons. Therefore this research was conducted to find out the reason for making the Selling Power of Attorney and the legal force of the power of attorney to sell it. Power of attorney to sell can be defined, as the power of

attorney from the owner of the goods to another party as the recipient of the power of attorney, to sell certain items owned by the owner of the goods, including doing actions in the interest of selling the goods. (Setyawan, 2016)

In this study based on the problems: How does the form of power of attorney sell related to PPJB and power of attorney that are usually not related to PPJB? The method used is to use normative research methods that are supported by empirical data, namely research based on secondary data by reviewing various laws and regulations as well as books, journals as well as writings relating to Selling Power of Attorney, sales deed documents.

2 RESULT AND DISCUSSIONS

2.1 Reasons for Making Power of Attorney of Selling

Land buying and selling according to national agrarian law that uses the basis of customary law is buying and selling that is *cash, clear and real*. *Cash* means that delivery of rights by the seller to the buyer is carried out together with the payment of the price by the buyer. With this act, the right to change was immediately implemented. Prices paid at the time of delivery do not have to be paid off, the remainder will be considered as debt from the buyer to the seller who is subject to the debt payable law. *Real* nature means that the intention or intention spoken must be followed by a real action to show the purpose of the sale and purchase, while *Clear* means that the legal act must be carried out before the Conveyancer as a sign that the act does not violate applicable law, means to be carried out openly, clearly the object and subject of the owner, complete letters and proof of ownership (SW and Sumardjono, 1993)

The process of buying and selling land according to national agrarian law, in addition to the agreement regarding prices and goods (land), a deed must be made by Conveyancer. Sometimes the buying and selling process before Conveyancer cannot be done yet, because there are some requirements that have not been fulfilled, such as the price has not been paid in full, or there are other requirements documents that do not yet exist. Therefore, before the sale and purchase process with the sale and purchase deed made by the Conveyancer was carried out, the parties entered into a sale and purchase agreement (PPJB). In practice, many people execute the land sales, which are one of the legal actions related to land

rights in cash or in full, are made more often using a Sale and Purchase Agreement (PPJB) due to various factors or reasons. (Kurniawati, 2018)

Sale and Buy Agreement is made to temporarily bind before making AJB officially before the Land Deed Making Officer (Conveyancer). In general, the contents of the PPJB are the agreement of the seller to bind themselves to sell to the buyer accompanied by the giving of a sign or advance based on the agreement. There are two kinds of Sale and Buy Agreement (PPJB), namely *PPJB Lunas*, in the sense that the land price has been paid in full, but there are requirements that have not been fulfilled, so that the land price has not been paid in full. Sale and Purchase Agreement.

Some of the reasons for using Power of Attorney of Selling in buying and selling land are:

a. The price of land has been paid in full, but the requirements for making a sale and purchase deed are not complete. Therefore, because the price has been paid in full, then in order to provide a guarantee to the buyer, a Sales and Purchase Agreement (PPJB) is made which is accompanied by a Selling Power of Attorney. With this power of attorney, then when all the requirements have been fulfilled, without the need for the presence of the seller because it has been represented by giving power, with the power of attorney to sell to the buyer, the PPAT can immediately make the Sale Deed to process the name of the certificate. The Power of Selling is intended to provide protection for buyers who have paid the price of the land in full. Basically the power of attorney to sell aims to simplify the work of the Notary if the seller cannot attend to sign the deed of sale due to certain reasons. In addition, the purpose of using the power to sell is to protect the interests of the parties from things that are not desirable, for example a broken promise from one of the parties. With the power to sell it becomes a kind of juridical safeguard in protecting the interests of the parties who make it. (Meiliyanza, 2016) The granting of the power of sale in the binding deed of sale and purchase is not included in the meaning of absolute power which is prohibited because the power of attorney is made in order to perpetuate a valid causal agreement, and legal actions referred to in the power of sale are not for the power of attorney but for the benefit of the power of attorney, which is the release of legal obligations by the power of attorney as the seller to the power of attorney as the buyer because the price has been paid in full. (Latumenten, 2003). The deed of power to sell is not an absolute power,

absolute power is an irrevocable power, the term absolute power is not a legal term, in the sense that there is no strict arrangement regarding that right. To be able to understand the true meaning of absolute power, it must be interpreted etymologically (Andasasmita. 1991).

b. The seller cannot attend directly to sign the sale and purchase deed before the Land Deed Maker Officer (Conveyancer).

A power of attorney to sell is made if the buyer does not want to directly attend himself to sign the sale and purchase deed before the Land Deed Maker Officer (Conveyancer), so as to empower other people to represent him. But there are times when there are other reasons, because the land purchased will be sold to another party. This is done with the aim of avoiding taxes and also the double / twice transfers of rights. This is usually done by developers or buyers whose profession is buying and selling land / houses. They buy land and have been paid in full and all the requirements for buying and selling have been fulfilled, but do not want to buy and sell as they should because they do not want to pay taxes, especially the Land and Building Rights (BPHTB) fees and the cost of making a Deed of Sale and Purchase and transfer of rights. Therefore *PPJB Lunas* is made with a Selling Power of Attorney, so that later those who will pay taxes and transfer fees are when buying and selling to new buyers. Still according to the resource person, even in the form of PPJB, the land office requires proof of income tax (PPh), this is to avoid PPJB being used as a way to avoid taxes. The income tax paid is income tax on a sum of money from the value of the transaction that has been paid, not the overall price. But if it has been paid in full, it means that the income tax that must be paid is calculated from the total value of the transaction price as a whole. Whereas for BPHTB that must be paid by the buyer will be paid during the process of making AJB. So with this Power of Attorney Selling a new BPHTB will be charged when making a Deed of Sale before PPAT, for the production of PPJB BPHTB not yet paid.

This power to sell can be entered as a clause in the PPJB, it can also stand alone, in the form of a separate deed. So, when signing, signed two deeds: PPJB and the Deed of Power to Sell. In the event that the power to sell is entered as a clause in the PPJB, the PPJB deed will only be signed. There are two types of power of attorney to sell, namely a power of attorney to sell to himself (the recipient of the power of attorney), and the power to sell to another party. The

power of attorney to sell to itself is usually related to PPJB while an ordinary power of attorney, in the sense that the power to sell to another person is not related to PPJB.

The power to sell to oneself can be a part of the PPJB, it can also be a separate deed of authority. If the power to sell Kediri itself is made in its own deed, then when the rights are transferred at the land office, the PPJB must be included. To distinguish ordinary power of attorney from the power of attorney to sell to oneself is the editorial sentence. For the power of attorney to sell to oneself the sentence used is "sell to the recipient of the power of attorney", while the usual power of attorney reads "giving power to and on behalf of the authorizer to sell to anyone".

In the event that the selling power is separately made with the PPJB, then when registering the sale deed to the Land Office, the PPJB must be accompanied. Because basically the power of selling is made based on PPJB which has paid off, so that both are interconnected and inseparable. This is to avoid misuse of the selling power, for example, for example, the power of attorney is used to make a sale and purchase deed, which the buyer is different from the buyer listed in the PPJB. This can cause legal problems in the future, including can be used for irregularities in the tax field.

In the case of the seller or the buyer acting through a power of attorney, then there must be a special power to sell. General power, which is usually only for management action does not apply to selling. The power must be firm in selling the land sold. The form of power must be written, verbal power cannot be used as a basis for buying and selling land. The written power of attorney is also at least legalized (by a Notary / Registrar of District / State Representatives abroad) (Wicaksono and Sugiarto, 2009).

However, the special power of attorney is different from the absolute power of attorney as stated in the Instruction of the Minister of Home Affairs on March 6, 1982 Number 14 of 1982 jo. Supreme Court Jurisprudence dated April 14, 1988 number 2584 K / Pdt / 1986 which affirmed that absolute power, regarding the sale and purchase of land, cannot be justified because in practice it is often misused for smuggling buying and selling of land.

Authorization to sell is of the nature or type of special power of attorney because it only concerns one particular interest or more, the contents of which are clearly and explicitly stated regarding acts or legal actions authorized by the recipient of the power of attorney.(Zainudin, 2017)

1.2 Legal Protection using Power of Attorney of Selling for Buyers

Protection of buyers who have paid off and made using PPJB, besides being carried out with conditions must be followed by making irrevocable power-giving clauses. The point is that if the seller does not fulfill it, the buyer can sue and request compensation in accordance with the agreement stipulated in the sale and purchase agreement.

The Selling Authorization contained in the *PPJB Lunas* deed is absolute, meaning that it cannot be revoked and will not end due to the reasons set out in Article 1813 of the Civil Code. This is to ensure legal certainty for buyers who have paid in full the price they have paid in full but cannot yet be implemented because of one thing or another there are conditions that have not been fulfilled. It should also be noted that, if the power to sell this an inseparable part of PJB is complete, then in the event the said PJB certificate is completely signed without any erroneous, coercive or fraudulent elements, then the PJB process is complete, which continues to be AJB and comes back the name of the certificate, it is already running as it should.

A power of attorney to sell, subject to the regulation of power of attorney in article 1792 - article 1819 of the Civil Code Law (KUHPer). In these articles, there is no regulation regarding the period of validity of a power of attorney. So, the validity period of a power of attorney depends on the agreement of the parties, in accordance with the principle of freedom of contract in article 1338 of the Civil Code Law (KUHPer).

Authorization to sell is of the nature or type of special power of attorney because it only concerns one particular interest or more, the contents of which are clearly and explicitly stated regarding acts or legal actions authorized by the recipient of the power of attorney. It should be noted that the prohibition on absolute power of attorney, namely a power of attorney containing the element "cannot be withdrawn by the authorizer". In accordance with article 1813 of the Civil Code Law (KUHPer), one of the reasons for the termination of power of attorney is if the authorization withdraws its power. This absolute power ban was strengthened in the Instruction of the Minister of Home Affairs No. 14 of 1982 concerning Prohibition on the Use of Absolute Authorities as the Transfer of Land Rights.

The deed of power to sell is not an absolute power, absolute power is an irrevocable power; the term absolute power is not a legal term, in the sense that there is no strict arrangement regarding that right. To be able to understand the true meaning of absolute power, it must be interpreted etymologically (Andasasmita. 1991). From the contents of the Power of Attorney mentioned, the Power of Attorney can be categorized as a General Power of Attorney or an Absolute Power of Attorney, because the object is very broad. Instruction of Minister of Home Affairs No. 14 of 1982, in the second part, describes the definition of Absolute Power of Attorney, namely:

a. Absolute Power is the power in which the element of irrevocability is given by the authorizer.

b. Absolute Power is the transfer of rights to land that gives authority to the recipient of the power to control and use the land and to do all legal actions that according to the law can be carried out by the right-holders.

In practice, this type of Absolute Power of Attorney is prohibited from being used in the process of transferring land rights / sale and purchase of land, as stipulated in the Instruction of Minister of Home Affairs No. 14 of 1982 aimed at regulating public order in the transaction of sale and purchase of land. Letter c, considering that the Instruction states: The purpose of the prohibition is to avoid misuse of the law which regulates the power of attorney by holding the transfer of land rights in a covert manner using the form of "absolute power". Such action is one form of legal action that interferes with efforts to control land status and use.

Even though the power of attorney to sell is irrevocable, the authorization to sell in the binding deed of sale and purchase is not included in the meaning of absolute power which is prohibited because the power of attorney is made in order to perpetuate an agreement with a valid causal, and legal actions referred to in the power of sale, not for the interests of the power of attorney, but for the interests of the power of attorney, which is the implementation of legal obligations by the power of attorney as the seller to the power recipient as the buyer because the price has been paid in full (Latumenten, 2003). It becomes a fair thing if someone has paid in full the price of land to get protection with the power of attorney to sell it.

Basically the responsibility in fulfilling the rights and obligations in the power of attorney becomes the responsibility of the principal which is in this case the attorney acts for and on behalf of, and represents the principal. An attorney does a business not for himself, but for the interest of the person he represents, who is the true owner of the interest. That means the legal actions carried out by the attorney are the legal actions of the principal (Adnyana, 2015). In theory,

the power to sale is the delegation of some or all of the authority that is in the power of attorney to the person who receives power in the event and / or to carry out legal actions to transfer the right to land owned by the authority (Zainuddin, 2017).

3 CONCLUSIONS

From the results of the analysis and discussion of the problem of using the power of selling in land sale and purchase, several conclusions can be drawn as follows:

1. The power of attorney to sell relating to PPJB is included in the PPJB deed which aims to sell to himself (the recipient of the authorization) as the buyer who has already settled, while the ordinary power of attorney is made separately to sell to others which is basically really intended to represent the seller for various reasons because the seller cannot attend to sign the deed of sale directly before the Land Deed Maker Officer (Conveyancer).

2. The legal strength of the power of attorney to sell with *PPJB Lunas* is strong, because the power of attorney to sell is basically to provide legal protection to the recipient of the power of attorney, i.e. the buyer who has paid the land price in full, so that the sale and purchase has already occurred, and therefore it is natural that the power of attorney to sell is irrevocable. Whereas the power of attorney to sell to other people is basically intended to represent the seller, for various reasons, the seller cannot attend to directly sign the sale and purchase deed before the Land Deed Maker Officer (Conveyancer), so that the authority of the authorized person is only to sign the deed of sale buy before Conveyancer. Against the risks resulting from the implementation of the sale and purchase remains the responsibility of the seller.

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The Responsibilities of the State in the Fulfillment of Inclusive Education for Persons with Disabilities: Case Study in Indonesia

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Abstract: Indonesia has signed The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) in 2006 and ratified it through The Law Number 19 of Year 2011 concerning Ratification of The UNCRPD. Inclusive education is one of the mandates that must be realized in The UNCRPD but Indonesia not yet to realize the fulfillment of inclusive education for persons with disabilities. The arrangements for inclusive education in Indonesia are only technically regulated up to primary and secondary education. There are many problems regarding the fulfillment of inclusive education like educational facilities and teaching methods are not yet accessible, The inclusive education system in Indonesia has not yet been built systematically, etc. Indonesia need to make National Strategy to realize Inclusive Education. This research emphasizes the responsibilities of the state in the fulfillment of inclusive education for persons with disabilities in Indonesia. The type of research used is normative juridical research, that examines legal regulations relating to inclusive education for persons with disabilities.

1 INTRODUCTION

UNCRPD is one of the international conventions that specifically regulates about the rights for the Persons with Disabilities (The Persons with Disabilities hereinafter abbreviated to PD).(Ariyani, 2017) Indonesia has ratified The UNCRPD through The Law Number 19 Year 2011 concerning The Ratification of the Convention on the Rights of Persons with Disabilities (hereinafter referred to as The Law Number 19 of 2011). This ratification shows the commitment and seriousness of the Government of Indonesia to respect, protect and fulfill the rights of people with disabilities which in the end is expected to improve the welfare of people with disabilities.

PD have the right to be free from torture or cruel, inhumane, degrading human treatment, free from exploitation, violence and abuse, and have the right to obtain respect for their mental and physical integrity based on equality with others, including in it the right to obtain social protection and services in the context of independence, as well as in emergencies. The Government of Indonesia is obliged to realize the rights contained in the convention, through adjusting the laws and regulations, including ensuring the fulfillment of the rights of PD in all aspects of life such as education, health, employment, politics and government, culture and tourism, and the use of technology, information, and communication.

According to PUSDATIN data from the Ministry of Social Affairs of Indonesia in 2012, the percentage of PD reached 2.45% with a total of 11,580,117 people. By classification, 3,474,035 (people with visual disabilities), 3,010,830 (people with physical disabilities), 2,547,626 (people with hearing disabilities), 1,389,614 (people with mental disabilities) and 1,158,012 (persons with chronic disabilities).(Nurinayah, 2018) The Government of Indonesia in the framework of fulfilling the rights of persons with disabilities, issued several related policies fulfillment of the rights of persons with disabilities among others, by ratifying the UNCRPD through The Law Number 19 Year 2011 and forming The Law Number 8 Year 2016 concerning Persons with Disabilities.

The UNCRPD and The Law Number 19 Year 2011, and The Law Number 8 Year 2016 are the international and national instrument of Human Rights in order to Respect, fulfillment and protection of the rights of PD in Indonesia (Development tools and Human Rights Instruments). The purpose of this

Convention is to promote, protect and guarantee the equality of rights and fundamental freedoms for all PD, as well as respect for the dignity of persons with disability as a part inseparable (inherent dignity). (Fikriyah, 2018)

This ratification of The UNCRPD has made Indonesia as a part of the world community that is committed to realizing optimally all forms of honor values, protection and fulfillment of the rights of persons with disabilities as stated in The UNCRPD. (Nursyamsi *et al.*, 2015) With the ratification of The UNCRPD by Indonesia, Indonesia has declared itself to be definitively bound to The UNCRPD. Ratification is one form of ratification of international agreements so that when the state has ratified an international agreement, the state has bound itself to an international agreement.

Inclusive education is one of the mandates that must be realized in the fulfillment of rights in education in The UNCRPD. Inclusive education is the implementation of universal education, emphasizing human rights, based on equality and without discrimination. Inclusive education is an alternative solution in order to prevent discriminatory treatment for PD. The state based on The UNCRPD is the party most responsible for effectuating inclusive education.

The facts, PD in Indonesia have various problems because they are treated discriminately related to the fulfillment of rights in the field of education, including not accepted as students in public schools and colleges for reasons of disability and/or reasons for infrastructure that has not been accessed; media (tools or facilities) used for student admission examinations at schools and colleges are not accessible to persons with disabilities; some people with disabilities are accepted in public schools and universities/colleges, but it turns out that educational facilities and teaching methods are not yet accessible(SIGAB, 2017); There is no choice of the type of school and college for persons with disabilities. Primary and secondary schools are usually directed to The Special Needs Schools and tertiary institutions are directed to The Special Needs Higher Education).(Syafi'ie, 2015)

The state as the party most responsible for fulfilling the right to education for PD is required to immediately overcome all the problems mentioned above. Based on the background above, the authors raised the issue with the title " The Responsibilities Of The State In The Fulfillment Of Inclusive Education For Persons With Disabilities: Case Study In Indonesia" to be discussed and reviewed in this paper.

2 RESEARCH METHODS

The researcher used a type of normative juridical research, namely research focused on examining the application of rules or norms in positive law.(Ibrahim, 2011) The approach method that used in this study is statute approach.(Marzuki, 2009) The researcher also used Analytical Approach. Basically, the task of legal analysis is analyzing legal notions, legal principles, legal rules, legal systems, and various juridical concepts. The researcher also uses Case Approach to learn the application of legal norms or rules carried out in legal practice (Marzuki, 2009)

The purpose of this case study is to find out the implementation and obstacles faced by Indonesia in fulfilling inclusive education. Another objective of this research is to analyze the appropriate juridical policies to be taken in the fulfillment of inclusive education in Indonesia.

Researchers used primary legal material sources including UNCRPD, The Law Number 19 Year 2011, The Law Number 8 Year 2016 and several other regulations. Researchers also used secondary legal material sources including books, journals, proceedings, official documents, sources from the internet relating to the fulfillment of inclusive education for persons with disabilities. Researchers also used primary data by conducting interviews with the Minister of Ireland State with Special Responsibility for Disability Issues as a material for comparing policies in Indonesia with Ireland State.

The method of presenting legal material in this study is presented in the form of descriptions arranged systematically, logically and rationally. Legal materials obtained are analyzed using qualitative methods by describing and interpreting data obtained based on legal norms, theories and applicable doctrines associated with problems regarding the fulfillment of inclusive education for persons with disabilities.

3 RESULTS AND DISCUSSION

The responsibilities of the state relating to education are regulated in several instruments related to education. It can be concluded that state responsibility generally relates to fulfilling educational rights among others the obligation to respect, to protect and to facilitate. According to the obligation to respect, the state must avoid all things that can hamper or prevent the fulfillment of the right of education. Acording to the obligation to protect, the state must take action that can avoid third parties

from intervening in the fulfillment of the right of education. Acording to the obligation to facilitate, the state must take positive actions that help individuals and communities to obtain the right of education. Acording to the obligation to provide. the state, in this case, must fulfill the rights of education. If a person or group cannot because of reasons beyond their control, the state must realize their rights in the available ways.(Syafi'ie, 2015)

Furthermore, there are more specific arrangements regarding state responsibilities in the fulfillment of educational rights for disabilities persons : in The UNCRPD Article 8 Paragraphs (1) and (2b), Article 16 Paragraphs (1) and (2) and also Article 24 Paragraphs (1) and (2). Article 8 of The UNCRPD contains the role and responsibilities of the state to adopt effective and immediate policies with the aim of increasing the awareness of the whole community about the rights of persons with disabilities and to maintain respect for the rights and dignity of persons with disabilities.

Article 16 Paragraphs (1) and (2) of The UNCRPD is an affirmation of the role and responsibility of the state to take education policies to protect and prevent persons with disabilities from all forms of exploitation, violence, and harassment, including the gender aspects of these actions. Furthermore, Article 24 paragraph (1) broadly explain that the party States of UNCRPD recognize the right of education for persons with disabilities through the fulfillment of the right of education for persons with disabilities without discrimination and based on equal opportunities. The participating countries must guarantee an inclusive education system at all levels and lifelong learning.

Article 24 paragraph (2) of the UNCRPD contains guarantees of the state on the rights of persons with disabilities related to the education system, the right to compulsory and free basic education, the right to further education, access to basic and advanced education, the provision of accommodation, educational facilities, and supporting facilities in academic and social environments.

The mandate in The UNCRPD, The fulfillment of the right of education for persons with disabilities can be summed up broadly, among others:

1. That the state party is obliged to adopt policies from the national level to the regional level, which aim to increase public awareness about the importance of education rights for disability persons as well as policies that are oriented towards respecting human rights for disability persons.

2. That the state is obliged to protect disability persons and prevent all forms or kinds of exploitation, harassment, and discrimination in the aspect of gender towards persons with disabilities.

3. That the state guarantees the realization of inclusive education system in all levels of education ranging from the basic, middle to tertiary level)

Based on Mandate in The UNCRPD about the responsibilities of states in the fulfillment of inclusive education for persons with disabilities, Government of Indonesia have prepared three types of education :

1. Segregated Education is education that separates disabled students from other non-disabled students. Examples of this type of education are special schools or special schools.

2. Integrated Education is education that allows disabled students to take education together with non-disabled students in regular schools. The consequence of this education is that disabled students must be able to follow the curriculum and learning carried out in regular schools.

3. Inclusive Education is education where disabled students can take education together with non-disabled students in regular schools. In inclusive education, of course, there are curriculum modifications and learning that is adapted to students with disabilities.(Setiati, 2017) Inclusive education has a broader goal to make society equitable and more just for all citizens in every aspect of life including education. The concept of inclusion has to be understood as well as implemented through a comprehensive lens, which would not plan for any segregated approach or intervention for any particular group or context.(Ahsan, 2018)

In order to realize inclusive education, an institution that specifically builds support services for students with disabilities is required. This institution by the Law Number 8 Year 2016 on Persons With Disabilities is called "Disability Service Unit". This unit will help schools and universities to fulfill the special needs of students with disabilities, which The UNCRPD and The Law on Persons with Disabilities are called "fulfillment of decent accommodation". Schools and Universities also need the presence of "Special Guidance Teachers". In fact, the Government has never recruited them. As a result, regular schools and colleges that accept persons with disabilities do not have experts who help them how to adapt the learning process for persons with disabilities.(Indrawati, 2018)

The government must ensure that inclusive education runs optimally, by including a Special Guidance Teachers scheme in receiving state civil apparatus teachers in order to fulfill Special Guidance Teachers needs.(Utomo *et al.*, 2018)The government also should make a Government Regulation that regulates the fulfillment of adequate accommodation for persons with disabilities who take Inclusive education, but the regulation has not yet been made until now.

Inclusive education is a process for making changes to the education system so that it produces equal and quality education.(Ahsan, 2014) Inclusive education is a way to foster a positive attitude and is a fair step for people with disabilities in the community.(Robinson, 2017) The Fact, inclusive education system in Indonesia has not yet been built systematically and this is also the duty of the state to establish an inclusive education system that is not discriminatory. Furthermore, for provisions regarding inclusive education can be applied until to the local level, the local government through decentralization is authorized to more contribute towards implementing inclusive education through the establishment of policies that are inclusive.

State through Government should support the implementation of inclusive education by giving sufficient financial support for schools and colleges. financial support is needed especially to support the fulfillment of facilities needed by PD and improve the quality of teaching resources.(Lindsay, 2018)

In order to realize inclusive education, the Government of Indonesia also must immediately realize a special curriculum for inclusive schools (in all levels of education ranging from the basic, middle to tertiary level) and their supporting facilities so that teaching and learning activities in inclusive schools can run effectively.

The researcher compared the fulfillment of inclusive education in Indonesia with State of Ireland. Ireland is a country that committed to the UNCRPD. Ireland has The Minister of State for Disability Issues. This minister is is a junior ministerial post at the Departments of Employment Affairs and Social Protection, Justice and Equality, and Health of the Government of Ireland. The Minister of State for Disability Issues works together with the senior Minister in the department and has special responsibility for all disability and equality issues.

Based on interviews with Finian McGrath, Minister of Ireland State with Special Responsibility for Disability Issues on July 11, 2019, said that Ireland is very committed to implementing the UNCRPD. Ireland have ministries that specifically handle Disability Issues and establish the National Disability Inclusion Strategy (NDIS) 2017 – 2021. The National Disability Inclusion Strategy (NDIS) NDIS 2017– 2021 contains a wide range of practical commitments to improve the position of people with disabilities. NDIS provides a mechanism for joined-up working to deliver on Ireland's commitments to implementing the UNCRPD.

Acording to NDA independent assessment of progress under NDIS 2017-2018, NDIS takes a whole of Government approach to improving the lives of people with disabilities both in a practical sense, and also in creating the best possible opportunities for people with disabilities to fulfil their potential.The Strategy comprises the following eight themes: Equality and Choice, Joined up policies and public services, Education, Employment, Health and Wellbeing, Person centered disability services, Living in the Community; and Transport and access to places

The Strategy was prepared on foot of a comprehensive consultation process that took place during 2016 and was completed early in 2017. The purpose of this process was to identify and agree specific actions and timescales for delivery under the themes set out above. Implementation of the Strategy is being overseen by a Steering Group, which comprises representatives of the key government departments and agencies and of disability stakeholders. The Group is chaired by the Minister of State. The National Disability Strategy Steering Group will publish an annual report on progress made in each year of the Strategy starting in 2018, and there will also be a midterm review.

Finian McGrath also explained that The NDIS Steering Group, oversees and monitors the implementation of NDIS, Steering Group will have an important role in guiding on progress in this area. The National Disability Authority (NDA) will also play a critical part in the implementation of the Convention, and will be carrying out a review of progress with respect to the Strategy's key indicators in this regard. In the NDIS 2017-2021, Ireland supports the fulfillment of inclusive education, including:

a. Set up systems and policies to support children and young people with disabilities to move into and out of education
b. Train teachers and schools new skills to support students with disabilities
c. Encourage people with disabilities to take part in third level education

d. Make sure that schools can use information technology to help students with disabilities

e. Improve the Special Needs Assistant (SNA) Scheme,etc.

Indonesia doesn't have the National Disability Inclusion Strategy like Ireland to handle all the issues of disability. Indonesia can adopt the policies and/or steps taken by Ireland because Ireland is one of the most committed countries to realize the mandate of the UNCRPD even though Ireland has only ratified it in 2018 but the steps taken in realizing inclusive education are very real. Indonesia can create a special division under the Ministry of Social Affairs which deals with disability issues. through this division, can make a national strategy to overcome the problem of disability in Indonesia. The division will be overseen and fostered by a steering group formed by the social ministry. Indonesia through the Ministry of Social Affairs can form an Independent Legal Entity consisting of various elements as a body that will work together with the Special Division to create a national disability inclusion strategy.

4 CONCLUSIONS

Indonesia as one of the countries that ratified The UNCRPD has accommodated The UNCRPD provisions, among others, by providing three educational options for persons with disabilities: segregated education, integrated education, and Inclusive education. Indonesia doesn't have the National Disability Inclusion Strategy like Ireland to handle all the issues of disability. The Next Steps of Indonesia to handle issues about inclusive education,Indonesia can create a spesial division under the Ministry of Social Affair to make National Disability Incusion Strategy where one of the Strategy is Strategy to fulfill inclusive education in Indonesia among others: Establish The National Disability Inclusion Strategy sustainably; Establish Steering Group that specifically oversees, monitors, provides input and also guidance related to the national Disability Inclusion Strategy from all parties concerned with persons with disabilities in synergy (non-government organizations, disability groups, government, experts or from universities, communities, etc); Build institutions that specifically build support services for students with disabilities in schools and colleges; Make implementing regulations for laws relating to the fulfillment of the right of inclusive education for persons with disabilities in the form of government regulation that regulates the fulfillment of adequate accommodation for persons

with disabilities who take Inclusive education; Improve the Special Guidance Teachers scheme or the Special Needs Assistant (SNA) Scheme; Build the inclusive education system systematically not discriminate; make policies and implement inclusive education; also provides financial support for the development of inclusive education up to the regional level.

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Regional Economic Growth in Indonesia, Information and Communication Technology Perspectives

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Abstract: This paper aims to investigate the contribution of information and communication technology (ICT) to local economic growth in Indonesia in the period 2008-2017, as it provided a critical backbone to the development of the data industry in Indonesia, especially mobile data. This study tested a cross-section instrument on 33 provinces in Indonesia. The simultaneous equation model is employed to analyze the effect of ICT on regional economic growth. This study assessed two policy settings, namely direct contribution to access and availability for economic growth, and the indirect impact on labor productivity. The results revealed an increase in the role of ICTs in encouraging regional economic growth in Indonesia, although most provincial areas have limited ICT infrastructure. This paper opens an extended solution to the improvement of ICT infrastructure and emphasizes a better in-depth analysis of ICTs on regional economic growth.

1 INTRODUCTION

The idea of long-term economic growth followed the theoretical framework of Solow-Swan (Solow, 1957; Swan, 1956). This model makes technology the main ingredient in long-term growth and economic development. Over the past few years, growth was a process of increasing capital and labor to achieve higher returns. This Solow-Swan model shows that because of fewer profits, there are limits to the increase in the amount of money and energy to achieve sustainable growth. Improved technology can offset this declining profit and provide an opportunity for a country to experience productivity growth.

Technology has always been at the forefront of economic growth and productivity. Increasing capital and labor input in the production process alone is not enough to maintain sustainable growth. Productivity is the primary driver of growth after a country reaches its capital and labor use limits. Recognizing the importance of technology in industrial growth, more and more countries and companies are allocating their resources for investment in technology.

Furthermore, technological advances have contributed to human well-being, including in terms of new jobs, goods, health services, travel, and communication. At the same time, technology also has a disturbing power. Technology can influence how labor is employed, and companies operate. Technological changes in the fourth industrial revolution at the moment may not be as drastic as they have been in the past, but the acceleration of technological improvements and adoptions is happening even faster. The previous industrial revolution took decades to truly change so that the adjustment time was longer, especially in the labor market.

Information and Communication Technology (ICT) is one form of technology that is snowballing today and can be an indicator in determining the economy of a country. The high demand and penetration of digital devices in various aspects of human life has directly created a significant industry in the field of technology and involves almost all major nations in the world, with business value increasing day by day (Indrajit, 2011). ICT has become a new resource for economic growth. It is observable from the impact of the use of ICTs in a broad manner, which enables the implementation of more efficient ways to produce, distribute, and consume goods and services.

Several previous studies have shown that ICTs can drive economic growth. The higher the development of a country's information technology, the higher the economic growth. There is a tendency that countries with rapid ICT growth have fast economic growth as

well. In the United States, in the period 1995-1998, ICTs were able to contribute to the economic growth of 4.73% (Jorgenson, Dale and Stiroh, 2000). Also, some European Union member countries (notably Ireland, the Netherlands, and Finland) and some OECD countries (for example, US, Australia, and Canada) have recorded increases in economic growth and productivity, stable inflation, and reduced unemployment through the application of ICT.

In the Asia Pacific region, a country like Indonesia provided evidence that ICT diffusion is positively correlated with the level of economic growth. The role of communication equipment calculates research in Asia regarding ICT's role in economic growth. The results showed that the accumulation of capital of communication equipment had a positive impact on all Asian countries during the 1990s, and positive side measures were similar in Asian countries (Kanamori, Fujiwara, and Mitomo, 2004). This study provides the first step in understanding the impact of using ICT in Asia.

Recently, the rise of the information society in Indonesia exhibits the continuous development of ICT, especially telecommunication firms, as magnified by the transition from fixed-line phones to the mobile cellular phone. Besides, due to the rapid growth of telecommunications in Indonesia, the term "Digital Economy" has penetrated the urban and even rural areas in Indonesia. Telecommunication has eliminated the distance and reduced the differences between communities. Information is no longer constrained by time, location, or demographics, providing a great value to society.

A study from the International Telecommunication Union revealed 25 percent of Indonesia's population had accessed the internet in 2016, showing the climate of information disclosure and public acceptance of technological developments and changes towards the information society. The high number of internet users in Indonesia is inseparable from the rapid growth of cellular phones (Batunanggar, 2019). In 2017 there was 88.13 percent of households in Indonesia having/controlled at least one mobile telephone number. This figure is much higher when compared to the conditions in 2012, which only reached 83.52 percent.

This paper examines the causal relationship of ICTs to growth, using panel data from 33 provinces in Indonesia for the ten years 2008-2017, where ICTs are multiplying in various regions in Indonesia. The data compiled from three primary sources are the dataset of the Statistics Indonesia (for regional economic indicators), the International Telecommunication Union (ITU) database (for ICT penetration indicators), the Indonesian Ministry of Communication and Information.

2 LITERATUR REVIEW

The contribution of Romer (1986; 1990) and Lucas (1988), had provided a stimulus to investigate endogenous factors that determine economic growth. It centered on the central question or idea of which "the main engine of growth."

One of the engines of growth is human capital. It is static, instead of being static, it is very dynamic and possessed abundant productive capabilities. Every step of development would yield to the stock of knowledge obtained. Therefore, this kind of improvement would boost economic growth. Quah emphasizes the demand for supply, argues that the Information and Communication Technology (ICT) revolution encourages the advancement of workforce skills, consumer sophistication, and broad-based education level improvement; furthermore, it urges increased use of technology and increases the productivity of labor, leading to the increase of economic growth (Quah, 2002). Levine argues that a lesser barrier to information, essential driver of ICT, would promote increased investment (1997).

Even before the advent of ICTs, the imminent impact of the increased access and participation on information and effective communication yielded economic growth, as evidenced in Japan, Korea, Hong Kong, and Taiwan. The extraordinary economic growth in the late 80th as a result of how companies and people had better access to market information. Besides, they benefit from more effective communication with foreign partners and each other.

The slow development of productivity had been observed as a critical inhibitor of economic growth in many developing countries (Cirera, 2016). One of the answers to the previous problem was the advancement use of ICT (Cirera, Lage, and Sabetti, 2016), as it could facilitate a more efficient approach to factors of production utilization and promoting the application of and to other technologies. Its potentiality as a productivity driver in areas with lower ICT adoption or underdeveloped infrastructure, such as Sub-Saharan Africa.

Although the magnitude of ICT contributions to the growth of productivity still sparked heated conversation and debate, various study findings such as Pilat (2004); Draca, Sadun, and Reenen (2006); Litan and Rivlin (2001) revealed that ICT positively affected the productivity growth. Polak found a low elasticity, despite being positive of 0.3% (2014). This low elasticity could be explained by the fact that ICTs are integral parts of many production and capital

technologies, which makes it difficult to separate the effects of ICT investments on the impact of other production factors. The debate over the contributions of ICT remains an open question of whether ICT could potentially become an important driver of productivity growth and subsequently increase economic growth.

The rapid application of ICTs raises essential questions about the possible impacts on the company's operations. For example, Bloom, Sadun, and Reenen (2012) investigate how ICTs affect worker autonomy, differentiating between cost reduction in the information, or even communication. They found that as the independence of workers increased would provide freedom, despite shrinking for the first time, while in the future, decisions were decentralized, and worker autonomy increased.

Several studies have empirically analyzed the relationship between ICT and productivity. At the sectoral level, Basu et al. (2004) examined ICT could differentiated the US and UK productivity performance. Focusing on the reduced ICT costs, cheap ICT investments are likely to create significant changes only if companies can radically apply their other inputs and increase productivity. They concluded that the different productivity patterns was the result of unmeasured investments in intangible organizational capital of these two countries after 1995.

Among all types of ICT investments that have an impact on productivity, internet adoption is the main application that triggers many kinds of research. Sánchez, Gallego-Álvarez, and Rodríguez-Domínguez (2011) investigated the effect of the internet on productivity as evidenced in Spanish-based corporations. They reported three channels where the internet can affect productivity: (i) the reduced transaction costs in the production and distribution of goods and services; (ii) the increased management efficiency, by a more effective management of supply chains, and a more effective communication within the company as well as customers and partners; (iii) the increasing competition provided the platform of a more transparent prices with a more expansive market potentiality for buyers and sellers, who put pressure on suppliers to implement techniques that translate into cost savings. The important conclusions of this study indicate a positive impact on the productivity of internet adoption but it would decline as a certain level of usage is reached.

Although ICTs cover a variety of applications, internet adoption is in the frontrow driver of how it developed rapidly inside the firms. Loundes (2002) shows that the percentage of businesses using the internet in Australia has doubled in three years. In 1998, 29 percent of Australian companies used the internet, while it increased to 69 percent in 2001. Recent data shows that internet penetration reaches almost all companies in developed countries; 97.9 percent of businesses with ten or more employees in OECD countries have internet connections (Cirera, 2016). Even developing countries have a high percentage of companies using ICT (Cirera, 2016). For example, the rate of Turkish and Mexican companies that use the internet is more than 90 percent (OECD, 2012). However, ICT adoption is not evenly across all types of companies. Walczuch, Braven, and Lundgren (2000) have shown that small companies in the Netherlands do not adopt the internet at the same speed as their larger counterparts.

Bresnahan et al., using company-level data, suggest that the reduction in ICT prices will increase investment in work organizations and product and service innovations, which in turn increases the demand for skilled workers to increase productivity growth (Bresnahan, Brynjolfsson, and Hitt (2002). The Bresnahan study, using US-level company data from 1987 to 1994, found evidence of complementarity among the three types of innovations (ICTs, workplace reorganization, and complementary new products and services). In other words, companies that adopt innovation tend to use more skilled labor, and the impact of ICT on labor demand is more significant when combined with organizational investment. In short, they highlight the importance of ICT as an enabler of organizational change, which leads to productivity growth.

Furthermore, using the same company-level data, Brynjolfsson and Hitt specifically investigate the influence of computerization on productivity and output growth (Brynjolfsson and Hitt, 2003). According to them, ICTs affect productivity because companies change their production processes and produce complementary innovations in and throughout the company. Their main conclusion is that the estimation of computerized contributions to output growth continues to increase in the long run. In the short term, the output contribution measured from computerization is roughly the same as the computer capital cost, but in the long run, their participation is significantly more significant than their expenses.

Furthermore, Polder et al. (2010) investigated the impact of ICT on productivity using data for more than 5,000 Dutch companies from 2002 to 2006. Polder, including ICT investment as an input to innovation similar to investment treatment in R & D within the framework proposed by Crépon, Duguet, and Mairessec (1998). Their central hypothesis is that ICTs affect productivity through an innovation process. Thus, ICT is input to the innovation process, such as the input of other knowledge for R & D. In other words, ICTs enable higher levels of productivity through an innovation process because this is an input of innovation to increase output and ultimately leads to higher company performance. The findings of

Polder et al. show that investment and use of ICTs are essential drivers of innovation output in manufacturing and services. Besides, they found that the strong effect of ICT on productivity is through organizational innovation.

Internet penetration in Indonesia is increasing, from 25.37 percent in 2016 to 32.34 percent in 2017. One indicator illustrating this phenomenon is the correlation between the percentage indicator of the population using the internet and per capita GRDP, which shows a positive relationship of 0.723 (Statistics Indonesia, 2017. Judging from the growth of research conducted by Nata found that ICT investment in Indonesia both in telecommunications and hardware and software has a strong influence on the growth of the Indonesian economy, and the high growth rate of ICT investment has triggered high economic growth in Indonesia (Nata, 2007). Hardware has an active role if viewed in terms of it's physical, whereas software has a high contribution in terms of service services.

3 METHOD

The analytical method used in this study is the panel data method with quantitative analysis and strengthened by qualitative analysis. This study will conduct a simultaneous modeling framework of ICT, human capital, labor productivity, and regional economic growth in a model that explicitly connects all variables is the most appropriate equipment to see, both directly and indirectly, the impact of ICT on regional economic growth. Therefore, in this study, a simultaneous equation regression model will be used using the two-stage least square (TSLS) regression technique to see the relationship between ICT, human capital, labor productivity, and regional economic growth. Thus, the general specifications of the structural equation system used in this study are:

$$P = f(ICT, HC) \qquad (1)$$
$$Y = f(P, ICT, HC) \qquad (2)$$

Where P is labor productivity; Y is regional economic growth; ICT is information and communication technology which is proxied by the ICT Development Index, and HC is human capital proxied by the Human Development Index.

Given the size of regional economic growth seen from ICT, human capital, and labor productivity, structural equations (1) and (2) become:

$$P_{it} = \alpha_0 + \alpha_1 ICT_{it} + \alpha_2 HC_{it} + \varepsilon_{it} \qquad (3)$$
$$Y_{it} = \beta_0 + \beta_1 P_{it} + \beta_2 ICT_{it} + \beta_3 HC_{it} + \varepsilon_{it} \qquad (4)$$

Next equation (3) is substituted to equation (4):

$$Y_{it} = \beta_0 + \beta_1(\alpha_0 + \alpha_1 ICT_{it} + \alpha_2 HC_{it}) + \beta_2 ICT_{it} + \beta_3 HC_{it} + \varepsilon_{it}$$
$$Y_{it} = \beta_0 + \alpha_0\beta_1 + \alpha_1\beta_1 ICT_{it} + \alpha_2\beta_1 HC_{it} + \beta_2 ICT_{it} + \beta_3 HC_{it} + \varepsilon_{it}$$
$$Y_{it} = \beta_0 + \alpha_0\beta_1 + (\alpha_1\beta_1 + \beta_2)ICT_{it} + (\alpha_2\beta_1 + \beta_3)HC_{it} + \varepsilon_{it} \qquad (5)$$

Where P_{it} is labor productivity; Y_{it} is regional economic growth; ICT is Information and Communication Technology proxied by the ICT Development Indeks; HC_{it} is Human Capital proxied by the Human Development Index; i is the province I, where i = 33 provinces in Indonesia; t is year t, where t = 2008-2017; α, β is estimated parameters; α_0, β_0 is intercepting; and ε is error term.

The Two-Stage Least Square (TSLS) method can work on a simultaneous equation system that is over-identified and exactly-identified. For an exactly-identified equation, besides being estimated by the TSLS method, it can also be assessed by the indirect least square (ILS) method to produce parameter values that meet the best linear unbiased estimator (BLUE) criteria.

Then through equation (5), brought to the reduced form equation. The reduced form equation in question is as follows:

$$Y_{it} = \pi_0 + \pi_1 ICT_{it} + \pi_2 HC_{it} + \mu_{it} \qquad (6)$$

Where:
Y_{it} = regional economic growth
$\pi_0 = (\beta_0 + \alpha_0\beta_1)$
$\pi_1 = (\alpha_1\beta_1 + \beta_2)$
$\pi_2 = (\alpha_2\beta_1 + \beta_3)$
μ_{it} = composite term error

4 RESULTS AND DISCUSSION

Based on the estimation results using 33 districts/ cities, it shows that the direct effect of ICT on Productivity (P) is 0.386, which means that an increase of 1 point ICT Index will result in an increase in labor productivity of 0.386 percent with a significance level of 1% (0.01). This means that the effect of ICT on P is significant, presented in table 1. These results are in line with Quah's view, which states that ICT penetration will encourage skill improvement and increase the education level of the workforce, thus increased labor productivity and, finally, economic growth (Quah, 2002). Likewise, Levine (1997) argues that ease of accessing ICTs is believed to be an important driver of increasing productivity faster, which in turn increases economic growth.

Based on the estimation results in Table 1, it shows that the direct effect of Productivity (P) on regional economic growth (Y) is 0.173, which means an increase of 1 percent labor productivity will

increase the economic growth of 0.173 percent with a significance level of 0.013. These results are consistent with Cirera's opinion that states that low productivity growth is one of the main factors that inhibit economic growth in many developing countries. One potential for productivity growth is the adoption and use of ICT. Information technology can facilitate productivity growth by utilizing production factors more efficiently and promoting the application of other technologies. The potential of ICT as a productivity enabler is even more enormous in areas far from the availability of technology, especially in developing countries, which until now have tended to have lower rates of ICT adoption and underdeveloped ICT infrastructure (Cirera, Lage and Sabetti (2016).

Based on the estimation results in Table 1, it shows that the direct effect of ICT on Y is 0.331, which means that an increase of 1 point ICT Index will result in a rise in regional economic growth (Y) of 0.331 percent with a significance level of 1%. These results support Nata's study, which found that ICT investment in Indonesia in both telecommunications and hardware and software has a strong influence on Indonesia's economic growth, and the high level of ICT investment has triggered high growth in Indonesia (Nata, 2007). Hardware has an active role when viewed in terms of its physical, while software has a high contribution in terms of service. The fact is that internet penetration in Indonesia is multiplying, from 25.37 percent in 2016 to 32.34 percent in 2017; moreover, it encourages the development of internet usage in economic activities or digital economy phenomena. One indicator that can illustrate this phenomenon is the correlation between the percentage of the population using the internet and the GDP per capita which shows a positive relationship of 0.723 (Statistics Indonesia, 2018).

Table 1: The Estimate Results.

Directions of Effect		Estimate	t-statistic	Prob.
P <----	ICT	0.386***	3.804	0.000
Y <----	ICT	0.331***	7.139	0.000
P <----	HC	0.076**	2.100	0.036
Y <----	HC	0.015	0.917	0.359
Y <----	P	0.173*	2.491	0.013

***p<0.01;
**p<0.05;
*p<0.1

5 CONCLUSIONS

An important finding in this study is that ICTs have a significant relationship to regional economic growth in Indonesia. This relationship begins with the influence of ICT penetration on labor productivity. Information and communication technology can facilitate productivity growth by utilizing production factors more efficiently and promoting the application of other technologies, which in turn, encourages increased use of technology and increases labor productivity and, as a result, encourages economic growth.

ACKNOWLEDGMENTS

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Exploring Indigenous Material of Thorny Pandanus Pangandaran as Indonesian Traditional Craft in the Creative Context

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Keywords: Creative Context, Exploring Design, Indigenous Material, Pandanus Thorny Pandanus, Traditional Craft.

Abstract: The creative industry is a mainstay of supporting the national economy. The novelty in the finding of this research is that the people's product taste generally becomes the main consideration in the creative context aspect in the current and future creative industries, which includes the development of product design, along with its economic projections, and additionally the Indonesian aesthetic characters integrated into traditional craft products that have sociological impact. The scope of this research is the development of creative products such as design, production, effective technology, distribution and marketing, management of indigenous renewable raw materials based on natural environment tourism on the coast of the southern coastal area of Pangandaran. The focus is on exploring the indigenous thorny pandanus material as material for the development of traditional craft products in the Pangandaran tourism area. The applied creative design methods with explorative and experimental creative process and design of creative economic products. The aim is to realize eco-design ideas and concepts by capturing potential natural resources, crafters as human resources of home industry, and Pangandaran tourism as a representation of the national creative industry cluster, which enhances the competitiveness of superior national creative products through expanding national and international market access.

1 INTRODUCTION

In the book entitled "The Science of Art and Design", published by the Faculty of Art and Design of Bandung Institute of Technology (B. Anas, 2010), it is stated that design is a scientific phenomenon that grows along with the development of design as an object of study. In its scientific studies, design does not only observe design objects as functional objects, but also probes further by placing them as meaningful objects. Gradually, in line with the scientific developments and research programs, design science has established itself as a new science that has its own epistemology.

As the level of education becomes higher, design is no longer only seen as a specific object of study. It is drawn into a broader area of cultural studies, namely as a region of visual culture studies. In a macro understanding, visual culture is a form of tangible and visible human work. In a specific understanding, it is a form of visual work that becomes an integral part of modern human life and its value sys-

tem. In addition to historical studies, especially observations of the dynamics of Indonesian culture, it also extends to observe the phenomenon of the development of modern design. The main issues that are the focus of study and thoughts in design science and visual culture include the development of design theories, the development of design methodologies, the development of basic science in the field of design, cross-disciplinary studies between design and other fields, visual language with various aspects, design history and visual culture in general, social impact of design works, design strategies, design and development, and development of futuristic designs. As a relatively new scientific domain, scientific studies of design and visual culture have enabled efforts to study and explain various phenomena in contemporary culture that have developed in the community. In addition, it has examined the developing Indonesian and foreign visual culture. The condition has been triggered by the widespread of the visual civilization over the past few decades which was built by information and communication technology, thus

38

the exploration of visual culture is no longer limited to something visible, but it also covers ideology, values, and the mentality of the practitioners. Since creative craft industry is the research object, the industry has the potential to be developed, considering that this industry has extensive resources and also a production mechanism that encourages high demand for the needs of creativity and character in the craft, design, and tourism entrepreneurship. This research covers the development of knowledge of creative design products such as design, production, effective technology, distribution and marketing, and management of indigenous renewable raw materials, based on the local natural (tourism) area. Along the coast of southern Pangandaran Regency, wild thorny pandanus plants grows. Thus the focus of this research lies in exploring the indigenous renewable material for the development of traditional craft products in Pangandaran tourism area, towards the realization of regional superior products in creative context and increasing the welfare of local tourism crafters and souvenir traders, as well as increasing regional original income with regional superior products characterized by the cultural identity of Pangandaran tourism.

2 PANGANDARAN AND THE POTENTIAL OF THORNY PANDANUS

Pangandaran is known as one of the famous tourist destinations in West Java that has the potential of natural marine resources. Southern Pangandaran has a coastal area of 91 km, and the wild thorny pandanus grows along 41.85 km of the southern coast region. Hence, the focus of this research is on exploring the indigenous thorny pandanus as materials for developing traditional craft products in the Pangandaran tourism area towards the realization of superior products regions as well as the increasing welfare of local tourism crafters and souvenir traders, that also adds to the regional income, with regional superior products specific to the cultural identity of Pangandaran tourism (H. Hendriyana, 2019).

The thorny pandanus plants (Figure 1) have the potential to be used as raw materials for craft products, as well as regional superior products that can support tourism in the Pangandaran Regency. Pandanus leaves can be used as raw material for products such as mats, sandals, bags, boxes, and wallets (Figure 2). One example of superior product supporting Pangandaran tourism is hotel sandals. Using the abundant raw materials, trained local crafters can real-

ize the advantages of quality and sustainable products. The rationale is through the cooperation between the academic sector, the craftsmen community, hoteliers, local traders and exporters, and the government as policy and regulation makers. The local government requires the hotels to purchase or distribute products (hotel slippers) made by local artisans. Moreover, thorny pandanus fibers can be used for composite building materials, such as Asbestos, GRC (Glass-fiber Reinforced Cement) with several variants (GRC Panel, GRC Cladding, GRC Jali, GRC Reinforced, GFRC (Glass Fiber Reinforced Concrete), etc.) and also interior body kit for cars, trains, and motorized tourist boats or canoes.

Figure 1: Thorny pandanus plants in Pangandaran Regency.

3 PURPOSE

The objectives of this research include: (a) Realizing eco-design ideas and concepts by capturing the potentials of natural resources, human resources for home industry craftsmen, and Pangandaran tourism as a representation of the national creative industry cluster; (b) Designing a method and a creative process model in realizing environmentally friendly and superior local products based on thorny pandanus fiber that support sustainable tourism and the economy of
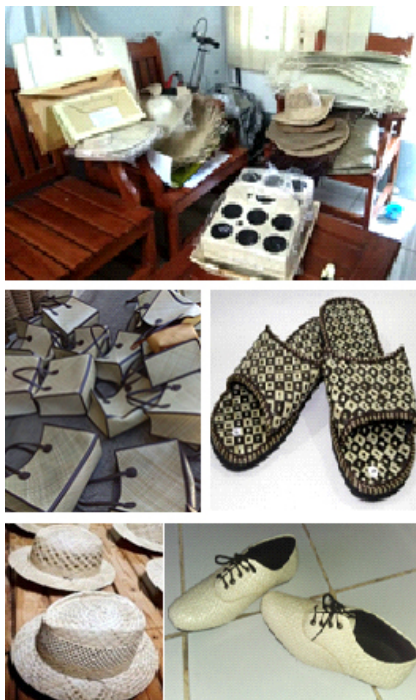
Figure 2: Similar craft products that are competitors for woven pandanus products, to anticipate plagiarism, including: hats by Japanese craftsmen, hotel sandals, laced shoes, and by local craftmen.

communities in Pangandaran; (c) Strengthening and applying product development methodologies in the scale of Small and Medium Industries oriented to the Intellectual Property Rights (IPR) that prioritize creativity and effective technology in the production process; (d) Designing joint commitments from various related elements in realizing regional superior products, economic welfare of the local community, and increasing regional income added value from the creative and tourism industry sectors in Pangandaran; and (e) Increasing the competitiveness of national superior creative products through the expansion of national and international market access.

4 METHODOLOGY

The applied creative design methods (Hendriyana, 2018), and (Lawson, 1980) with explorative and experimental creative process and design of creative economic products are as follows: (a) Revitalization of creative products by analyzing the potential of creative products in the research area, identifying creative products according to market needs in the Pangandaran region as a tourism city, and developing the creative product and transferring of technology from

traditional to simple machine technology; (b) Development of traditional craft products into contemporary products based on cultural identity by analyzing market potential and identifying consumer lifestyles, and re-conceptualizing the aesthetics of contemporary products based on national/international market reputation; and (c) Rebrand of superior products towards the development of national superior product concepts.
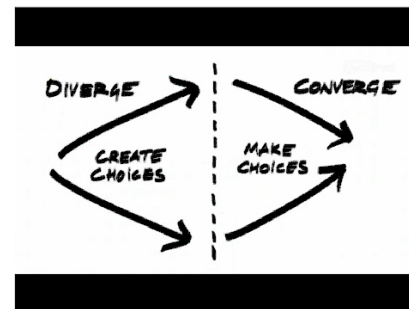
Figure 3: Creative process elaborates diverge and converge ways of thinking.

5 VALUES

The economic potential of the products include: (1) the product variations in line with the development of people's lifestyles; (2) fulfillment of the segmentation of new market shares in various craft and hotel markets; (3) the shift from traditional home industry technology towards simple industrial machinery through research on the feasibility and strength of thorny pandanus fibers as renewable material that can be used as fiber materials for products of car interior body, rock climbing clothes, and other clothing products such as pray mats, bags, slippers, mats, and so on.

The added value of the products to science, technology and art include: (1) development of appropriate design/craft knowledge for Small and Medium Industries (SMIs); (2) resulting an appropriate method for the development of SMIs, both in terms of technology, design, work procedures, and market development which will be applied in relatively the same conditions in other regions; (3) improvement of design quality.

The national social impacts include: (1) an increase in design and quality insights for craftsmen and entrepreneurs; (2) the development and maintenance of the potential of regional socio-culture that has nuances of Indonesian culture.

Efforts to strengthen cultural heritage identity include: (1) increasing the understanding of user char-

acteristics when interacting with creative products that have cultural content, through revitalizing traditional craft regions as an effort to increase cultural identity in eco-design contexts for creative economy-based industrial clusters (contemporary craft products made of pandanus fiber); and (2) demonstrating the distinctiveness of craft products as unique products and have a different visual application background from other regions.

6 DESIGN IN THE CONTEXT OF USEFULNESS AND CREATIVITY

The elaboration on the philosophy of design in the context of usefulness rests on the socio-historical point of view of the field of design that relates to the field of philosophy. This research did not try to explain the linkages between the theories of the two fields—even though there are linkages, it requires intensive study—instead, it sought to explain the connection of substantial conceptual phenomena as a meeting point between the two fields of science.

It starts with an understanding of the world of design which is not only appreciating design works as mere artifacts, but it is also an integrated view that covers cultural values and thoughts, and the accompanying socio-economic changes. Design is not a standalone product, but it is a living order of civilization. Even historians argue that design is an integrated and synergistic form of humans, nature, and social environment in a broad and substantial sense (Walker, 1989).

Design is inseparable from the aspect of creativity as the spearhead of design. Substantively, it cannot be separated from human ideas, namely elements of reason (ratio, logic, thoughts, ideas, and so on) and elements of taste (creativity, intuition, inspiration, taste, value -values, and so on). In viewing the current development of design and creativity, there has been an established mutualistic relationships, namely as an order of physical cultural works, which are born from various considerations of thoughts, ideas, tastes, and souls of the designers, and they are supported by external factors concerning discoveries in science, technology, art, social environment, values, culture, aesthetic rules, economic and political conditions, as well as projections of future developments. Its role is increasingly important in the order of physical cultural work, especially to support creative economic growth and increase the quality of human life.

On one hand, when referring to efforts in applying innovative approaches of design to that produce innovative products, then design innovation in the context of creativity is the solution to the deadlock of creativity. This design innovation is based on exploration activities on the superiority and uniqueness of indigenous materials and design ideas to be developed into products that have originality and new function values. On the other hand, the world of creativity indicates the convergence of concepts and practices from creative design works, originating from individual talents collaborating with cultural industries on a large scale through the use of new technological media in the digital era which is a new economic knowledge as a way of using new interactive media in the consumer community. The emergence of this new-faced world of creativity is a result of changes in the global technological and economic fields and the widespread use of various forms of interactive media (such as high-capability computers), as well as commercial exploitation of IPR-based goods and services. In short, design is a modern object culture. In essence, it is built by involving aspects of human images in viewing the world, mastery of technology, understanding of science, and aesthetic values. Starting from creative images, humans build their world—with the support of science, technological proficiency, and tangible aesthetic values—into products that are functionally useful, and meaningful in human civilization ((A. Sachari, 1999) and (Sunarya, 2014)).

7 CURRENT AND FUTURE CREATIVE INDUSTRIES

The creative industry in Indonesia is one of the mainstays that is expected to support the national economy (Pangestu, 2008). At present, the creative industries, especially small industries, are the one that empowers the most workers, which utilize local natural resources, and national cultural wealth, so that its development deserves attention. The products produced by small industries now have relatively short and fast changing life cycles. Therefore, a strategy model is needed in developing new designs. This is one of the keys that becomes the strength of the national creative industry to be able to have excellent competitive power in the national and regional markets. In developing an accurate product development strategy, all elements must be assessed on the basis of the goals and objectives. Another element is the control function that identifies the phenomena of global change and development. This function must work responsively and quickly in informing processed data in evaluating the strategy. Thus, as a designer, it

is necessary to strategize by adopting a design concept with an interactive-participatory approach (Hendriyana, 2017).

The development of design in creative industries is related to the development of culture in the visual culture setting, coupled with the increasingly widespread claims of ownership of designs. Design innovation in product diversification with applied local wisdom as a cultural heritage step is to become the basis for exploring and implementing local-based designs. In general, it is said that there are still weaknesses in the craftsmen's competency level due to: (a) the quality of production, the lack of visual appeal/design and quality; (b) lack of the ability to read the market situation; and (c) competitors of similar small industries. Thus, an aspect that must be improved in this case is the ability of the craftsman to be able to carry out production techniques in terms of the production process and design improvements, and to diversify their products through creative capabilities.

8 CONCLUSIONS

Exploring the indigenous material of Thorny Pandanus Pangandaran as Indonesian Traditional Craft in The Creative Context is a design strategy that has aspects of design innovation in its implementation related to the current and future creative industries including the development of product design, along with economic projections. In general, the products of public taste are the main consideration, in addition to the Indonesian aesthetic character is sought to be an integrated part of the product which has a sociological impact.

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Design of Prototype Electric Car using 4 Motors as Future City Car in Indonesia

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Keywords: Electric Vehicle, City Car, Energy Consumption, Performance.

Abstract: The availability of non-renewable energy used by motorized vehicles will eventually run out. According to Ministry of Energy and Mineral Resources, crude oil reserves in Indonesia are declining. In 2030 or next 11-12 years, oil in Indonesia will be run out. In the other hand, fuel consumption increase significantly for 13.5 million barrels, from 374.7 million barrels to 388.2 million barrels. Electric vehicles for the future of alternative solutions are emerged by this situation. This study aims to design, fabricate and tested the electric car as the future city car in Indonesia. The test results of electric cars are as follows: 1) the average speed of 8 km mileage was 12.52 minutes; 2) the uptake is tested at a distance of 10 meters with a slope of $25°$ by 1387,266 watts; 3) the acceleration and deceleration of 100 meters followed by braking and the stop distance after braking was 5.3 takes 8.643 seconds; 4) The acceleration was 2.49 m/s2 and 50 total Energy consumption of Energy used in 8 km was 587,782 Wh.

1 INTRODUCTION

The increasing numbers of fossil fuel vehicles makes humans dependent and lead to energy crisis. The availability of non-renewable energy used for motor vehicle fuel has gradually diminished over time. The demand for fossil fuel continuously increases. Another problem that arises from vehicles with fossil fuel is environmental pollution. Pollution is caused by carbon dioxide in exhaust gas as a result of combustion. Excessive carbon dioxide will cause long-term effects such as various respiratory diseases, the greenhouse effect. In 2030 or next 11-12 years there will be run out of oil in Indonesia.

In the other hand, fuel consumption increase significantly for 13.5 million barrels, from 374.7 million barrels to 388.2 million barrels (of Energy and of Indonesia (MEMRI), 2019). Therefore, the alternative energy sources have been developed such as pyrolytic oil from waste plastic and tire as partial substitute for fossil fuel (Syamsiro et al., 2018); (Syamsiro et al., 2019a) and also tested in the combustion engine to assess the thermal performance of that fuel (Syamsiro et al., 2019b). However, the combustion based engine was still used in this system, so that the alternative engine need to be developed to solve these problems.

Electric vehicles for the future of alternative solutions are emerged by the petroleum supplies crisis; moreover fossil fuel generates air pollution and noise in our society and environment (Bambang et al., 2011).

Exhaust gas emissions such as CO, NOx, SOx, HF are polluting the environment, thus the emission of exhaust gas must be in accordance with the laws and regulations so that it is safe for the environment. Hydrogen fluoride is a compound of hydrogen and fluorine with the chemical formula of HF. Fluorine is in halogens elements group, which all combine with hydrogen in the same way to form hydrogen halide. At room temperature and normal pressure, hydrogen fluoride is a colorless gas with a boiling point of $19.5°$ C, and allows it to exist as a liquid at room temperatures. Hydrogen fluoride can be produced by the reaction of metal fluorides. Hydrogen fluoride is very toxic and very corrosive. Inhaling gas damages the respiratory system and can cause pulmonary edema and death.

Nitrogen oxide (NOx) is a type of air pollution; NOx is a group of gas which mainly consists of two main components, namely nitric oxide (NO) and nitrogen dioxide (NO2) gas, and other very small amounts of nitrogen oxides. NO is a colorless and odorless gas, in contrary NO2 is brown reddish and has a strong odor. In general the NOx gas formation reaction process is as follow:

$$N_2 + O_2 \rightarrow 2NO$$

$$2NO + O_2 \rightarrow 2NO_2 \quad (1)$$
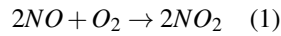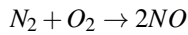
Nitrogen oxides (NOx) is formed from oxidation of nitrogen molecules in fuel combustion process, consisting of 95% NO and 5% NO2. SOx (sulfuroxide) is one of the components of pollutants in the atmosphere resulting from the combustion process of oil and coal and other processes containing sulfates (Wark et al., 1998). SOx gas is very dangerous for living things because it plays an important role in the accumulation of acid in the air which causes acid rain (Benitez, 1993). In certain concentrations SOx can cause lung disease and respiratory problem, especially for people with asthma, bronchitis, and other respiratory diseases (Bruce and Bruce, 2003).

CO (carbon monoxide) is a colorless and odorless gas produced from an incomplete combustion process from carbon-based materials such as wood, coal, fuel oil and other organic substances (Grant and Clay, 2002). Claude Bernard in 1857 discovered that the toxic effect of carbon monoxide caused by the release of oxygen bonds from hemoglobin into carboxy-haemoglobin.

The energy produced from fossil fuels is increasingly expensive and scarce and one day it will surely run out, Indonesia's oil production is now far less than the needs of the population and industry, currently it is estimated to have a deficit of around 500,000 barrels/day (BP Statistical Review Of World Energy) as seen in Figure 1 ((BPS), 2010)
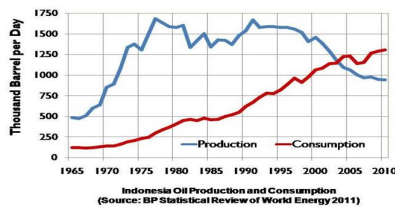
Figure 1: Petroleum production and consumption in Indonesia

2 METHODOLOGY

2.1 Battery

Electric cars are vehicles that are driven by an electric motor, using electrical energy stored in batteries or other energy storage. Electric Energy is converted into mechanical energy by a motor. The power from the electric motor is then transmitted to the wheel so that it becomes the rotating energy which drives the wheels of the car.

2.2 Frame or Chassis

Chassis is an important part of the vehicle. Chassis serves to support and mount the components in the vehicle. For this reason, material selection must be considered in accordance with its use. In selecting the most important material is the analysis of mechanical properties, namely the concept of the voltage acting on the structure and the stress of the material used. From this analysis we can find the maximum voltage and deflection. Once the maximum voltage and deflection is known, we can determine the material and size of the material. In this analysis we use the 2009 Autodesk Inventor software (Curtis and Loren,).
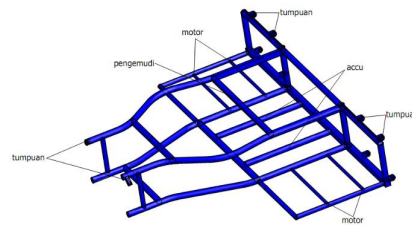
Figure 2: Chassis of an Electric Car

2.3 Motor

Before determining the motor power, the first consideration is vehicle's trail force the following data are known:

a) Wheel Base (L): 1500 mm

b) Center Weight (l1): 754 mm from the front axle

c) Center Weight (l2): 746 mm from the rear axle

d) Weight point height (h): 250 mm

e) Vehicle weight (W): 250.10 = 2500 N

f) Glinding resistance coefficient (fr): 0.3

Wheel adhesion coefficient with road surface (μ): 0.3 using the rear wheel drive then the vehicle's trail force can be calculated (Mott, 2009).

$$F = \frac{\mu W (l1 - f_r.h)}{L - \mu.h} =$$
$$\frac{0,3.2500.(0,754 - 0,3.0,25)}{1,5 - 0,3.0,25} =$$
$$\frac{750.0,679}{1.5 - 0,075} = \frac{509,25}{1,425} = 357,4N \quad (2)$$

So the force needed to drive the car is at least 357.4 N. From this calculation, the BLDC 500 watt motor is able to move. The performance of the BLDC 500 watt motor is as follows:

Table 1: Reference table for motor determination of electric car (Champion and Arnold, 1954)

Torque (Nm)	Voltage (volt)	Current (ampere)	Input Power (watt)	Rotation (rpm)	Output Power (watt)	Efficiency (%)
1.2	48.07	2.42	116.4	720.6	9.5	8.2
1.7	48.09	3.445	165.7	719.5	13.4	8.1
2	48.06	3.444	165.5	720.7	14.2	8.6
2	48.04	3.456	116	720.7	14.3	8.6
2	48.07	3.448	165.7	718.5	14.9	9
3.7	48.02	4.333	208.1	718.2	27.5	13.2
7.5	48.01	4.687	225	715.7	56.5	25.1
11	47.99	4.849	232	712.4	79.8	34.4
19	47.96	5.934	284.6	707.9	142.6	50.1
26	47.9	6.973	334	702.4	190	56.9
41	48	9.725	466.8	697.6	297.4	63.7
52	47.6	11.618	553.01	690.5	373.3	67.5
67	47.79	13.289	660.1	686.2	480.8	72.4
85	47.96	16.236	778.7	674.6	598.1	76.8
99	47.52	18.314	870.3	662.4	688.4	79.1
123	47.64	21.72	1034.7	644.1	830.8	80.3
157	47.41	25.106	1190.3	590.7	968.9	81.4
200	47.26	28.121	1328.9	529.6	1111	83.6
247	47.54	30.483	1449.2	478.3	1234.7	85.2
275	47.48	31.704	1505.3	431.9	1244.8	82.7
320	48.01	32.302	1548.7	375.3	1257.5	81.2
336	47.23	31.4	1507.1	332.4	1169.5	77.6
356	47.35	30.581	1478	305.7	1139.5	77.1
382	47.19	27.1	1304.8	290.2	916.5	70.2
426	47.42	25.932	1203.8	270.6	840.3	69.8
453	47.19	24.356	1149.4	240.7	743.9	64.7
484	47.16	23.782	1121.6	220.6	654.8	58.4
511	47.14	23.453	1105.6	201.1	610.9	55.3
542	47.26	22.892	1081.8	160.6	550.7	50.9
581	47.37	24.55	1162.9	111.3	452.8	38.9
605	47.51	25.068	1190.9	70.2	359.4	30.1
639	47.2	26.514	1251.5	43.5	276.6	22.1

3 RESULTS AND DISCUSSION

3.1 Trial Framework Design

The results of the framework design analysis is shown in Table 2.

Table 2: Framework design analysis

Name	Minimum	Maximum
Equivalent Stress	3.086e-003 MPa	42.96 MPa
Maximum Principal Stress	-33.68 MPa	29.72 MPa
Minimum Principal Stress	-80.81 MPa	7.48 MPa
Deformation	0.0 mm	0.5398 mm
Safety Factor	4.816	N/A

Considered from the critical stress the design is safe, because the maximum stress acting on the construction is smaller than the material tensile stress (42.98 <345). Based on the results of the analysis above, the material used for the framework is a low

carbon steel pipe with the diameter of 3/4 "and 1/2" and thickness of 2 mm, this specification is safe
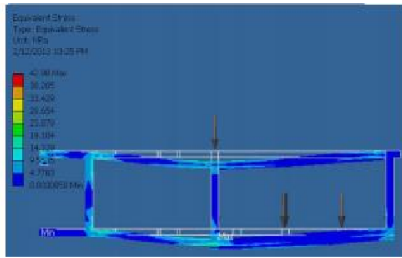
Figure 3: Load Analysis Low
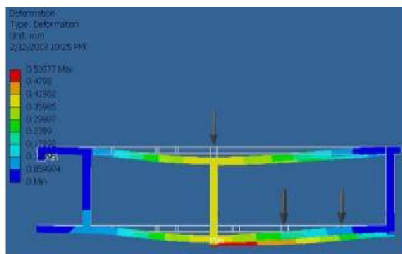
Figure 4: Load Analysis Medium

3.2 Steering Design Test

The steering mechanism used in this mode was the type of ackerman with rack and pinion. When the steering wheel was rotated, the swivel force will forwarded to the pinion by the steering wheel shaft. Then the rotational motion was changed to horizontal with a straight gear rack-gear mechanism. Furthermore, this horizontal movement was forwarded to knuckle arm/ackerman by tie-rod. Ackerman which is connected to knuckle will bend the wheel.

The Ackerman type steering system mechanism shows that the knuckle is angled to form a trapezoid. In this construction, there is a joint point on Ackerman and the tie-rod tip so that a different turning angle occurs between the left wheel and the right wheel

3.3 Test Result for Electric Car

The results of the electric car performance test is shown in Table 3 using the fabricated car shown in Figure 9.

Figure 5: Adjustable wheel tilt model
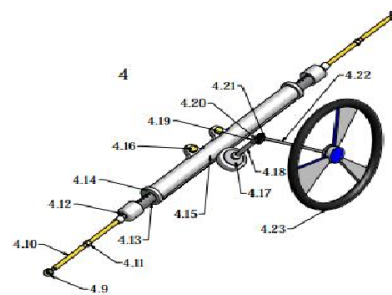
Figure 6: Gear and pinion rake system

Figure 7: The ackerman

Figure 8: Full body design

Figure 9: Fabricated electric car.

Table 3: Framework design analysis

Category	Information	Result
Average speed	Distance of 8 km, time 12.52 minutes = 751.2 seconds	38.34 km/hour
Climbing Power	Tested at a distance of 10 meters with a slope of 25°	Climb Power was 1387,266 watts (read on display measuring instruments)
Acceleration & Deceleration	Tested at a distance of 100 meters then braked and the stopping distance after braking is 5.3	Readable acceleration on the display devicemeasure was 2.49 m / s2 and result deceleration takes 8.643 seconds
Energy Consumption	Total Energy used in 8 km	587,782 Wh

4 CONCLUSIONS

The test results of acceleration, deceleration, gradeability, show very good data results. However the average speed efficiency shows relatively good results, this is influenced by the transmission system that has not been suppressed by the development of a combination of gears automatically. Model 4 BLDC motors with 1 motor each of 500 watts, this is suitable for large torque speeds, but vehicle speed was still lower than it required.

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The Feasebility Analysis of Public Investment: Evidence of Reservoir

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Keywords: Indonesia, Reservoir, Feasibility Analysis, Economic Analysis

Abstract: Farmers need water urgently, especially in District of Gunungkidul, because their farm's irrigation depend on rainfall. It is not a lucky condition. They face drought in dry season, but rudundant water is in rainy season. Moreover, their area covered by water significantly. Therefore, irrigation management is urgent for the local government, such as build a reservoir for providing water supply constantly. This study aims to perform feasibility analysis approach, namely net present value, benefit cost ratio, and internal return rate. This study also implement sensivity analysis through different schema of interest rate. Prior research has implemented economic analysis to examine public investment, but in this case, the reservoir's project has to release communities' land and communities' vegetation. This study reveals that the project of Embung Kedung Poh is eligible to execute and this result contributes to reseach about public investment that have to sacrifice private land and vegetation.

1 INTRODUCTION

Farmers who depend on field, farm, or livestock to earn money consider the important role of water in their life. According to sustainable water supply, farmer needs guarrantee that their field or farm get enough irrigation in order to optimize the growth. However, the increasing of population affects to increasing of food, therefore an irrigation management should consider the need of food beyond to the population (Indarto, 2012). As a consequence, management of irrigation also involve analysis of public investment. This analysis requires an understand about feasibility of project, so the result of study regards to decide whether project be able to be implemented or not (Jo et al., 2015).

A study about public investment reveals that Hundred Billion Plan in Cina could increase food output significantly approximately 4.34% from 2007 – 2013 through improving productivity (He et al., 2019). In general, public investment has negative relationship with debt to GDP ratio, especially in short term, and public investment can also reduce unemployment rate in short term (ADB et al., 2016).

This study examines the public investment in Nglipar Subdistrict of Gunung Kidul District, Special Region of Yogyakarta Province. Generally, people in Subdistrict of Nglipar, District of Gunungkidul works as farmer, so they depend on irrigation as water supply to grow their plants and vegetables. Unfortunately, the irrigation supply is only provided by rain, so in several times, they experience crop failure, especially when the lack of rain intensity. Therefore, local government has to build a reservoir (as Javanese People called it as embung) to guarantee the consistency of water supply for the farmers.

According to the geography characteristic of Subdistrict of Nglipar, District of Gunungkidul, the reservoir (embung) mainly accommodates the overwhelming water during rainy season. Actually, infertility soil in this distict also deteriorate the productivity of farmers, so the reservoir also has a function to reserve abundant water supply during rainy season. Therefore, the reservoir has two functions: contribute to water supply during dry season and reduce the volume of flood during rainy season.

Prior research such as (He et al., 2019) implement internal return rate as benefit cost analysis on China's Hundred Million Plan to estimate the project's economic return. (Jo et al., 2015) combine system dynamics (SD) and agent based modelling to examine the project's feasibility and in the system dynamics step, the analysis uses NPV and B/C ratio. This study also use NPV, B/C ratio, and IRR for project's economic analysis, but this study have to consider the value of vegetations that are obviously sunk under the water and the value of field that is released for the reservoir project. Therefore, this study performs sen-

sivity analysis to estimate the project's return on several cost and interest rate schema.

This aim of study is to contribute to reseach about public investment that recently focus in railway, airport, energy, because the reservoir commonly is built naturally. The second contribution is the cost benefit analysis relate to private land that should be sacrificed for this project. The next detail below will describe about area and data, and finally this study will describe the analysis of net present value, benefit to cost ratio, and internal rate of return and implication of the analysis.

2 METHODOLOGY

2.1 Area and Data

The Kedung Poh Reservoir lies on Kedung Poh Lor Village, Nglipar Subdistrict of Gunung Kidul District, Special Region of Yogyakarta Province and approximately + 530 metres above sea level (MASL) (see figure 1). The building of this reservoir implements a rainfall management system, because the source irrigation of the reservoir comes from rainfall. Therefore, the reservoir will be built through a soil dig. This study uses the project costs include operating costs, legal consulting cost, and administration and contingency cost. Then, this study emphasizes in both cost and benefit aspects based on the project costs.

2.2 Analysis

This study performs economic analysis, such as nett present value, benefit to cost ratio, and internal rate of return. This analysis of project focus in from economical perspective with several cost and return alternative for sensivity analysis. There are some asumption, such as project uses a shadow price as price indicator uses shadow price, project analysis exclude tax payment, and market price of goods that is resulted by farmer must include government's subsidy (Suyanto et al., 2001). The detail of economic analysis formula be described below. First, net present value indicate the progress of project's profit economically, so this analysis compares cost and benefit regarding in cost rate of project or interest rate of bank. The formula of present value (PV) uses formula of (Kuiper, 1971) and (De Garmo and Sullivan,).

$$PV = \frac{F}{(1+i)^n} \qquad (1)$$

Notes:
PV: present value

F: year x (cardinal) variable
I: interest rate
N: first,second,third year (ordinal)....so on

According to net present value evaluation, current loan of interest rate should exceed to 0 (morethan zero). It means that project will result profit or as a profitable project. If the net present value of project has value zero, so the return of project is not more than the initial investment. However, if net present value of project is less than zero, it indicates that the project has to be delayed. It also imply that the project does not have benefit economically. For economic analysis, this study also consider net present value of cash out flow scenario based on several discount rate (I) alternative.

Figure 1: The location of Kedung Poh Reservoir

Second, analysis benefit to cost ratio is a comparison present value of cash in flow that shows the project's value and present value of cash out flow (total investment costs of maintenance) that indicates the project's cost. This comparison is based on determined discount rate (i) that is formulated by (Kuiper, 1971) and (De Garmo and Sullivan,).

$$BCR = \frac{\sum_n^{t=1} \frac{Bt}{(1+I)^t}}{\sum_n^{t=1} \frac{Ct}{(1+I)^t}} \qquad (2)$$

Notes:
I: dicount rate
t: year index

According to benefit to cost evaluation, if the value of comparison has more than 1 (x > 1), it means the project has profitability. However, if the value of ratio is less than 1 (x < 1), it means the project should be delayed. The project can not be able to earn profit.

Third, this study also analyze the internal rate of return that shows discount rate (I) causes the value of net present value has zero. The calculation of interanl rate of return includes cash out flow and cash in flow per year. This study performs several schema of rate that has assupmtions as followed below :

a We should assume the discount rate (I) that has value as close as IRR variable. Then we calculate

NPV variable per year and NPV's cummulative.

b The value of discount rate (I) should b modified as accurate as possible to seek the cummulative of NPV's value equal to zero at the end of the project. This study also implement convergency approach as a possible way to seek the value of NPV's cummulative that closes to zero (Kuiper, 1971) (De Garmo and Sullivan,). The formula of IRR is stated as below:

$$IRR = I' + \frac{NPV}{NPV' - NPV'}(I'' - I') \qquad (3)$$

Notes:
I' :first trial
II": second trial
NPV': first cummulative NPV variable
NPV": second cummulative NPV variable

After the analysis of NPV, B/C ratio, and IRR, the second step is an sensivity analysis that considers the probability of project's return based on the possibility of project's cost and profit. This approch is important in project's analysis because we have to predict the possibility of poject's profit based on rate changing. There are four assumptions to consider in sensivity analysis: cost overrun, a change in price compare to price level in general (for exampledecreasing price on agricultural products), delayed time for the project execution, and project's result deviation. According to sensivity analysis, this study uses any kind of conditions as followed (Suyanto et al., 2001): normal condition (stable worth and fixed cost), cost condition increased up to 10% stable worth,cost condition increased up to 10% worth decreased up to 10%, and cost condition decreased up to 10% worth increased up to 10%.

3 RESULTS AND DISCUSSION

3.1 Economic Analysis

This study calculates project's cost, such as land releasing cost, construction cost, and operating and maintaning cost, and project's benefits, such as irrigation, fishery, and recreation (see table 1). The project proper analysis is done based on the calculation of the project costs by applying NPV, B/C ratio and IRR variables, with current interest rate up to 12 %. The detail of analysis as depicted below.

First, estimated project's cost is an estimation of resources that is required by a project, namely Embung Poh Reservoir. This study calculates inital investment of project and project's benefit, such as the

amount of project costs is calculated in detail as followed, namely land releasing cost, contruction cost, and operating and maintaining cost. Land releasing cost is an acquiring cost of land owned by community affected by this project. The community also plant vegetable plants and trees, such as manggo, banana, coconut, to earn money from it. Therefore, this study estimates the cost of dry field and the value of vegetation. Concerning on the land of Embung Kedung Poh covers approximitly 5.000 m. The total cost of land is IDR200,000,000, includes released land, vegetation, and trees price. Constructing cost is a building cost of the reservoir and facility surrounding the reservoir from reservoir's blueprint until the reservior able to irrigate the land. Estimated construction cost is IDR3,000,000,000, include blue print, planning, drainage, spillway building, fence surrounding reservoir, and gazebo and sign board. Operating and maintaining cost is a cost to optimize the reservoir's benefit. This study estimates 2% of constructing cost as estimated maintaining cost, namely IDR60,000,000.

Second, Calculation of project's benefit is an analysis the possibility of benefits that can be taken by society sorrounding the project directly and indirectly. Therefore this study analyze direct benefit, such as irrigation and fishery, and also indirect benefit, such as water tour and recreation. Analysis of irrigation is an analysis of the reservoir's benefit to irrigate field and create other possibility economic's benefit from the abudant of water source. This study assumes that the cost of land's cultivation, land's fertilization, pest prevention, and harvest approximately 25% of harvest's value and crop productitvity. If the field can result 3 tons per hectare of crop in one period of plantation and the farmers can plant the field three times in a year. It also assume the price of harvest is IDR10,000 per kilogram, so the revenue can be calculated as follow: (1.0 – 0.25) x (3 x 10.000 x 1000) = IDR22,500,000 per year per hectare.

Table 1: Economic Analysis

No	Criteria	Cost(IDR)
Estimated Project's Cost		
1	Land Releasing Cost	200, 000,000
2	Construction Cost	3,000,000,000
3	Operating and Maintaning Cost	60,000,000
Total of Project Cost		3,260,000,000
Project's Benefit		
1	Analysis of Irrigation	355,000,000
2	Analysis of Fishery	112,200,000
3	Analysis of Fishery	112,200,000
Total of Revenue within a Year		474,400,000

This study also assume that farmers able to plant palawija (a kind of crop that does not need much water in growing, such as beans, corn, chili, casava, or sweet potato) 2 times within a year and it is predicted producing 2 tons per hectares. The farmer can sale within IDR5,000 per kilogram of palawija. If the cost of plantation is approximately 35% of the harvest's value, so the revenue of two times in harvest is 2 x 2 x 1000 x 0.65 x IDR5,000 = IDR13,00,.000. Therefore, this study assumes the farmer who has 5 hectares of field will result approximately IDR355,000,000 within a year (10 x (IDR22,500,000 + IDR13,000,000)).

Analysis of fishery is an analysis to predict the reservoir's extraordinary result. This study assumes that a pond within 1 m3 is optimum for approximately 10 fish and net profit from fishery is IDR30,000.00 within 8 months. According to the volume of reservoir aproximately 3,740 m^3, the reservoir results profit IDR112,200,000. Analysis of profit from recreation activity, such as water tour, also can be predicted and it is based on the number of reservoir's visitor. If there are 10 persons/each day and each of visitor has to pay IDR2,000.00, therefore revenue from recreation activity is approximately IDR7,200,000 within a year.

Based on estimated project's cost, the total of initial project's investment is IDR3,200,000,000 and the project's operation cost is IDR60,000,000 within a year. This study also estimate the project's benefits and the estimation of reservoir's result is IDR474,000,000 within a year. The next step is to analyze NPV, B/C ratio, dan IRR of project. Why is the analysis impoartant? The project requires investment and operating cost, but the project's benefits only can be acquired periodically after project's building.

Table 2: The Economic Analysis of Embung Kedung Poh

No	Discount Rate (i)	NPV (IDR)	B/C Ratio	IRR(%)
1	8%	1.834.573.580	1.467	
2	10%	1.019.098.513	1.267	
3	12%	398.169.008	1.107	13.62
4	14%	(83.367.534)	0.977	
5	16%	(463.340.090)	0.871	

The analysis of NPV, B/C ratio, and IRR need assumptions as stated follow (Salsabiila, 2016): discount rate up to 12%, the length time of the project up to 25 years, the length time of constructing up to 1 year, the optimum estimated land developing after 10 years, the benefit increases during the term of the time in line, 1 US$ = IDR10,000 and the bank's interest rate up to 12.00%. Based on that assumption, the result of analysis is NPV = IDR398,169,008, B/C ratio = 1.107, and IRR = 13.62% (see table 2).

The analysis of NPV determines the execution of the project whether fixed or unfixed. If NPV > 0 means a project is fixed economically. According to NPV analysis with bank interest rate up to 12%, project results IDR398,169,008, so the project of Embunng Kedung Poh has fixed economically. The analysis of B/C ratio reveals that the project is also fixed economically, because the value of B/C ratio is more than 1 (one). The analysis of IRR is based on discount rate determination, which all future revenue possibility is predicted in certain discount rate. Therefore this study calculates IRR's value in some interest rate schema, such as smallest positive NPV and smallest negative NPV.

3.2 Sensivity Analysis

The second step of the analysis is a sensivity analysis that describes several economic result on several assupmtions. This study applies present worth (PW) method to capture the several possibility of economic value. As an ilustration, this study determines the interest rate i.=.12% , so the value of NPV is IDR398,169,008. If this study determines the interest rate i.=.14%, so the value of NPV is IDR- 83.367.534 (see tabel 2). This study also consider the value of IRR up to 13.62%. If the value of IRR is higher than market return that has interest rate up to 12 %, so the project is economically eligible to execute.

This study also apply different schema of interest rate to reveal different of economic result, such as detailed in three schema. First, this study assumes that cost increases up to 10% within stable benefit, so the study reveals that the value of NPV = IDR346,071,967 (positive), the value of B/C ratio = 1.092, and the value of IRR = 13.41%. Second, this study assumes that the benefit of project decreases up to 10% within stable cost, so this study reveals that the value of NPV = IDR13,744,934 (negative), the value of B/C ratio = 0.996, and the value of IRR = 11.94%. Finally, this study assumes the cost increases up to 10%, but the benefit of project decreases up to 10%. Therefore, the value of NPV = IDR65,841,976 (negative), the value of B/C ratio = 0.983, and the value of IRR = 11.73%. This sensivity analysis indicates that the optimum of IRR's value approximately on 12% interest rate, because the value of NPV and the value of B/C ratio has lowest.

This study implements feasibility analysis on reservoir's project kedung poh (embung kedung poh) at District Gunung Kidul and the analysis includes

economic analysis and sensivity analysis. Result shows that this project is eligible to execute. Prior research has implemented feasibility analysis on public investment because it enhances understanding decision maker about project's viability (Jo et al., 2015). Study of (Jo et al., 2015) consider dynamic aspects ecompass micro level or system level and micro level or individual level. The effect of macro level relates to economic, social, and environmental effect, but the effect of micro level relates to individual who interacts to the project directly. Therefore, (Jo et al., 2015) analys benefit, cost, feasibility (NPV and B/C ratio) of project. According to the agents who are possible affected by project, (Jo et al., 2015) predict individual who can not do activities during the project contruction. However, this study considers the community's sacrifice such as land, field, and vegatation for the reservior project.

Study of (He et al., 2019)) implement benefit – cost analysis, namely internal return rate (IRR), forHunderd Billion Plan in China form 2007 – 2013 and the analysis is to understand the effcientcy level of project. This program has an objective to enhance food security, so this investment has impact to large scale output. According to (He et al., 2019), the investment are categorized into irrigation, land improvements, and farm support because the three kinds of project support HBP output directly. According to kedung poh reservoir, this study also consider fishery and recreation benefit of project beside irrigation benefit. The community sorrounding the reservoir can earn from fishery that be culltivated or developed together by this community.

Study of (Rolfe, 2019) about public investment evaluation in sporting events in Australi implements evaluation stage that involve possible generated benefit from this project. Therefore, the study identifies direct benefit, such as spending for local economy, tourism attraction, and attraction synergies, and intangible benefit, such as additional positive images for the local community or region (Rolfe, 2019). According to kedung poh reservoir, water recreation also become positive effect of the project, however this study only consider the minimum income from recreation. We predict that if the local government encourages local community manage the potential water recreation profesioanally, so community earns optimum indirect benefit from kedung poh reservoir

Next study should be performed especially about the water quality of this reservoir. Why is it important? The infertility soil characteristic of District Gunung Kidul causes the community severe by drought longer than other Distict at Yogyakarta Province. Therefore, the community can take benefit from reser-

voir to supply clean water. However, the intensive research should be done because the quality of water has impact for the community health. For an ilustration, based on compiled data within 13 years of 142 lakes and reservoirs in China, an empirical study reveals that the quality of water increases during 2005 – 2013, although during this period, the pollutan is stable. However, the pollutan of water decreases during 2014 – 2016. This study also reveal that eutrophian causes the deteroriation of China's lakes and reservoir during 2005 – 2011, but heavy metal pollution causes the reduction of water quality in China's lakes and reservoirs during 2011 – 2017. The non point source pollution indicates China needs a consolidation effort of government on ecosystem and environmental management (Huang et al., 2019). (Kerr et al., 2016) suggest that the involvement of farmers on conservation program be able to reduce the sediment of non point source pollution. ((Kerr et al., 2016).

4 CONCLUSIONS

This study be encouraged by the unique characterictis of public investment, namely kedung poh reservoir, such as realising cost from community land and vegatation, indirect benefit from fishery and water recreation, although the main objective of reservoir's onstruction provides irrigation supply constantly. Based on the feasibility analysis, this project is eligible to execute. The next study should be performed regarding to water quality analysis, because the drought problem during the dry season.

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Geological Model for Mineplan Method to Support Economic Activities in a Remote Island

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Keywords: Geological model, Onyx, Selective mining.

Abstract: Mining materials are natural resources that cannot be renewed and require a long time to form so that their management and utilization must be wise. Mining has high economic value but is also a major cause of natural disasters. In this study the method of investigation is by conducting a literature review, survey and investigation of the geological and geomorphological processes that occur, then analyzing the genesis and mining activities that are in accordance with the conditions and characteristics of the onyx marble. The onyx marble mining on Bawean Island is manually very suitable because it is selective mining, which only takes onyx potential by not dismantling the entire limestone so that it is more environmentally friendly. The onyx marble marketing on Bawean Island is also not good due to the limited transportation that operates 3 times a day out / to the island in the form of cargo ships.

1 INTRODUCTION

The types of mining materials are differentiated based on economic value, benefits and difficulties in obtaining them. In Indonesia, based on Government Regulation number 27 in 1980, the materials are divided into 3 types, namely excavation materials A, B and C where onyx is included. C can be used directly as the main raw material for industry without or little through the processing process and does not require an international market.

Bawean Island Stratigraphy starts from the Gelam Limestone (Early Oligocene-Miocene) Unit, Kepongan Sandstone Unit (Late Miocene-Pliocene), Balibak Volcanic Rock Unit and the youngest is an alluvial precipitate aged Resen(Aziz et al., 1993). Physiography, Bawean Island has its own characteristics compared to the Rembang - Madura and Kendeng Zones which incorporate into magmatism behind the outer arc which is likely to be built by products from submarine volcanic activities(Van Bemmelen, 1949). Onyx is a chalcedony coating which is a group of silica minerals (WHITTEN and BROOKS, 1976), usually layered, compact, translucent with variations of calcite such as travertine coating having a good gloss and usually deposited in the form of stalactites in caves (Bates and Jackson, 1987). The definition of onyx marble is applied to layered calcite minerals,

yellowish white, gray to reddish, translucent, crystalline, compact, massive, hardness of 3 Mohs scale. There are 5 important mechanisms that can explain how the deposition of $CaCO_3$ and the increase in CO_2 that can be dissolved in water, (1) by the increase in temperature and evaporation, (2) by water movement, (3) by addition of salinity, (4) by organic activity, and (5) by pressure changes.

Onyx on Bawean Island in its formation process is only found (Aziz et al., 1993)in a few places with certain conditions and requires a long time so that its existence is limited / rare and different from onyx in other regions in Indonesia such as Tulungagung - East Java. Bawean Island itself is an island located on the north side of Gresik with connecting access only in the form of ships from the Gresik pier (East Java). Rural development issues in Bawean Island have previously been compared to a similar set of challenges in sub-Saharan Africa, particularly in regards to inadequate infrastructure and remoteness of markets (Booth*, 2004). The parallels further include low agricultural production, a history of supplementary livelihoods supporting subsistence agriculture and poverty-driven de-agrarianization (Booth*, 2004). These livelihood characteristics, which have been associated with the shift towards ASM in sub-Saharan Africa, are also evident in West Timor. Onyx mining in Bawean Island has been carried out by the

community (artisanal and small-scale mining /ASM) and is one of the reliable livelihoods because it has good economic value. . It is in this context that the artisanal miner themselves trying to strategically manoeuver a complex, dynamic in- stitutional environment to secure their livelihoods (Bersaglio and Cleaver, 2018). Not only did income from mining provide a safety net when crops failed, it also acted as an opportunity to 'step up', with money reinvigorating farming opportu- nities and creating new livelihood opportunities.(Fisher et al., 2019).

On the other hand, there are at least three factors which contribute to the underestimation of mining's impact on the local economy. The first is the existence of money flows that result from the company's activity on the island, but which are not taken into account in the context of input–output analysis, the most glaring example being the incomes and expenditures of retired employees who still live in the island.13 The second concerns the importance of the economic and social effects that cannot even be expressed in monetary terms, such as the contribution of mining activity to the preservation of the local community and the prevention of demographic decline or migration. Finally, mining activity possesses some special characteristics that cannot be embedded in the input– output model, the most important being that it implies the frequent development of new productive installations (mines), as well as the restoration of old ones, hence the accumulation of high expenditures (Tserkezis and Tsakanikas, 2016). This research is expected to produce genetic geological models for planning mining methods that are good and environmentally friendly.

2 METHODOLOGY

The procedure of this study is illustrated in Figure 1, however this paper only presents geology and geomorphology process in order to explain onyx genetic geological model. Base material of onyx is limestone. The dissolution process causes changing of limestone to onyx. The main factor: (1) Hot water, (2) Evaporation, (3) hot air and (4) fracture.

The presence of underground rivers, caves, stalactites, and travertine deposits is an indication of geomorphological processes which also greatly influence the control of onyx formation.
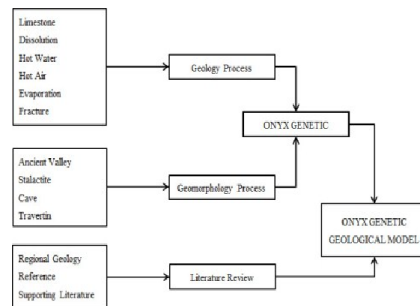
Figure 1: Flowchart of study on Onyx in Bawean Island

3 RESULT

Genesis is the sequence of events in the formation of an object in geology related to the trigger force, namely exogenous energy (originating from outside) that works on the surface of the earth and endogenous energy (from the inside) that works below the surface of the earth. The two forces that cause the formation of various forms that exist in this earth but also there are natural processes on the surface of the earth such as the process of erosion, transporting the results of erosion, transportation and sedimentation that affects.

Onyx on Bawean Island is a type of onyx marble which is milky white, milk chocolate, gray, and reddish milk chocolate, translucent, crystalline, straight wavy and homogeneous, massive and hollow, with hardness of 3-4 Mohs scale. The difference of onyx silica and onyx marble namely onyx silica is composed of quartz, the composition of SiO_2, hardness of 7 on the Mohs scale while onyx marble is composed of calcite, composition of $CaCo_3$, hardness of 34 on the Mohs scale.

The process of forming onyx starts from the crystalline deposits of calcium carbonate carried by water containing carbon dioxide flowing into the limestone and can convert calcium carbonate to soluble plus the help of hot water, air heat and evaporation, stalactite and stalagmite in the limestone cave. The metamorphosis process then changes the deposits to be harder and increase density. The number of onyx spreads is very limited compared to the extent of the surrounding limestone distribution because onyx which is the result of dissolution of the limestone itself and its formation is controlled by typical geological and geomorphological factors also requires a long time (thousands to millions of years) so that onyx has high economic value.
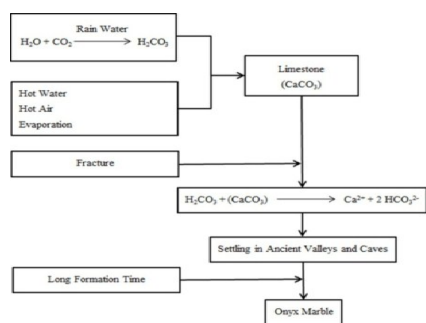
Figure 2: Onyx Genesis Process

Figure 3: Outcrop of Onyx and Limestone

Figure 4: Outcrop of Onyx and Limestone

4 DISCUSSION

Onyx quality is a combination of the properties possessed including objective genetic factors and subjective market tastes. Quality based on genetics is objective, namely:

a Scarcity where the onyx formation takes a long time in the geological time scale, the distribution is not evenly distributed only in places that meet the requirements for the formation of onyx, so the

less frequent onyx is in the price, the more expensive the price.

b Violence where increasingly hard onyx is increasingly expensive, because the retrieval process (cutting and forming) requires a large amount of special and special equipment.

c Purity is defined as authenticity, passivity, cleanliness which all determine quality and price.

d The layer pattern shows the flow structure and onyx. The bawean island forms straight or wavy and homogeneous layers, following the slope of ancient slopes.

e Pore where onyx has a high pore level will reduce the level of quality onyx because it is easily broken.

Quality based on market tastes is subjective, namely:

a Beauty is determined by high aesthetics when it has artistic and suitable properties when combined with other objects in a layout arrangement. The smoother the refinement, the higher the quality and the more expensive the price.

b The larger the size of the onyx, the higher the quality and the more expensive the price.

c Color is closely related to beauty because it usually depends on the nature and tastes of each person.

d Complexity where the more complex the shape, the higher the quality and the more expensive the price because it requires special expertise and the time and cost of production.

Onyx marble mining activities on Bawean Island are still manual work by man (human) and simple equipment that has the character of "selective mining" where mining concentrations are only on the onyx marble excavation material whose unique position is not to spread across limestones but only in certain places so that damage to limestone or soil around it can be minimized, making it more environmentally friendly. In addition to positive values, manual mining has a negative value, namely the risk of workplace accidents is very large, this is due to the lack of equipment and operational security and safety (K3) standard in the mine location.

The marketing of onyx marble in the form of raw materials as well as those that have been processed at this time is still minimal due to inadequate access to the entry and exit of goods to Bawean Island where it is only served by cargo ships operating 3 times a week

5 CONCLUSIONS

The genetic geology model is very important in the interpretation of determining the presence of mineral deposits, the geological and geomorphological processes that make up deposits of minerals, the association of mineral deposits and the time of formation of mineral deposits in the geological environment.

Factors that influence the genetic geology model are thin volumes of sediment, so descriptive information is needed to describe the formation of sedimentary complexes through drawing or sketching the onyx formation process, site of formation and other factors that play a role in the formation of onyx.

The genetic geological model illustrates the relationship of each data and fact in the field to the geological environment, namely geological and geomorphological processes in the form of images and formation sequences without using long explanations such as descriptive geological models, but only a short description of the image.

The geological model of onyx genetic is useful in knowing the formation process and determining mining activity planning, namely in determining the direction of mining as well as selective and appropriate manual mining methods where this will have a direct impact on the spatial layout planning of Bawean Island.

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Bantul Krebet Wooden Batik Crafts as a Local Potential Area in a Study of Intellectual Property Rights: Juridicial and Economic Insight

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Keywords: Krebet Wood Batik, Local Potential, Intellectual Property Rights, Copyrights, Legal Protection.

Abstract: This study aims to analyze the existence of the typical Krebet wood batik as a Local Area Potential where it is reviewed by conducting judicial and economic reviews. This research is empirical juridical research with descriptive analysis method by taking empirical data in Krebet Village, Bantul Regency, Special Province of Yogyakarta. The results of this study indicate that there are local potentials in Krebet Bantul, namely Krebet Wooden Batik which is an intellectual work of craftsmen in Krebet, where there is a distinctive characteristic of Krebet wood batik motifs, which has the potential to apply for copyright registration on the wooden batik motif. So far, legally the Krebet wooden batik has not been touched by IPR protection and the level of public awareness in Krebet is very low to understand IPR due to various factors, namely education, community culture, bureaucracy and IPR registration fees and others. However, IPR assistance has been carried out so that there has been a Certificate of Recording 2 (two) batik motifs, namely Colorful Batik Motifs and Red Black Grompol Batik Motifs. From the economic aspect, registration of IPR has benefits for the community, especially the craftsmen community, to utilize their economic rights from the existence of these legal protections. With the existence of legal protection, it will be possible for other parties who do not have the right to take economic benefits, thus the creator can make maximum use of the economic benefits of the product of his work, either for his own use or transferred to other parties.

1 INTRODUCTION

Indonesia is an archipelago that has a diversity and richness of art, culture, ethnicity, nation, and religion, where diversity will provide a distinct identity for the regions in Indonesia. One of the diversity of Indonesian arts and culture is batik,which in all corners of the world has its own motives in accordance with the distinctive characteristics of each region. Krebet Bantul area is the area of the Wood Batik Craft Center, where most of the people have a livelihood as wood batik craftsmen known as Krebet Wood Batik. Krebet wood batik is a craft product that is produced from the intellectual abilities of humans that produce a craft product with a variety of variations, motifs and types. As a result of Intellectual Property originating from human intellectual capabilities through creativity, taste and caress, of course the product has a very economic value that will benefit the creator .

A distinctive feature of Intellectual Property Rights hereinafter abbreviated as IPR is that this right is a private right, so that someone is free to submit an application or register his intellectual work or not. Exclusive rights granted by the state to individual IPR actors (inventor, creator, designer, etc.) are nothing but intended to reward the work / creativity and so that other people are aroused to be able to further develop it, so that the IPR system is determined by the public interest market mechanism. Intellectual property (IP) is the original creation of the human intelligence such as artistic, literary, technical, or scientific creation. Intellectual rights (from the French "droits intellectuels") Intellectual property rights (IPR) to the inventor or creator to protect the creation of a certain period of time (Chopra and Kumar, 2014). The IPR system also requires a good documentation system for all forms of human creativity, so that the possibility of producing the same technology or other works can be avoided or prevented. With this good documentation, it is expected that the community can make maximum use of it or develop it further to provide higher added value. IPR also provides protection against economic interests from the findings or works of inventors or creators. Legal protection aims to pro-

vide stimuli to produce more innovative inventions or works. The scope of the IPR regime includes patents, brands, industrial design, copyright, trade secrets, integrated circuit layout design and plant varieties.

Many countries that are participants of the Trade Related aspects of Intellectual Property Rights (TRIP) agreement show that the international community cares about IPR protection. This has an impact on efforts to improve IPR protection at the local / national level including Indonesia. In the last decade Indonesia has ratified international agreements related to IPR, which have the consequence that Indonesia must make regulations regarding the protection of human intellectual work and harmonize with the development of the conditions of society. Problems on IPR on the one hand relate to the problem of economic liberalization, and on the other hand are faced with social, cultural, and economic conditions of the Indonesian people. The socio-cultural conditions of the Indonesian people are still in the transition period of industrial society and not all understand and understand the issues of IPR. This cannot be denied considering that the concept of intellectual property rights does not originate from the Indonesian people, but originates from the developed countries to protect their intellectual works from the people's mindset of those countries that are different from Indonesian society.

Economic aspects or aspects can show the study that IPR is an object of wealth that can be transacted in the process of exchanging human economic needs (Mahila, 2018). Based on the types of IPR that exist, the art of Batik craft is included in the Copyright regime which in its regulation has been made a separate regulation namely Law Number 28 of 2014 concerning Copyright. The number of creative industries in the field of arts and culture that developed in Indonesia, certainly balanced also with the development of the creation of batik motifs, especially wooden batik motifs in Krebet Bantul, Yogyakarta Special Region. If there is no immediate protection, in this case copyright protection against the creation of batik motifs, it is feared that the creation will be increasingly destroyed and can be claimed by other regions and countries that understand more about the protection of IPR against batik.

Based on the description and background above, the authors formulate the problem as follows:

a What is the implementation of legal protection for wooden batik motifs in Krebet Village, Bantul Regency, Special Province of Yogyakarta?

b What economic benefits can the creator take regarding the protection of the batik motif?

2 METHODOLOGY

Referring to the formulation of the problem, this research belongs to the type of empirical normative research method. In empirical legal research, what is examined initially is secondary data, then proceed to primary data in the field that exists in the community. In this case, the researcher wants to provide an overview and elaborates on the study of copyright protection for wooden batik art in Krebet Village, Bantul Regency. The approach used in this study uses a qualitative approach, namely the approach used by researchers by basing on data stated by respondents in writing or verbally, as well as real behavior, which is examined and studied as something intact. Data collection techniques in this study used interview techniques and observations to a number of respondents in this study. The location of this study is in Krebet Village, Pajangan District, Bantul Regency, Yogyakarta Special Region, in a place where there are many centers of Krebet wood batik. Analysis of the results of this study is descriptive analysis.

3 RESULTS AND DISCUSSION

3.1 Copyright Legal Protection against Batik Motives

Copyright is a part of IPR that provides legal protection in the fields of Science, Arts and Literature. Legal protection against batik motifs which are also copyrighted works, which have been recognized as world cultural heritage by the United Nations Educational, Scientific and Cultural Organization (UNESCO). Batik is declared feasible to be included in the Representative List of the Intangible Cultural Heritage of Humanity, which means that batik has gained international recognition as one of Indonesian culture, so it is expected to motivate and elevate the dignity of batik artisans and support efforts to improve people's welfare economically. UNESCO's recognition of batik as an Indonesian cultural heritage for the world should encourage Indonesia to truly work on batik in order to remain sustainable. Some efforts can be made both in terms of law and in terms of the economy.

The Intellectual Property Issues in Cultural Heritage Project multidisciplinary and multi-sectoral together together with scholars and experts partners to collaborate on intellectual and timely investigation of intellectual property issues in cultural heritage that represent emergent local and global interpretations of

culture, rights, and knowledge (Nicholas, 2007). In Article 1 point 1 of Law Number 28 of 2014, the Copyright states that the definition of copyright is that Copyright is the exclusive right of the creator that arises automatically based on the declarative principle after a work is manifested in a tangible form without reducing restrictions in accordance with the provisions of statutory regulations. Based on the above understanding, copyright can be defined as a monopoly right to member or announce creations that are owned by the creator or other copyright holders who, in their implementation, pay attention to the applicable laws and regulations.

The protection provided by copyright is given automatically since the creation is in the form of a concrete, because this law adheres to the declarative principle, where legal protection is provided automatically by the state without the need for registration. The period of legal protection of copyright especially for batik motifs is valid for life plus 70 years after the creator dies. Batik artworks are included as copyrighted works protected according to Article 40 paragraph (1) letter j of Law Number 28 of 2014 concerning Copyright. What is meant by "batik artwork" is contemporary batik motifs that are innovative, present, and not traditional. The work is protected because it has artistic value, both in relation to the image, style, and color composition.

IPR ownership is very important in dealing with global markets, because with IPR ownership someone has legal certainty when there are other entrepreneurs who will emulate the same brand (Widihastuti and Kusdarini, 2013). Looking at the importance of legal protection against culture in Indonesia, this clearly has a very strategic value that can be seen in terms of cultural, economic and social (Asri, 2016). Problems regarding IPR will touch on various aspects such as technology, industry, social, culture and various other aspects. However, the most important aspect if it is associated with the protection of intellectual work is the legal aspect.The law is expected to provide protection for intellectual work.

Besides having potential as a cultural heritage, batik also has the potential as a driving force for the national economy and creating jobs to increase people's income. Batik artwork has an increasingly creative motive to still be able to meet consumer desires. If ancient batik motifs had to be associated with mythology, social status and also related to the rank signs in the palace environment, then now batik motifs are far more innovative in pursuit of the pace of globalization and cultural change from society. This motif is called the contemporary batik motif.

Considering that batik has great economic poten-

tial, of course, protection is needed to avoid parties who use batik motifs by taking the essence of the motif to be modified and meramunya into the latest motifs that are individually registered. Even this protection is becoming increasingly urgent given the high piracy of Indonesian batik by foreign producers and batik products made by Indonesian craftsmen that are exported without any identity, so that it is finally recognized by other countries. This certainly will harm the moral rights and economic rights of the creators of contemporary batik.

3.2 Krebet Village as a Center for Wooden Batik

Krebet is a sub-village in Sendangsari village, Pajangan sub-district, Bantul Regency,approximately 12 Km Southwest of Yogyakarta City, with an area of $\pm$ 104 ha. Geographically, the north is bordered by sub-village Kaliasem, Bangunjiwo Village, on the east borders with Pringgading hamlet which falls into the area of Guwosari Village, in the south borders with Dadabong sub-village and Kabrokan Wetan subvillage, and in the west borders with Petung and Dusun Desa Lor Triwidadi. Krebet is surrounded by teak trees, acacia mahogany and sengon so the distance from other sub-village is quite far apart.

Krebet is an area with infertile land with barren limestone land. Initially the Krebet community relied on agriculture as a source of livelihood, but because agricultural activities only lasted seasonally and relied on rainfed irrigation and the condition of the barren land, local residents developed other skills namely by making batik-made wooden handicrafts. Around the village of Krebet there is wood that can be used as a craft, for example teak, sengon mahogany, as a raw material for making crafts with batik motifs. One form of creativity in batik craft is the development of batik using wood media, where in general batik is made on cloth. The results of creativity are manifested in the form of masks, key chains, puppets, tissue boxes, trays, jewelry places, miniature animals, and other decorative creations. Designers make use of the terrace and yard as a place for producing wood batik. More and more people of Krebet Hamlet are skilled in making crafts, so more and more consumers are coming to order wood batik from both domestic and overseas. The production of wooden batik is one of the home industries that can sustain the economy of the Krebet Hamlet community which can be a magnet for the interest of local and foreign tourists to visit this village, making Krebet hamlet one of the tourist villages that must be visited when coming to Yogyakarta.

The enactment of the Copyright Law brings hope for the process of protecting a design especially Kayu Batik, namely by obtaining a recording of the Batik Kayu motif as a copyrighted work by the creator / craftsman who is legally protected. Although legal protection is obtained from copyrighted works in the form of Copyright automatically, but as authentic evidence in the future there is a need for recording so that the creator will have a certificate of recording the batik motif. The lack of knowledge and legal awareness of the creators is the main factor underlying this weakness.

Until now, wooden batik artisans in Krebet still maintain this tradition. The artisans try not to leave their profession as wood batik craftsmen who have been handed down from generation to generation. Krebet wood batik has distinctiveness in its design mainly based on raw materials as its medium, namely pule wood, and sengon. The coloring also has its own characteristics, especially when compared to wood batik motifs from other regions. This is based on the manufacturing process in the form of stages from the selection of wood media, wood cutting, making batik patterns, batik process, coloring, drying, drying and finishing. The process requires special care and expertise that can only be done by the Krebet community which has been carried out for generations. Another distinctive feature is that the coloring quality is quite good so it does not fade easily and fade.

Legal protection against batik motifs is regulated in the Copyright Act which provides protection for the copyrighted works of the wooden batik motif. The creations and creations of batik artisans can be protected by copyright, given one of the scope of copyright protection, including batik art. With the protection of the wooden batik motifs / motifs, exclusive rights for crafters / creators will appear to publish or reproduce their own new batik motifs that have become their creations or give permission to other parties to do so. Actually the protection of a work arises automatically since the creation is manifested in a tangible form, namely in the form of a new batik motif which is the creation of craftsmen and not merely as a result of modifying the old batik motifs, because recording a work is not an obligation. However, the recording of batik motifs is still needed, so that batik artisans as creators obtain a "letter of registration of creation" which is very urgent if the craftsmen intend to make a licensing agreement or agreement to transfer copyright to others. The letter of registration of the work can also be used as an initial proof in the court if a dispute arises in the future over the batik motif. To simplify the registration process, the craftsmen should indeed document all the designs of the batik designs in the form of soft copy, or in hard copy.

Most Imogiri batik artisans have not considered IPR protection as a necessity and they have not seen the importance of legislation in the IPR field. Some obstacles in the provision of IPR protection to the work of Krebet wood batik craftsmen include:

a The limited knowledge and understanding of Krebet wood batik craftsmen regarding matters relating to IPR which are actually needed and can protect their batik works;

b The low level of education and the level of the economy of the artisans hampered the protection of IPRs on the work of artisans. The low level of education and economy is what makes the craftsmen think "practical" and simple, that is, preferring their batik works to sell quickly to meet their daily needs rather than thinking about their work being traced, stolen, and so on. The craftsmen did not respond too much to the idea of IPR to provide protection for their works;

c Communal and religious culture, making craftsmen very difficult to accept IPR concepts that highlight personal rights. For them, the process of making and traditional batik motifs is a cultural heritage, which should not be possessed possessively (monopolized). The philosophy of life in togetherness makes the tradition of "sharing" including sharing knowledge about batik, one of the forms of virtue, the reward of which is inner satisfaction. This is different from the views of Western society, the place of origin of the development of IPR, which places ideas, feelings, knowledge and even feelings as a valuable property of money (intellectual property). In the modernist view, traditional knowledge is a tool to use (or discard) for the development of indigenous societies, and therefore must be subordinated to Western science (Vermeylen et al., 2008);

d Some craftsmen who have received information about IPR state that the procedure for submitting IPR applications is difficult and expensive. Protection of IPR is obtained through certain efforts in accordance with IPR legislation. The registration procedure or arrangement for obtaining simple IPR protection and the burden of not making a "bid for IPR protection" is not enough to attract artisans to get it.

However, from the process of IPR assistance that has been carried out, it has succeeded in legally recording 2 (two) contemporary batik motifs from krebet wood batik motifs, namely Colorful Batik motifs and Red Black Grompol Batik Motif, both of

which have received a copyright registration certificate (Granted) with the recording number of each EC00201846181 and EC00201846181.

Figure 1: Warna-warni Kahyangan wooden batik motive and Grompol Merah Hitam motive

Registering the Batik Wood Motif Copyrights in addition to providing legal certainty for legal protection, it will also prevent other parties from imitating or copying the work and taking economic advantage of the batik's copyrighted work. In addition, the application for recording the batik works will educate other craftsmen and motivate them to immediately record the batik motifs they created.

3.3 Economic Benefits of Wood Batik Craft Protection

Talking about IPR cannot be separated from its principles, one of which is economic principles. In economic principles, IPR comes from creative activities of the human mind that have benefits and economic values that will benefit the copyright owner. What are the benefits and risks associated with copyright protection in the global economy? To answer this question we must evaluate the main arguments invoked to justify strong copyright legislation and enforcement (Downes, 2006). IPR is built on the foundation of "economic interests", the law regarding property (intellectual property). IPR protection becomes irrelevant if it is not associated with the process or commercialization of IPR itself.

In contrast to industrial property rights in general, copyright also contains economic rights and moral rights of holders of copyright. What is meant by economic rights is the right to obtain economic benefits over Copyright. The economic rights are in the form of profits obtained by money because of the use of the copyright by themselves, or because of use by other parties based on the license. The wealth of Indonesian culture can be used as a source of innovation in running the wheels of the country's economy. However, this wealth must be protected by the government, in this case as the holder of state sovereignty through various efforts. The existence of the Copyright will expressly regulate one's intellectual property to be protected and if it will be used commercially it is necessary to pay a sum of money to the creator (in the form of royalties), as the license holder. The law can also provide state foreign exchange because it will be treated the same as Intellectual Property by paying a license if it is to be produced commercially.

Legal protection that has been obtained by the owner can provide a sense of security to develop his work so that eventually he can obtain economic benefits. Owners who have not received legal protection will not feel fully secure in utilizing the results of their work due to threats from other parties.

IPR owners who use their economic rights can immediately obtain economic benefits from their work. Owners who do not use economic rights and do not make products in the form of products on the market, the owners will not get economic benefits from the results of their work. So it is very necessary to do legal protection for copyrighted works that have obtained economic benefits for the copyrighted work, so that the creator / copyright holder is protected by his economic rights. Copyright is intellectual property that can be exploited by its economic rights, so the right to transfer ownership of copyright can arise, for example through an assignment, or a license to use copyrighted works.

The reality that occurs is that many IPR owners do not use their economic rights when they have obtained legal protection. This causes IPR owners not to get economic benefits from their IPR. Economic benefits in principle must be felt by the owner and the community. This is in line with the theory of utilitarianism, that is, an act is said to be good if it provides the greatest possible benefit for as many people as possible. Commercialization, in their view, would result in over the knowledge to outsiders, in that hands would fail to have the desired efficacy. One specialist also observed that outsiders would have a price on knowledge, which would clash with their 'ethics.' Such knowledge is only meant to be used for the welfare of human rights, not for profit (Sarma and Barpujari, 2012). Legal protection is not intended to only provide legal guarantees but also economically. IPR owners expect that their property can provide maximum economic benefits. To get economic value, this right can be transferred to other people, through agreements, licenses, grants, inheritance and other causes that are permitted by law. Some things that cause the owner not to use his economic rights are the cost of making a product that is quite high. This can be a stumbling block for the owner to realize this. The incentives provided by the government only apply to the registration of intellectual property rights while making products is the responsibility of each owner.

With the protection of IPR it should be followed by the transfer of these rights to other people / other parties so that economic rights can be enjoyed by the creator.

4 CONCLUSIONS

The making of wooden batik has been through several stages, starting from making motif designs, making batik, coloring, sucking and so on, each of which requires its own expertise and creativity. Thus the Krebet wood batik products need to get IPR protection in this case Copyright protection. The existence of various obstacles in the field related to the request for registration of Copyright, among others, is from the cultural aspects of the community, the level of education and understanding, so that the need for guidance from the government as well as ongoing socialization.

In order to obtain broad economic benefits, it is better to involve the company in providing assistance for the production of IPR products through the Corporate Social Responsibility (CSR) program so that it can provide economic benefits to the owner / creator.

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The Role of After-sales Service for Online Shopping Loyalty

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Keywords: Loyalty, Perceived Risk, Perceived Benefit, Trust, After-Sales Service

Abstract: This study aims to identify the effect of after-sales service on online shopping loyalty. Sample 200 in this study is people who have done online shopping to meet the sample adequacy requirements in the structural equation model test. The results of the study indicate that after-sales service moderates the customer loyalty model. This study only uses 200 samples and does not divide the sample according to specific criteria. Future research is expected to increase the number of samples and divide the sample based on specific criteria so that the results of the study can be more precise in explaining the increasing phenomenon of online shopping.

1   INTRODUCTION

Online shopping is a rapidly growing phenomenon and is one of the most astonishing trends (Lim et al., 2016). The definition of online shopping in this study is shopping through the Internet. The Internet affects consumer behaviour in conducting searches, shopping and product payments (Yannopoulos, 2011). At present, the Internet is developing not only as a means of communication and information search engine but has become one of the essential tools to improve competitiveness. The Internet plays a role in encouraging sales transactions and increasing cost efficiency (Yannopoulos, 2011). The Internet because it affects the daily lives of consumers (Nam, 2003). The growth of internet users in Indonesia is very rapid and is estimated to reach 143 million in 2017 (Bohang, 2018) so that Indonesia is a potential market for online stores. Although the number of online transactions has increased, more than half of internet users have expressed confusion and frustration at online shopping activities (Horrigan, 2008). Perceived inconvenience indicates that in addition to providing the benefits of online shopping it also faces risks due to uncertainty (Egeln and Joseph, 2012). To reduce customer perceived risk, the seller provides after-sales service (Asugman et al., 1997). After-sales service is an ongoing relationship with customers after purchase (Sigala et al., 2008), by providing guarantees or repair services to increase customer satisfaction and

loyalty (Ladokun et al., 2013). After-sales service can increase competitive advantage because it can attract the attention of customers (Chien*, 2005). Companies invest significant funds to make differentiation by providing additional services (Loomba, 1998).

Many studies on the role of after-sales service on purchasing behaviour indicate that after-sales service has a positive effect on customer behaviour. After-sales service is a necessary construct that influences customer behaviour. Customers receive positive benefits from the after-sales service provided, but customer perceptions of after-sales service vary. Previous research put the role of aftersales service as a predictor of buying behaviour has not yet explained the role of after-sales service in moderating buying behaviour.

This research aims to identify the role of aftersales service as a moderating model of customer loyalty. Transactions that are potentially at risk, customers need a loss-free guarantee. Even though the product is of good quality and profitable for the customer, if the customer faces a risk, then aftersales service becomes an essential consideration in the decision-making the process. Customers who give full trust to the seller may be insignificant after-sales service in the buying process.

This study divides customers into two groups. Groups that have the perception that after-sales services are critical, namely high groups and groups that have the perception after-sales services are less criti-

cal, namely low groups.

2 HYPOTHESIS

Risk plays a vital role in consumer behaviour because it influences the process of making consumer purchasing decisions and reduces consumer intention to make online purchases (Barnes et al., 2007). Risk includes all the negative consequences of consumer purchases that cannot be anticipated. There are two theoretical perspectives on risk: one that focuses on the uncertainty of the outcome of the decision to make a purchase and the other focuses on the costs or consequences of the results of online purchases (Barnes et al., 2007). There is no agreement on the definition of risk, but often more shows the results of adverse decisions (Gefen, 2002a). Consumers have differences in assessing risk, and there are differences in consumer attitudes towards risk.

Previous research shows that perspectives of risk are negatively and significantly related to online purchases; if customer perceptions of risk are high, then the attitude of customers to online shopping is low. Based on this, the second hypothesis in this study is.

H1: Risk perception has a negative effect on online shopping loyalty

The perceived benefits of online shopping compared to buying in traditional stores is one of the main driving factors for online purchases. The choice of one's behaviour to make an online purchase is a consequence of the satisfaction felt by the customer.

Consequences that consumers feel significantly influence the behaviour of online shopping. In other words, an individual will make an online purchase if they feel the benefits (positive consequences) or will not make an online purchase if the consumer feels critical negative consequences. This finding is consistent with research from (Kurnia and Chien, 2003) which indicate that perceived benefits and ease of use are felt to have a positive effect on online shopping behaviour.

Consumers' perceived consequences significantly influence online shopping behaviour. In other words, an individual will make an online purchase if they feel the benefits (positive consequences) or will not make an online purchase if the consumer feels critical negative consequences.

(Forsythe and Shi, 2003) found evidence that there was a positive and significant relationship between perceived internet shopping profits and the frequency of spending and the amount spent online. Based on previous research, the first hypothesis in this study is.

H2: Perception of benefits has a positive effect on online shopping loyalty

Trust is an essential variable in online purchasing because one party does not take advantage of the weaknesses of the other party in trade, willingness to accept the actions of others because of the expectation that the other party takes actions that are important to him (Mayer et al., 1995). Trust in the context of online purchases is related to risk factors (Van der Heijden et al., 2003). Trust is one of the main factors that influence the context of online purchases and as a determinant of individual attitudes or online purchase intentions (Gefen et al., 2003). Trust indicates that higher consumer confidence in online shopping, higher shopping behaviour. Based on previous research, the third hypothesis in this study is.

H3: Trust has a positive effect on online shopping loyalty

After-sales service is a continuous relationship with customers after the purchase (Sigala et al., 2008), by providing after-sales services and ensuring reliable product functions (Ahn and Sohn, 2009), for example warranty or repair services, so as to increase satisfaction and customer loyalty (Ladokun et al., 2013). After-sales service can increase competitive advantage because it can attract the attention of customers (Chien*, 2005).

After-sales service is an activity carried out by the company after the purchase of products that can increase competitive advantage by ensuring that the product is problem-free for the duration of the product, failed product replacement and guaranteed repairs during the warranty period, timely repairs and affordable repair costs.

The higher the after-sales service provided to customers, the greater customer loyalty because of getting a guarantee of the costs spent. After-sales service is a variable that can moderate customer loyalty by divide into high and low after-sales services. Based on this understanding, the hypothesis in this study is.

H4: After-sales service moderates the effect of risk perception on customer loyalty on online shopping

H5: After-sales services moderate the influence of perceived benefits on customer loyalty on online shopping

H6: After-sales service moderates the effect of trust in customer loyalty on online shopping

3 RESEARCH METHODS

3.1 Population and Samples

The object in this study is online shopping loyalty. The population in this study are people who have the intention to repurchase online shopping intending.

In this study, the sample size to be taken is 200 according to the requirements of the study sample adequacy using SEM analysis tools.

Data collection uses a questionnaire given to people who have the intention of shopping online through convenience sampling techniques.

4 RESULTS AND DISCUSSION

The Structural Equation Modeling (SEM) test uses sample adequacy assumptions, data normality and outliers. The number of respondents in this study was 200 to fulfil the sample adequacy requirements.

Table 1: Normality Test Result

item	Before Transformation				After Transformation			
	skew	c.r.	kurtosis	c.r.	skew	c.r.	kurtosis	c.r.
R2	-0.61	-3.005	-0.408	-4.715	0.032	2.337	0.108	2.21
R3	0.992	1.62	1.02	3.77	0.761	1.208	1.335	2.09
M1	1.382	1.54	1.46	4.05	1.046	1.334	1.06	1.89
P1	-0.592	-3.221	-0.451	-3.332	0.026	0.497	-0.288	-1.058
P2	0.339	4.684	-0.857	-3.102	0.328	1.382	-0.985	-0.997
Multivariate		89.081	15.557				66.037	9.048

The normality test consists of two parts. Univariate abnormalities identified from the value of the critical ratio (c.r) skewness and multivariate normality are identified from the value of the critical kurtosis ratio (c.r). Univariate and multivariate normality is accepted if the critical ratio (c.r) is between the critical values of -2.58 and 2.58. The results of the normality test after data transformation indicate that the data is normally distributed univariately. Although the distribution of multivariate normality data is not fulfilled,

because the amount of research data is quite large (n> 100), the assumption of normality can be ignored .

Table 2: Outliers Test Resut

Observation number	Mahalanobis d-squared	p1	p2
104	102.96	0	0.09
95	99.04	0	0.08
88	83.75	0	0.06
87	66.53	0	0.05
52	63.05	0	0.04
33	58.44	0	0.04
9	49.32	0	0.04

The number of indicators in this study is 25, and the case said that if the outliers are married, the Mahalanobis d-Square value is greater than $\chi2$ (25; 0.001) = 44,314. The test results in this study indicate that there are six outlier cases, but because there are no specific reasons for issuing outlier data, the data can still be used in subsequent statistical tests.

Table 3: Goodness-of fit test results

Indeks	Cut-off	Result	Conclusion
Chi Square	Kecil	382.091	
P	≥ 0.05	0.822	Fit
CMIN/DF	≤ 2.00	0.981	Fit
GFI	≥ 0.90	0.934	Fit
AGFI	≥ 0.90	0.871	Marginal
CFI	≥ 0.95	1	Fit
TLI	≥ 0.95	0,995	Fit
RMSEA	≤ 0.06	0.01	Fit
IFI	≥ 0.95	0,990	Fit

Goodness-of-fit test to identify whether the model developed can explain data according to the underlying theory. The goodness-of-fit test results identify only AGFI that has marginal values so that the research model is indicated to be fit and able to explain the phenomenon of research.

Table 4: Regression Test Before Moderation

			β	C. R
Perception Risk	→	Loyalty	-0,104	205
Perception Benefit	→	Loyalty	0,162	3,11
Thrust	→	Loyalty	0,117	2,17

To identify the causality relationship between research variables and hypothesis testing, the Structural Equation Modeling (SEM) test is used, by analyzing the significance level of the effect of independent variables on the dependent variable based on the CR value

(z-count) greater than or equal to the z-table value (z-count $\geq$ z-table). The test results before being moderated by the trust as follows.

The regression test results between the risk perception variables and loyalty indicate that perceived risk has a positive and significant effect on loyalty (β = -0.104, and CR = 2.05), so H1 is supported. The regression test results indicate that the perceived risk hurts online shopping loyalty, so to increase online shopping loyalty, a program is needed to reduce perceived risk.

The implies of the result that perceived risk influence online shopping behaviour. The results of this study support previous research. (Barnes et al., 2007) which states that risk plays a vital role in consumer behaviour because it affects the process of making consumer purchasing decisions and reduces the intention of consumers to make online purchases. (Gefen, 2002b)(Liu, 2012)(Sweeny et al., 1999) which state that the chance of loss experienced by consumers both financial and nonfinancial losses will have a negative and significant effect on the attitude of online shopping. Although tested in a different context from previous research, this study identifies that the effect of perceived risk on loyalty tends to lead to negative and consistent influential phenomena.

The regression test results between perceived benefit variables and online shopping loyalty indicate that perceived benefits have a positive and significant effect on online shopping loyalty (β = 0.162, and CR = 3.11), so H2 is supported. The result indicates that if the benefits perceived by consumers as a result of online shopping are getting bigger, the positive attitude of consumers towards online shopping is getting bigger.

The results of this research are supports the opinion of (Forsythe and Shi, 2003) which states that the perceived benefits of online shopping compared to purchases in traditional stores is one of the main driving factors of purchase, because one's choice of behaviour to make online purchases is a consequence of satisfaction perceived by customers. In other words, an individual will make an online purchase if they feel the benefits (positive consequences) or will not make an online purchase if the consumer feels essential negative consequences. This finding is consistent with research from (Kurnia and Chien, 2003), who found the fact that perceived benefits and ease of use were positively affected by online shopping attitudes.

Although tested in a different context with previous research, this study identifies that the influence of perceived benefits on online shopping loyalty tends to lead to a phenomenon that has a positive and consistent effect.

This study also found the fact that trust had a positive and significant effect on online shopping loyalty (β = 0.117, and CR = 2.17), so the third hypothesis (H3) in this study was supported. The result indicates that if consumers increasingly believe in online shopping, the positive attitude of consumers will be higher in doing online shopping. Online business actors must increase consumer trust because trust is a vital variable in online purchases due to uncertainty. Online stores require effort to improve integrity, kindness, and competence and provide what has been promised to strengthen customer loyalty.

The results of this study support previous studies conducted by (Liu, 2012)(Teo, 2002) which state that trust is one of the main factors that have a positive effect in the context of online purchases, (Gefen et al., 2003). That the higher the customer's trust in online shopping, the higher the customer's attitude towards online purchases. Although tested in a different context with previous research, this study identified that the influence of trust on customer loyalty tends to lead to a phenomenon that has a positive and consistent effect.

Table 5: Regression Test Before Moderation

				High		Low
			B	C.R	β	C.R
Perceived Risk	$\rightarrow$	Loyalty	-0,091	1,35	-0,233	2,04
Perceived Benefit	$\rightarrow$	Loyalty	0,221	2,94	0,181	2,19
Thrust	$\rightarrow$	Loyalty	0,193	1,56	0,126	2,52

difference chi square test ($\Delta\chi2$) = 572,366 - 544,027 = 28,34
difference df (Δdf) = 338 - 301 = 37
chi square table (37;0,05) = 52,192
chi square table ($\chi2$) > difference chi square calculate ($\Delta\chi2$)
The Constrained model is significantly different from the Unconstrained Model

The results of the multi-group regression test after moderating after-sales service indicate that after-sales service moderate the research model (chi-square table ($\chi2$)> chi-square difference count ($\Delta\chi2$)) so that the constrained model is significantly different from the unconstrained model.

Table 5 shows that in the after-sales service group, high perceptions of risk and trust do not affect online shopping loyalty, while perceived benefits have a positive and significant effect on online shopping

loyalty. In the low after-sales service group, that perceived benefits, perceived risk and trust affected online shopping loyalty.

In the high after-sales service group, the results of the regression test between risk perception variables towards online shopping loyalty indicate that risk perception does not affect online shopping loyalty (β = -0.091, C.R. = 1.35). The results of this study indicate that after-sales service as providing a solution that reduces risk perception — various opportunities for losses that occur on online shopping minimized by the guarantee.

In the low after-sales service group, this study indicates that risk perceptions have a negative and significant effect on online shopping loyalty (β = -0.233, C.R. = 2.04). This result indicates that aftersales services provided by online stores do not reduce perceptions opportunities for losses that can be borne by the customer. In the low after-sales service group, customers consider that the aftersales service provided by online stores is not a variable that significantly reduces potential losses. The results of this study support the fourth hypothesis (H4). '

Based on the multi-group test, it identifies that the influence of after-sales service moderated the effect of risk perception variables on online shopping loyalty in the high and low groups because the chi-square table ($\chi2$)> chi-square count difference ($\Delta\chi2$) — aftersales service as having a different influence on the effect of risk perception on online shopping loyalty.

The regression test results between the perceived benefit variables and online shopping loyalty at high after-sales service (β = 0.221, C.R. = 2.94) indicate that perceived benefits have a positive and significant effect on online shopping loyalty. This result shows that the after-sales service guarantee facility improves customer perceptions of the benefits received on online shopping.

The regression test results between the perceived benefit variables and online shopping loyalty at low after-sales services (β = 0.181, C.R. = 2.19) indicate that the perception of benefits has a positive and significant effect on online shopping loyalty. The moderation test results show that in high and low aftersales services, the benefit perception variable influences online shopping loyalty. Based on the multi-group test, it identifies that the influence of aftersales service moderated the effect of benefit perception variables on online shopping loyalty in the high and low groups because the chi-square table ($\chi2$)> the difference in chi-square count ($\Delta\chi2$). The results of this study support the fifth hypothesis (H5). Aftersales service is perceived to have a different influence on high and low after-sales service groups, identify

from different standard coefficient quantities in the high and low after-sales service group.

The results of the multi-group regression test in the high after-sales service group indicate that the trust variable does not affect online shopping loyalty (β = 0.193, C.R. = 1.56. The results of this study indicate that customers who have a positive perception of after-sales service, trust, reliability, the ability to maintain customer privacy, complete information, and the belief that the product does not affect customer loyalty. In the group of customers who have a positive perception of after-sales service have the perception that after-sales service can guarantee trust in online shopping.

The results of the multi-group regression test in the low after-sales service group showed that the trust variable affected online shopping loyalty (β =0.126, C.R. = 2.52). The results of this research indicate that trust affects customer loyalty. In the low aftersales service group, trust is an essential variable in customer loyalty.

Based on the multi-group test, that the effect of after-sales service moderated the influence of the trust variable on online shopping loyalty in the high and low groups because the chi-square table ($\chi2$)¿ the difference in chi-square count ($\Delta\chi2$). The results of this study support the sixth hypothesis (H6). After-sales service as having a different influence on consumer perceptions about the effect of trust in after-sales services.

5 CONCLUSIONS

This study focuses on high and low after-sales services, which in the previous study have not explained yet. Before moderates test the level of after-sales service online shopping loyalty, risk perception, perceived benefits and trust affect online shopping loyalty.

After moderation test, in the high-after-sales service groups, perceived benefits affect online shopping loyalty, but perceived risk and trust not influence. In the low after-sales service group, perceived benefits, perceived risk and trust affect online shopping loyalty.

This research indicates that after-sales service moderates online shopping loyalty.

The results of this study as a basis for online stores in developing marketing strategies to increase online shopping loyalty by designing stimuli that can increase customer loyalty. The stimulusstimulus in question is related to increasing online shopping loyalty, namely by considering the different levels of after-sales service.

Future research can develop this research model in the context of loyalty to online shopping outside and research outside the context of online shopping loyalty — subsequent research to improve generalization of broader concepts.

This research model uses online shopping loyalty as an object of research, so it has an impact on the limitations of generalizing the concept of research, and its application only in Yogyakarta. In connection with these limitations, it is recommended to illustrate this research model d at different locations and objects to improve the generalization of the concept.

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Information Technology for Easy Access to IPR Registration for SMEs in Yogyakarta

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Keywords: SMEs, Intellectual Property Rights, legal protection, information technology, IPR Registration.

Abstract: The existence of SMEs in Indonesia is very rapid, where each year produces extraordinary innovation products from creativity that has high economic value. In addition, the existence of SMEs is also believed to have a tremendous impact on a country's economic income. Because SMEs are strongly associated with creative industries that always create innovation and high creativity, legal protection is needed for their intellectual property. To simplify the SME registration procedure, it requires a touch of information technology so that SMEs can quickly and easily access IPR registration. This paper seeks to provide a website-based strategy for increasing IPR registration for SMEs in Yogyakarta at the Ministry of Industry and Trade of the Special Region of Yogyakarta through the Intellectual Property Management Center.

1 INTRODUCTION

As one of the most populous countries in the world, Indonesia still relies on micro, small and medium enterprises (SMEs), which produces creative products, as the backbone of its economy. Small and Medium Enterprise (SMEs) in Indonesia plays an important role in social and economic growth, due to great number of industry, GDP contribution, and total employment. SMEs characteristic more agile and adaptable that capable to survive and raise their performance during economical crisis than larger firm.(Hamdani and Wirawan, 2012). Unfortunately, of the many MSMEs in Indonesia, only a few have realized the importance of protecting intellectual property rights (IPR). In fact, IPR protection is one strategy to increase the competitiveness of small-scale businesses.

With a total of more than 56 million businesses, Indonesia has broken the record of the most MSME owner countries in Southeast Asia. MSMEs contribute 60.3% of Indonesia's gross domestic product (GDP) and employ 97% of the national workforce (Herlinda, 2017) However, in reality, of the many MSMEs in Indonesia, only a few have realized the importance of protecting intellectual property rights (IPR). In fact, IPR protection is one strategy to increase the competitiveness of small-scale businesses. Therefore there needs to be real support from the government regarding this reality.

In Yogyakarta, the Department of Industry and Trade of Special Region of Yogyakarta through the Intellectual Property Management Center, is currently developing the use of co-branding for SMEs products from Jogja, based on Governor Regulation Number 21 Year 2017 concerning the Use of the Jogjamark Brand, 100% Jogja and Jogjatradition as Co Branding of Regional Products to ensure protection and competitiveness, increase consumer loyalty and trust, as well as legal protection and prevent the practice of unfair competition. The use of co-branding based on Intellectual Property Rights (IPR) is an effort to protect the intellectual property aspects of MSME products in Yogyakarta. In order to implement the rules regarding Jogja Co-Branding, facilities are needed that can facilitate SMEs to access IPR registration through the Center for Intellectual Property Management, by utilizing technological advances, especially Information Technology as Information Technology-based IPR service models, namely website.

Technology is the key for developing core competency in industry. Technological innovation is regarded as a tool for strengthening the competitiveness of a nation (because it secures continued economic growth by reinforcing employment and income generation)(Sikka, 1999). This paper try to propose a model and strategy for the use of information technology in order to facilitate SMEs to access IPR registration through the Intellectual Property Management Center.

2 METHODOLOGY

This research is qualitative research with an Empirical Juridical approach. Department of Industry and Trade through the Management of Intellectual Property of the Special Region of Yogyakarta became the location in this study. Data collection methods are carried out through library research studies and field studies with informants from Department of Industry and Trade through the Management of Intellectual Property of the Special Region of Yogyakarta and The Ministry of Law and Human Rights Regional Office of the Special Region of Yogyakarta. The analysis method starts with data collection, data reduction, data presentation, and conclusion drawing.

3 RESULTS AND DISCUSSION

3.1 The Importance of IPR for Creative Industries

Protection of Intellectual Property Rights (IPR) is an important thing to do in Indonesia today. This is based on the reason that Indonesia has great potential in the field of creative industries and abundant natural resources, so it needs to be supported by optimal efforts in providing IPR protection. Many benefits will be obtained from IPR protection, among others because of people others who want to enjoy the economic benefits of the IPR of an owner, they must obtain permission from the owner. Likewise, when someone else uses without permission, falsifying, imitating, or taking IPR, it is categorized as violating the law. This is the background to the importance of IPRs needing to be registered. In the business world, IPR can be an important element because it can provide competitive advantage when playing in targeted markets for its owners. In fact, it is also possible that this IPR can be a trigger to bring up new innovations for companies that ultimately benefit the public as well as the company itself.

There are reasons to believe that the enforcement of IPRs has a positive impact on growth prospects (Lall, 2003). Intellectual Property (IP) should be seen as a power tool for economic growth instead of an obscure legal concept. The protection of IP rights plays an important role in inducing technological change and facilitating economic growth. The value of IP is often not adequately appreciated and its potential for providing opportunities for future profit is widely underestimated by SMEs (Sukarmijan and Sapong, 2014). Small and medium-sized enterprises (SMEs)

are often the driving force behind such innovations (Saleh et al., 2008). Their innovative and creative capacity, however, is not always fully exploited as many SMEs are not aware of the intellectual property system or the protection it can provide for their inventions, brands, and designs (Druker, 2005). Furthermore, IP rights may enhance the value or worth of SMEs in the eyes or investors and financing institutions. Hence, in the event of sale or merger or acquisition, IP assets may significantly raise the value of the enterprise. Traditionally, physical assets have been responsible for the bulk of the value of a business entity and largely responsible for determining the competitiveness of an enterprise in the market. However, these scenarios have changed as a result of the revolution of the information technologies, intangible assets ranging from human capital such asknow how to ideas, brands, designs and other intangible assets from the creative and innovative capacity are often today become more valuable than the physical assets (Idris,). However, many are unaware of the importance of IP. In a recent survey, it was clearly evident that the percentage of public awareness about IP is very low and only understood by parties with interest or institutions and organizations which are involved in the field (of Malaysia, 2019).

IPR as intangible, obtains legal protection due to registration (except for copyrights and trade secrets). With registration, protection for owners of intellectual property rights will be obtained in the form of obtaining exclusive rights. Without registration efforts there is no protection so that exclusive rights are not obtained. Registration of intellectual property rights has protective consequences. These intellectual works are born with sacrifices, making the works presented to be valuable, especially with the economic benefits that can be enjoyed, the inherent economic value fosters the property concept of intellectual property for the business world, or the works are said to be assets. Exclusive rights provided by law are appropriate rewards for investors and creators of IPR.. Through these rewards creative people are encouraged to continue to hone their intellectual abilities so that they can be used to help improve human life. The main objective of the IPR legal system is to ensure that the creative process continues by providing adequate legal protection and providing sanctions to those who use the creative process without permission.

3.2 IPR Registration for SMEs in Yogyakarta

There are still many small and medium micro business actors (SMEs) who do not understand Intellec-

tual Property Rights (IPR) (Asri, 2018). IPR is the legal protection of the products produced. This is an intangible asset. If a product is not registered with an IPR, someone else can emulate it. Meanwhile, if the owner has registered it can sell the product brand to another party, and the owner has economic benefits. In Indonesia MSMEs that have IPR are only around 11 percent, while around 90 percent do not take care of IPR.

In order for the registration of IPR for SMEs in Yogyakarta to increase, then in Yogyakarta the Department of Industry and Trade of the Special Region of Yogyakarta has an institution that specializes in managing and managing intellectual property, especially for SMEs. The institution was named the Center for Intellectual Property Management, which was under The Departement of Industry and Trade of the Special Province of Yogyakarta.

The Center for Intellectual Property Management has the duty to provide services and facilitation for business development and intellectual property management services for small and medium enterprises in the Special Region of Yogyakarta. This institution was established in order to encourage the realization of progress and development of small and medium industries in the Special Region of Yogyakarta by providing various forms of services and consultations to business people. In addition, this institution carries out other important tasks, namely providing services and technical assistance relating to the registration and management of intellectual property such as copyright, brand ownership rights, patent rights, industrial design and other intellectual property rights.

This institution has a strategic role and function as a party that will provide full support and facilitation for the creation of the existence of small and medium-sized businesses that are strong and competitive. This institution will oversee business people to have knowledge and awareness of the meaning and significance of intellectual property rights while providing management services for Intellectual Property Rights. Moreover, this institution is committed to providing the best services for small and medium businesses in Yogyakarta work area in an effort to develop small and medium enterprises to have a strong and solid footing related to the protection of Intellectual Property Rights which are an integral part of their business activities .

So far, the Intellectual Property Management Center has provided services manually, by conducting socialization to SMEs in Yogyakarta, and SMEs registering directly with IPR at the Office of the Management of Intellectual Property. This method is considered ineffective because it requires time and also not all SMEs can take the time to visit the Intellectual Property Management Center because of its remote location. Therefore, a breakthrough is needed in order to facilitate access to IPR registration through the development of information technology. With these easy facilities, it will certainly make SMEs interested in registering IPRs because they can be accessed wherever they are.

3.3 Website-based IPR Registration System

Current registration services for IPR in Indonesia are carried out by the Directorate General of Intellectual Property (DJKI) of the Ministry of Law and Human Rights in Jakarta. But in reality, so far to deal with IPR registration is not easy, complicated and bureaucratic, so people are reluctant to manage IPR. If this is allowed, it will certainly hinder the targets that have been sought by the government in obtaining IPR registration.

Technological advancements in the fields of transportation, telecommunications and information have created a world without boundaries, facilitate the occurrence of human mobility between countries and information exchange through the world virtual. The use of information technology can also be used to facilitate IPR services. Because it can facilitate access that can be done anywhere. So that it will not waste time visiting a service institution that may be too far away from the location of SMEs.

The system built is a system that is used to provide IPR services to the wider community. System users are grouped into two groups, namely system administrators and communities. The Administrators group has full authority over data, system user settings, and validation related to IPR registration from the community. Community groups have the right to view IPR related news and can apply for IPR registration.

IPR registration from the community will be validated by the Administrator. IPR registration that is declared valid by the Administrator can be forwarded to the Directorate General of Intellectual Property of the Ministry of Law and Human Rights of the Republic of Indonesia. The system will be built web-based using the PHP programming language, and MySQL as a database management system.
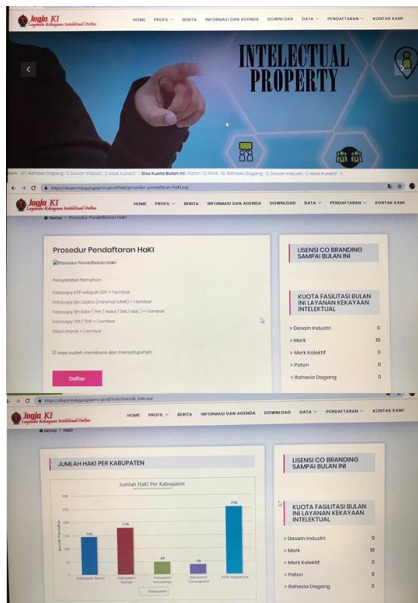
Figure 1: IPR Service Website at the Intellectual Property Management Center

4 CONCLUSIONS

The existence of information technology greatly facilitates the process of submitting IPRs for SMEs. Easily accessing IPR registration sites owned by the Institute for Intellectual Property Management institutions under the Department of Industry and Trade of the Special Region of Yogyakarta, will certainly provide many benefits for the increasing registration of IPR for SMEs. the creativity produced by SMEs becomes legally protected and has the potential to have great competitiveness both in the national market and international markets.

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Financial Services Authority Policy in Increasing Investment Indonesian Capital Market in the Disruption Era

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Keywords: Legal Policy, Financial Services Authority, Increasing Investment, Disruption Era

Abstract: Based on the Article 55 paragraph (1) of Law Number 21 of 2011 concerning the Financial Services Authority, the duties and functions of the Capital Market Supervisory Agency have been taken over by the Financial Services Authority. The assignment and function of the capital market watchdog are aimed at increasing the effectiveness and efficiency of capital market watchdog. This is evident that the growth of the capital market has increased both in terms of the number of issuers, number of investors, market capitalization, transaction volume, average transaction value, but can only contribute less than 3%, from the target of 3.3% of the total investment needs of Indonesia. Legal policies are needed which must be carried out by the Financial Services authority so that investments in the capital market can increase and meet the government's targets. Normative legal writing with a normative juridical approach aims to analyze the legal policies of what should be done by the authorities and the Self Regulatory Organization (SRO) so that investments in the capital market can increase significantly and can meet Indonesia's investment needs. In this disruption era, each Organizational Self Regulatory (SRO) has made a new policy, by applying the latest generation of each main system. Through the coordination of the Institutional Self Regulatory Institution (SRO) and the Financial Services Authority (OJK) legal policy, the Indonesian capital market is expected to be more efficient in terms of securities trading support systems and can increase investment in Indonesia

1 INTRODUCTION

The Capital Market aims to support the implementation of national development in order to increase equity, growth and national economic stability towards improving people's welfare. In order to achieve this goal, the Capital Market has a strategic role as one of the sources of financing for the business world, including medium and small businesses for business development, while on the other hand the Capital Market is also an investment vehicle for the community, including small and medium-sized investors. Fundraising through the capital market is indeed very large, which can be used to contribute to investment needs.

According to the records of the Financial Services Authority, throughout 2018, the collection of funds amounting to Rp 166 trillion from the capital market through a total of 168 public offers, while raising funds in the capital market until May 2019 had reached Rp 54.71 trillion from 52 public offerings.(Grace Olivia, 2019) According to data on the Indonesia Stock Exchange the stock trading recapitulation as of July 6, 2019 is as follows:(Rina Anggraeni, 2019)

Table 1: Stock trades on the indonesia stock exchange.

No	Jumlah	2018	Juli 2019
1	Investor	1.61O.00 0	1.676.606
2	Emiten	609	627
3	market capitalizati on	6.986,67	7.268,404
4	Indek HSG	6.163,60	6.373,477.
5	Transaction volume	14,39	18,278
6	Average daily transaction	380,54	484,227
7	Average daily transaction volume	10,13 triliun	8,060 triliun
8	fund raising	166 trilun of 168 initial public offering	54,71 trilun of 52 initial public offering

Initially foreign investors were limited to only

49%, and based on the Republic of Indonesia Minister of Finance Decree number 455 / KMK.01 / 1997 foreign investors were finally given freedom without restrictions.

In accordance with the principle of nondiscrimination in investment, freedom for foreign investors is a strategic policy in the capital market in order to obtain foreign funds through the capital market. The development of the capital market at the end of this decade experienced a significant increase, both seen from the various aspects, for example: aspects of the number of investors, number of issuers, market capitalization, funds raised, and so on. But compared to the total investment needs, the contribution of funds from capital market investments has only reached 3%.

The Financial Services Authority, target in raising funds through the capital market in 2020 is IDR 192 trillion, which is estimated to only contribute 3.3% of the total investment needs. What is the legal policy that must be done by the Financial Services Authority so that investment can increase. This problem will be analyzed and assessed by a normative juridical approach, by describing the capital market regulations as secondary data, and supported by primair data through field research by observation and interviews with officials in the financial services authority in Jakarta.

According to the Financial Services Authority, the opportunities and challenges in driving capital investment are increasing Human Resourse in the capital market, capital market instruments, new technology, transparency of securities prices, global macroeconomic conditions, political conditions, literacy and financial inclusion.

2 METHODOLOGY

This writing is the result of normative legal research, through legislation and conceptual approaches. As the material is secondary data, in the form of: 1) primair legal materials; which consists of various capital market law literature, scientific journals and other articles or writings related to capital market law. 2) secondary legal materials consisting of capital market regulations and tertiary legal materials consisting of various legal dictionaries and capital market dictionaries, and various news related to capital markets. The data is taken from libraries, websites by means of study documents, and analyzed concretively by providing exposure to the Financial Services Authority's legal policies in increasing investment in the capital market.

3 RESULTS AND DISCUSSION

3.1 Capital Market System

3.1.1 Primary Market

The activities on the primary market will begin with public offering activities by the issuer. Requirements for initial public offering, the issuer must submit an application statement to The Financial Services Authority . According to the law, those who can make initial public offering are only Issuers who have submitted a Registration Statement to The Financial Services Authority to offer or sell Securities to the public and the Registration Statement has been effective.(Indonesia, 1995) To be able to make purchases on the primary market or initial public offerings, the prospective buyer in addition to filling out a securities purchase order form and entering into an account opening contract and funding consignment on the underwriter or sales agent, it must be ensured that a buyer has read the prospectus. The law confirms that no Party can sell Securities in a Initial Public Offering, unless the buyer or buyer states in the Securities order form that the buyer or buyer has received or has the opportunity to read the Prospectus regarding the Securities before or when the order is made.

Public offering activities are carried out within 3 days and delivered within 60 days of the registration statement being declared effective, with the submission of securities and or the remaining consignment funds by the securities underwriter to the ordering party. The purpose of the issuer is to provide a public offer, of course so that the securities (shares) can be listed on the Exchange. Listing activities on the Exchange are carried out after the completion of the public offering with the listing on the Exchange, the issuer's securities (shares) can be traded on the trading floor (Secondary Market).

3.1.2 Secondary Market

Securities trading activities or often referred to as exchange transactions, are carried out entirely by members of the exchange, namely the intermediaries of securities traders (Brokers), which are located on the Stock Exchange. Prospective investors who will invest their funds in the secondary market must contract with securities companies that are licensed as securities brokers. The contract includes an account opening contract, a debit authorization contract, a securities deposit / fund contract, and a Single Investor Identication (SID). The position of investors in relation to securities brokers is as customers. After having

an SID, investors through their brokers can then make exchange transactions according to their ability.

3.2 The Role of the Financial Services Authority in Capital Market Activities

Based on article 55 paragraph (1) Law Number 21 of 2011 concerning the Financial Services Authority, the duties and authority of the Capital Market Supervisory Agency were taken over by the Financial Services Authority, and effectively took effect since January 2013. What is the duty and authority of the Capital Market Supervisory Agency is regulated in Law Number 8 of 1995 concerning Capital market.

According to Article 3 of Law Number 8 of 1995 concerning the Capital Market, the task of the Capital Market Supervisory Agency is to provide guidance, regulation and daily supervision of capital market activities. While the authority of the Capital Market Supervisory Agency is regulated in Article 5 of the Capital Market Law. Like Supervisory in America, Capital Market Supervision has three functions, namely;

1. Quasi Legislative Power: is the authority to make regulations in capital market activities.

   a Give licenses to each party that will conduct activities in the capital market and give approval to the Custodian Bank;

   b Require registration of capital market supporting professionals and trustees;

   c Establish requirements and procedures for nominating and temporarily dismissing commissioners and or directors and appointing temporary management of the Securities Exchange, Clearing and Guarantee Institution, and the Depository and Settlement Institution until new commissioners and directors are elected;

   d Establish requirements and procedures for the statement of registration and declare, delay, or cancel the effectiveness of the registration statement;

   e Establish fees for licensing, approval, registration, inspection and research as well as other costs in the context of capital market activities;

   f Provide further technical explanations for the Capital Market Law or its implementing regulations;

   g Determine other instruments as Securities other than those prescribed by the Capital Market Law.

2. Quasi Investigation Power: the authority to conduct investigations and investigations into alleged violations in the capital market.

   a Conducting checks and investigations on each party in the event of an event that is suspected to be a violation of the Law and / or its implementing regulations;

   b Require each party to:

   i. Stop or correct advertisements or promotions related to activities in the capital market; or

   ii. Take the steps needed to overcome the consequences arising from the intended advertisement or promotion;

   c Examine:

   i. Every issuer or public company that has or is required to submit a registration statement to Capital Market Supervision; or

   ii. The party that is required to have a business license, permission for individuals, approval, or professional registration under the law.

   d Appoint other parties to carry out inspections in the framework of implementing the authority of Financial Services Authority;

   e Inspect objections submitted by parties sanctioned by the Stock Exchange, the Clearing Guarantee Institution, or the Depository and Settlement Institution and provide a decision to cancel or strengthen the sanction.

3. Quasi judicial Power: is the authority to take action on violations in the capital market, such as the authority of a judicial body.

   a Announce the results of the examination;

   b Freeze or cancel the recording of a Securities on the Stock Exchange or stop the Exchange Transaction for certain securities for a certain period of time in order to protect the interests of investors;

   c Stop the Stock Exchange's trading activities for a certain period of time in the event of an emergency;

   d Doing other things given by law.

3.3 Financial Services Authority Legal Policies in the Capital Market

Development of capital markets that were reestablished from the start of the early 1990s in CEE countries is driven by numerous forces. The most important determinants are: (1) Legal and institutional framework (2) Political and macroeconomic stability (3) Broadening the investors' base.(Olgić Draženović

and Kusanović, 2016) From the regulatory aspect Financial Services Authority has issued many Regulations for regulate capital market activities. Some policies that need to be carried out, in an effort to increase investment in Indonesian, namely:

a Maintain investor confidence.

Investors are the backbone of investment activities in the capital market, without investors there will be no capital market activities. Judging from the nationality of capital market investors or often called public investors (minority shareholders) can be classified as foreign investors and domestic investors in terms of the number of investors can be qualified as individual investors and institutional investors. In terms of objectives, investors are divided into pure investors and speculative investors. One aspect to encourage investor interest in the capital market is investor confidence. Some of the things that form the basis of investor confidence in capital markets include:

(a) legal certainty, the existence of laws and regulations governing investment activities;

(b) Investor legal protection; one of the weaknesses in investment activities is the problem of investor legal protection. Juridically, the government only guarantees the Full Disclosure principle,(Nasution, 2001) where investors are guaranteed to obtain material information related to the capital market. This guarantee is only carried out in a formal form through research on document sufficiency, clarity of information and completeness of documents. The government does not substantially conduct due diligent and / or legal review of documents in the capital market.(Fuady, 1996)

(c) Ensuring benefits for investors. This policy is intended to make every investor get the maximum benefit from securities ownership in the capital market. The ones who get the most attention are stock investors, and therefore what benefits are obtained by investors in the share ownership.Many views that dividends are the main benefit for stock investors. Therefore, the Financial Services Authority must have the courage to make regulations that require issuers to pay dividends to investors. According to La Porta, mandatory dividend laws are a remedial measure designed to compensate minority shareholders in the event that their aforementioned rights are weak or non-existent.(Cyrus et al., 2006) That is, compulsory dividend law is a remedial step designed to provide compensation to minority shareholders if their rights at the general meeting of shareholders, the anti-directors' rights are weak or nonexistent.

b Providing diverse instruments, the aim can be used to support government needs in various priority sectors.

The object of trading in capital markets or often called the capital market instrument is in the form of securities. According to Securities law, securities are debt securities, commercial securities, shares, bonds, debt proofs, Participation Units of collective investment contracts, futures contracts for Securities, and any derivatives of Securities. The capital market instrument which has been widely traded is shares and every derivative of shares such as proof of right, warrant, option.

c Encourage regional bonds, green bonds and perpetual bonds. Local governments need to be encouraged to issue bonds, in order to get funds for development.

Local governments need to be encouraged to issue bonds, in order to get funding for development. According to the Financial Services Authority, the proceeds from debt securities will be used to finance investment activities and infrastructure to generate revenues for the Regional Revenue and Expenditure Budget. Not only that for investors, the issuance of regional bonds also became the instrument of the new investment portfolio.(Kontan, 2019) The issuance of municipal bonds is certainly not an easy matter, because it must require an assestment from the Ministry of Finance and there must be approval from the Regional Representative Council concerned. At present three provinces are said to have the potential to issue these bonds, including West Java, East Java and South Kalimantan. In fact, South Kalimantan said that it needed funds to reach Rp 10 trillion-Rp 20 trillion for infrastructure development, which could be covered by bonds other than the Regional Budget.(Monica Wareza, 2019)

d Issue Financial Services Authority Regulation

(a) Regulations concerning issuers' offerings with small and medium scale assets.

Small and Medium Enterprises and Micro Business Units need to be encouraged to be able to enter the capital market in order to obtain funds to develop their businesses. Therefore there is a need to regulate the problem. In the Financial Services Authority Regulation related to the public offering procedure for Small and Medium Enterprises and Micro, Issuers

with Small Scale Assets are companies with a maximum total assets of Rp 50 billion, while Issuers with Middle Scale Assets are companies with total assets of Rp 50 billion to Rp 250 billion . Financial Services Authority needs to develop an information technology system-based infrastructure used in the implementation of the initial public offering of equity securities, as well as debt and or sukuk securities, which include initial bidding activities (book building), securities offering (offering), until the allocation, allotment and distribution of securities . Through the development of these various systems, it is hoped that not only will the accountability and transparency of the public offering process in the capital market increase, but also inclusion in the Indonesian capital market.

(b) Regulations regarding Downhil Funds services through information technology-based stock offerings or equity crowd funding.

Financial Services Authority Regulation Number 37 / POJK.04 / 2018 dated 31 December 2018 concerning Funding Services. Regulates the equity crowdfunding organizers, parties that make public offerings, and investors who will invest in the company. This share offering with the Funding Service mechanism is organized by the organizer of the equity crowfunding, in the form of a limited liability company or cooperative with minimum capital and paid-up capital of at least Rp 2.5 billion. These organizers will later be able to act as securities underwriters, securities brokers and investment managers. Companies that will offer shares with this scheme may only have a maximum paid up capital of Rp 30 billion with a minimum amount of assets of Rp 10 billion.

4 CONCLUSIONS

Based on the analysis and discussion as outlined above, it can be concluded that the Financial Services Authority's legal policy in increasing investment in the capital market during the disruption era was to maintain investor confidence through legal certainty, legal protection and expediency in investment. Providing diverse instruments, issuing regulations on issuers' offers with small and medium-scale assets and regulations regarding fund services through information technologybased stock offerings or equity crowd funding. As a suggestion to the Financial Services Authority is that the legal policy must be able to be

implemented and implemented and developed more slowly so that investment in the capital market is increasing, by immediately issuing regulations: 1) Regarding the bidding mechanism by the local government; 2) About the issuance of shares by micro, small and medium businesses.

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Importance Performance Analysis of Online Motorcycle Taxi Services: Indonesian Passenger Perspective

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Keywords: Importance Performance Analysis, Online Motorcycle Taxis

Abstract: Online motorcycle taxis have received permission from the Indonesian government to serve the community. As a regulator, the government has an obligation to maintain that community needs are being met in every mode of public transportation. Therefore, online motorcycle taxi operations to be assessed for performance in order to maintain public services. This study aims to determine the characteristics of passengers as well as their importance and performance on online motorcycle taxis. Data was obtained by distributing questionnaires to, and conducting interviews with 200 random online motorcycle taxi passengers in Yogyakarta City, Indonesia. The Importance Performance Analysis (IPA) method was used to evaluate the online motorcycle taxis. According to IPA, most of the online motorcycle taxi services were perceived to be good by the passengers. A positive assessment of the online motorcycle taxi indicates that online transportation is very popular and fulfils a community need.

1 INTRODUCTION

Congestion is a serious problem in many cities in the world and various efforts have been made by governments to overcome this problem. One such effort has been to increase the use of urban public transport. Urban public transportation methods which are currently being widely developed are Bus Rapid Transit (BRT), Light Rail Transit (LRT), and Mass Rapid Transit (MRT). However, in the midst of efforts to increase urban public transport load factors, the rapid growth of online transportation has emerged. Application-based transportation company Uber has 3.9 million drivers around the world, while Grab, with 36 million passengers collectively using services as many as 2.5 billion times, is served by 2.8 million drivers and Lyft, another app based company, has 1.4 million drivers who have served 23 million passengers in over one billion trips (Iqbal, 2019). At first, the presence of many online transportation companies was opposed in various countries. Demonstrations by conventional taxi drivers often adorned the news in the mass media because of reductions in their incomes since online taxis began operating (Telegraph, 2019).

In addition, online transportation is deemed to be turning people away from fixed route urban public transportation and even increasing the level of congestion. But over time - although there are still governments that prohibit the use of online transportation - most cities of the world now allow online transportation companies to operate within certain parameters, such as having driving licenses and stickers on vehicles (Dickinson, 2018). In addition, fair cost standardization policies have been adopted for both online and conventional taxis in order to maintain a climate which is conducive to business.

During its development, Uber became the most downloaded ride-sharing and taxi application in Europe for May 2019 with almost 2.1 million installations representing 13.3 percent year-on-year growth from May 2018. The bulk of the installations came from Russia at 32 percent, followed by The United Kingdom 15 percent and France 11 percent (Chan, 2019). Meanwhile, based on Google and Temasek's research, the market share (Gross Merchandise Value / GMV) of online transportation services in six Southeast Asian countries reached US $ 2.98 billion, equivalent to Rp43.2 trillion, in 2015. The value consists of US$2.5 billion transportation services and US$450 million food delivery service. Then, in 2018 it increased to US$7.9 billion (Rp114 trillion) and is predicted to soar to US$29 billion (Rp420 trillion) in

2025. In 2015, the daily average number of users of online transportation services reached 1.5 million / day and increased to 8 million / day in 2018 (kata-data.co.id, 2018).

In Indonesia, on August 22 2017, the Supreme Court (MA) officially annulled the Minister of Transportation Regulation No. 26/2017, which became the legal umbrella for the implementation of application-based transportation. At least 14 points in the article are considered contrary to the higher laws and regulations by the Supreme Court, namely Law No. 20/2008 concerning Small and MicroMedium Enterprises and Law No. 22/2009 concerning Road Traffic and Transportation (detikNews, 2017). Thus, the points governing a number of rules, including upper and lower limit rates, were returned to the market scheme. That is to have online transportation without a legal umbrella but still allowed to operate.

Given the rapid growth of online motorcycle taxi services, the Indonesian government sought the need for policy / discretion based on Law Number 30 of 2014 concerning State Administration. In the Law it was stated that the minister may regulate something that occurs overwhelmingly in the community. With these considerations, the Government of Indonesia, through the Ministry of Transportation, permits the use of online motorcycle taxi services by issuing the Minister of Transportation Regulation No. 12 of 2019 concerning the Safety and Protection of Motorcycle Users While Utilising Such Services for Public Interest (INDONESIA, 2019).

In the midst of the pro-contra discourse, it cannot be denied that online motorbikes continue to receive a positive response from the public. Congestion that occurs in many cities in Indonesia encourages people to use online motorbikes as a faster but still affordable mode of transportation. Motorcycle based ride sourcing like Gojek and Grab Bike is a mode of motorbike taxi service that, assisted by technological devices, makes it easier for citizens to order quickly and be able to negotiate city traffic more easily compared to taxi cabs. The motorcycle taxi as a twowheeled motorized vehicle has its own advantages and uniqueness in that motorcycle taxis can provide door to door services, can reach difficult locations such as alleys and narrow roads and be able to bypass congestion spots.

Government policies that ultimately allow the use of motorcycle taxi online cannot be separated from the demands of the wider community to obtain the desired transportation services. However, every policy, of course, needs to be evaluated as the next policy material because the government's duty is to keep the needs of the community well served. One of the important aspects of the evaluation of materials is to understand the perception of passengers of online transportation services. If the public considers that online transportation performs well, this means that online transportation meets the expectations of the community and therefore online transportation operations are to be maintained. However, if the public's perception of online transportation is not good, the government can review the existence of online transportation by asking operators to improve their services or even, if it is deemed necessary, terminate this online transportation operation.

Online transportation in the form of motorcycles, also known as motorbike taxis, is, of course, quite unique and is not found in many countries. This research fills a gap by providing preliminary evidence about the use of motorbike ride sourcing in Yogyakarta Indonesia. The focus of this study was to answer two questions: (1) What are the main characteristics of online transport users (2) What are the perceptions of performance and interests according to passengers

2 PREVIOUS STUDIES

Studies related to online transportation include (Rayle et al., 2016), (Suatmadi et al., 2019)(Irawan et al., 2019)(Rakhmatulloh et al., 2019). Some studies highlight the shift in passengers of urban public bus transportation and conventional taxis to the use of online transportation services (Rayle et al., 2016). It was concluded that online transportation has the ability to increase mobility but it does nothing to improve environmental sustainability (Suatmadi et al., 2019). Meanwhile, (Irawan et al., 2019) showed that there is an opportunity for motorcycle-based ride sourcing as a feeder mode of Trans Jakarta Bus and Commuter Line in the Jakarta Metropolitan Area. However, not many of these writings are aimed specifically at motorbike type online transportation (as opposed to online cars / taxis). In certain countries such as Indonesia, the main reasons for the prohibition of online motorcycle taxis have been based on concerns for the safety and security of passengers, and it is precisely for these reasons that it is felt very necessary to conduct studies on online motorcycle services.

The focus of this research is to examine the performance and interests of online motorcycle taxis from a passenger perspective. If the assessment of the performance side falls below the interests of the users, then this indicates the need for service improvement. But if the opposite is the case, the interests of passengers are lower in terms of performance, meaning service to passengers has exceeded expectations.

2.1 Importance-performance Analysis

Importance-Performance Analysis (IPA) is a technique for analysing customer satisfaction with organizational products or services as proposed by Martilla and James (1977). IPA explicitly asks respondents in the customer satisfaction survey to show how important each attribute is (Eboli and Mazzulla, 2009). This method does not reflect the dependence of two or more variables and the effects of the presence or absence of different variables on overall service quality. Nevertheless this method is often used because it is easy to identify different quality parameters that can lead to improved service quality (Rahul Raoniar, 2015). In short, this science evaluation tool is used to prioritize attributes for improvement and can also provide guidance for strategic development (Slack, 2002). Some previous studies on transportation (Muttaqin et al., 2016), (Prasad and Maitra, 2019) (Machado-León et al., 2017) have also been used the IPA method.
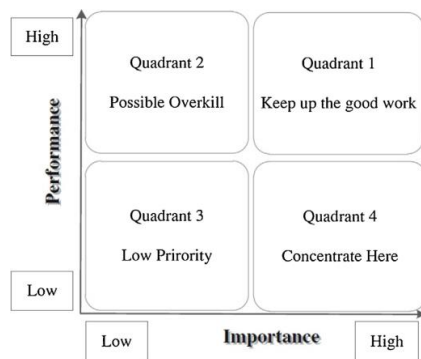
Figure 1: The Importance-Performance Analysis (IPA) matrix (Hosseini and Bideh, 2014)

Quadrant 1 contains attributes that are considered very important for the customer, and the driver provides a high level of performance. Thus the attributes in this quadrant are referred to as the main strengths and opportunities to achieve or maintain competitive advantage. Quadrant 2 contains attributes that are considered to be of low importance to the customer, but the driver provides a high level of performance. In this case, the organization must reallocate attributes in this quadrant to other quadrants that require performance improvements. Quadrant 3 contains low importance and low performance attributes which are referred to as small weaknesses. Thus attributes in this quadrant do not require many priorities for improvement. Quadrant 4 contains attributes that are considered very important for customers but the level of performance is very low. These attributes are referred to as major weaknesses that require immediate attention

for improvement.

The steps in determining the results of the Importance Performance Analysis (IPA) as a result of filling out the forms by respondents in this study are as follows:

1. Calculate the importance of the online motorcycle taxi,
2. Calculate the mean performance of the online motorcycle taxi,
3. Conduct plotting of mean interests and mean performance by Cartesian method into the quadrant of the Importance Performance Analysis (IPA),
4. Interpreting and analysing what indicators to enter into each quadrant.

2.2 Service Indicator

There are 10 indicators that are used as references in the assessment of services (Parasuraman et al., 1985). The ten variables are reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding / knowing the customer, and tangibles. Then by using the SERVQUAL model assessment, it is summarized into 5 pieces, namely tangibles, reliability, responsiveness assurance, and empathy (Parasuraman et al., 1988). Assurance is a combination of communication, credibility, security, competence, and courtesy, whereas empathy is understanding/knowing customers and access (Parasuraman et al., 1988).

Tangibles include physical facilities, equipment, and what appears from employees / staff. Reliability is the ability to perform promised services reliably and accurately. Responsiveness is willingness to help customers and provide fast service. Assurance is the knowledge and politeness of employees and their ability to inspire trust and confidence. While empathy is concerned with the individual attention that the company gives to its customers.

3 METHODOLOGY

Two hundred people who had used Gojek motorbike online transportation were asked to take part in this study. Gojek was chosen because it is one of the leading online transportation players in Indonesia, where, as of 2018, Gojek had attracted 1.7 million drivers, 300 thousand Go-Food partners, and 60 thousand service providers (Setyowati, 2019). The Likert scale was used to determine the performance and interests of Gojek online motorcycle taxi passengers. To determine the level of performance (performance), the

Likert scale used 1-5 where 1 is very bad and 5 is very good. While in terms of interests 1 is not very important, up to 5, which is very important. Next was the Quadrant Analysis or Importance Performance Analysis (IPA).

Online motorcycle taxi passengers were interviewed for their demographic characteristics and perceptions about online motorcycle taxi services. Interviews using questionnaires were conducted in 8 places spread across the Yogyakarta City area of Indonesia. The eight places were: the Yogya Kembali monument, Jogja City Mall, Senior High School 2 of Yogyakarta, Kranggan Market, Tugu Railway Station, along Jenderal Sudirman Section, Malioboro Mall and Alun-alun Kidul Yogyakarta (Yogyakarta South Square).

4 RESULTS AND DISCUSSION

4.1 Demographic Characteristics of Respondents

Respondents' characteristics of online motorcycle taxi users are shown in the following Table 1. As many as 56% of users of online motorcycle transportation were found to be women. Passenger figures were dominated by those of ages between 20-30 years, most were students / college students at 50%, without family dependants 57%. The purpose of their trip being to study at school / campus was 40%, the frequency of use was 41%, which was as many as 2-3 times per week. Interestingly enough, the majority of online motorcycle taxi users, namely 67% of passengers, have their own vehicles.

Table 1: Socio-demography Characteristics of Online Motorcycle Passengers.

Socio-demography	n	%
Gender		
Male	88	44
Female	112	56
Age		
< 20 years	50	25
20 – 30 years	102	51
31 – 40 years	28	14
41 – 50 years	20	10
> 50 years	0	0
Education		
Primary School	4	2
Junior High School	32	16
Senior High School	94	47
University	70	35

Job		
Student/College student	100	50
Private employees	44	22
Government Employees/Indonesian Soldiers/Police	18	9
Entrepreneurs	38	19
Others	0	0
Status		
Married	72	36
Single	128	64
The number of family/family burden		
< 2 persons	14	7
2 - 3	60	30
> 4	14	7
alone (no burden)	114	57
Purposes using Gojek		
School / campus	80	40
Work	38	19
Market / shopping mall	26	13
Bus Terminal / Railway Station	20	10
Home	36	18
Frequency of using online motorbike services per week		
< 2 (twice)	46	23
2 – 3 times	82	41
4 – 5 times	46	23
> 5 times	26	13
Income per month		
< 1 million	74	37
1 – 2 million	66	33
> 2 million	60	30
Vehicle owners		
motorbikes	134	67
cars	8	4
none	58	29

4.2 Importance and Performance

The number of questions addressed to respondents was as many as 15 questions concerning aspects of tangibles, of which were 3 questions, reliability at 4 questions, responsiveness was 2 questions, assurance 4 questions and empathy 2 questions, the number of questions, at 15 pieces, was considered sufficient to be filled out by respondents when receiving survey forms. 15 questions were neither too many nor too few. If the number of questions were to be too many, it was feared that at the end of the form the questions would be answered by the respondent because they were saturated. In fact, if the number of questions were too small, the information extracted would be very lacking. When filling out the form, if there were any questions that were not understood by the respon-

dent, the surveyor would explain the purpose of the question to the respondent.

The following Table 2 is a recap of respondents' answers which is indicated by the mean value on the importance side as well as on the performance side of online motorcycle transportation.

Table 2: Importance Performance Analysis on online motorbike service.

Aspect	Importance	Performance	IPA quadrant
	Mean	Mean	
Tangibles			
1. The condition of the motorcycle looks decent	4.66	3.975	2
2. Clean and tidy driver appearance	4.725	3.94	2
3. Attributes such as helmets and masks	4.845	3.415	4
Reliability			
4. Get a motorcycle taxi wherever and whenever	4.75	3.925	1
5. Ease of ordering a motorbike taxi via smartphone	4.595	4.025	2
6. Process of cash and non-cash payments	4.625	4.065	2
7. Drivers arriving on time	4.775	3.505	4
Responsiveness			
8. The driver tries to deliver the passenger quickly and on time	4.65	3.89	2
9. Fast and responsive driver service	4.785	4.075	1
Aspect	Importance	Performance	IPA quadrant
	Mean	Mean	
Assurance			
10. Prioritizing traffic safety	4.9	3.925	1
11. Giving a sense of security from crime	4.92	4.04	1
12. Reputation of Gojek	4.71	4.065	1
13. Politeness to passengers	4.575	3.915	2
Empathy			
14. Providing input on choosing a good route	4.545	3.575	3
15. Speaking courteously when giving advice	4.61	3.615	3

The standard deviation of the "importance" aspect is between 0.272 to 0.499. While the standard deviation of the "performance" aspect is in the range of 0.234 - 0.549.

In the tangibles aspect, there are two aspects which are in quadrant 2 and 1 aspect in quadrant 4. Quadrant 2 is a quadrant where driver services are exceedingly good even though the passengers already feel happy with the services below. This means that resources on aspects of motorcycle hygiene can be diverted to overcome the problem of helmet attributes complained of by passengers about the less clean and smelly side, and masks that are not always available. Likewise in the reliability aspect, complaints about the accuracy of the arrival of the driver need to be addressed because they are included in quadrant 4.

Quadrant 1 where the elements of performance and interests are equally high, there are aspects of the flexibility of time and place to get an online motorcycle taxi, driver responsiveness, safety, security and reputation of motorcycle taxi. This result disputes concerns from some circles, including those from the government, who question the safety and security of motorbikes online. Some aspects that are considered by passengers to be not so important and also do not need to be of excessively good performance are the advice of the driver to the passengers regarding the route and hospitality in speaking.

If examined, there are 5 aspects of quadrant 1 entry, 6 aspects of quadrant 2 entry, 2 aspects of entrance to 3, and those in quadrant 4 in 2 aspects. These results indicate that the services of online motorcycle taxi drivers meet passenger expectations. This good service is certainly inseparable from the characteristics of drivers, where as many as 62% have high school education and 23% have been educated at university. High school and PT graduates are considered to have the ability to interact and provide the best service to passengers.

Good service quality is also inseparable from the management carried out by the Gojek company. In the regulations applied by Gojek, there were 3 types

of violations carried out by the driver, which would result in punishment. These were security threats, fraudulent actions, and poor service. Security threats can be in the form of violating traffic laws, neglect when driving, disrupting customer privacy or committing criminal acts. Cheating actions include making a fictitious order, giving money back or requesting a payment that is not in accordance with the agreement, or using a modified application. As for bad service, such was listed as speaking harshly, the vehicle number plate being different from that written on the application and delay in pick up.

5 CONCLUSIONS AND RECOMMENDATIONS

If any, This study was conducted in Indonesia where the government allows the use of online transportation, not only online taxis, but also online motorbikes are permitted. Based on the analysis in advance, motorcycle taxi transportation is perceived by passengers to have good service. Government concerns regarding the safety and security aspects of online motorcycle taxi passengers are very reasonable even though they are contrary to the perception of passengers. This is because passengers provide good ratings on safety and security aspects. The weakness of online motorcycle taxi operations lies in the incompleteness of the attributes (masks) and the timeliness of pick up. These two things need to be addressed by the operator.

The progress of communication technology that has fundamentally affected the urban transportation sector has triggered further research about the effects of the presence of online transportation on the number of urban public transport passengers. Likewise, an important consideration might be the use of ride hailing using routes of urban public transport such as BRT, LRT and MRT.

To close, although this study confirms that customers are commonly satisfied with the online motorcycle taxi service, the government must highly consider the public transport demand (i.e. TransJogja Bus) due to the emergence of motorcyclebased ride hailing, since the bus is very hard to compete with motorcycle mode, especially in term of travel time and travel cost (Irawan et al., 2017). In Yogyakarta, people who decide to use public transport must depart earlier to work/school than those who use motorcycle (Irawan and Sumi, 2012) (Irawan and Sumi, 2011). The high level of satisfaction with motorcycle-based ride hailing service is feared threatening the bus ridership.

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Selection between AHP and TOPSIS for Academic Information Systems Decision Making Model

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Keywords: Academic Information System, Open Source, MADM, AHP, TOPSIS.

Abstract: One way to develop a system of academic information using applications Free Open Source (FOS) that are circulating. Academic information system developers need to determine the appropriate FOS used to develop academic information system based on the criteria required and reliability of FOS. One way to help decision-making can be used MADM models using AHP and TOPSIS. In this study, applying a comparative analysis of the two methods, the method of AHP and TOPSIS with analytical testing calculations used to compare the three-applications FOS Academic Information System, Campus Academic Information System (Siakad), Academic Information Systems Integrated (Sikadu), as well as SISFOKOL to develop academic information systems.

1 INTRODUCTION

Technological developments have an impact on university academic services. At first, the academic service is only done by hand using paper media and stationery (display devices), with the growing scale of academic service which means user can no longer do, many universities use Microsoft Office applications to perform academic services but each university institution has its own characteristics so that the necessary academic service system is unique academic information in accordance with the needs of each university. To develop an academic information system application do not require large funds to the presence of Free Open Source (FOS). FOS helping universities realize the management of information technology-based academic services without thinking about software procurement funds (Rousidis and Christodoulou, 2019), FOS can be developed and modified freely adapted to the needs.

It is necessary to pay more attention to determining FOS according to the needs of each university and its reliability because each FOS has advantages and disadvantages. In determining the most appropriate FOS needs and can reliably use the technique of decision-making methods Multiple Attribute Decision Making (MADM), including Simple Additive Weighting (SAW), Weight Product (WP), TOP-SIS, and AHP methods (Kazimieras Zavadskas et al., 2019), This study using AHP and TOPSIS later than the methods are superior and relevant to the research problems.

AHP is a multi-criterion that can perform decision-making process with many criteria (Terzi, 2019). AHP superiority compared to other MADM models are able to analyze simultaneously as well as integrated between quantitative and qualitative criteria (Distel, 2018). AHP can help facilitate decision-making by many criteria. Research using AHP previously been done in the manufacture and analysis of the rector election system by using AHP (Fitriastuti et al., 2019), Other studies of AHP has done research on the selection of open source digital library applications using AHP with three open source alternatives.

In addition to the AHP, TOPSIS can also perform multi-criteria decision-making (Distel, 2018) to provide a solution by comparing each alternative with the best and worst alternative (Fitriastuti et al., 2019). TOPSIS widely used on the grounds concept is simple, easy to understand computation, efficient, and have the ability to measure the relative performance of alternatives in the decision of a simple mathematical form (Distel, 2018). Research by TOPSIS method was made for selecting suppliers in the pharmaceutical distribution industry method approach (Putra and Sylvandinata, 2019).

The problem is how to find a better model of AHP or TOPSIS in decision making of academic information systems at Department of Informatics Engineering Universitas Janabadra. So, the goal is to produce the right solution in selecting the appropriate FOS and more relevant to know the method used in this case between the AHP and TOPSIS methods.

2 MANUSCRIPT PREPARATION

Following a decision support system theory MADM models used in this study:

2.1 Analytical Hierarchy Process (AHP)

Analytical Hierarchy Process (AHP) is a functional hierarchy to the main input of human perception. Method was developed to search for a rank (priority) of the various alternatives in solving a problem (Escolar et al., 2019). AHP in resolving problems with some design principles, which must be understood, such as (Maxwell, 2019); (1) Creating a hierarchy, (2) Assessment criteria and alternatives, (3) Synthesis of Priority (Setting priorities), and (4) Logical consistency.

2.2 AHP Steps

There are several steps in the completion of the AHP method, as follows (Gürbüz, 2019):

1. Defining the problem and determine the desired solution, then hierarchical structuring.

2. Prioritization; (a) the contribution size of each element to achieve the goal, (b) compiled by the relative level of interest of each element, (c) summing columns, (d) creating a new matrix by means of each element divided by the number of columns, (e) summing lines, (f) creating a new matrix with elements result the number of rows divided by the total sum. The results of the final division called Eigen Vector.

3. Logical consistency Consistency means two things: first that thought or similar objects are grouped according to homogeneity and relevance. The second meaning is that the consistency of the intensity of the relationships between ideas or objects based on a certain criterion to justify each other logically; (a) create new matrix by multiplying the initial matrix with Eigen Vector, (b) add up in rows, (c) for the sum with Eigen Vector, the division called Eigen Value, (d) Count the ways by; (i) add up by Eigen Value, (ii) the sum

is divided by the order, then the result is called a lambda max or t, (iii) calculate CI (Consistency Index), (iv) calculate CR (Consistency Ratio)

4. Rin is the Random Index. Random Index (RIN), also called Random Consistency (RC) (Gürbüz, 2019) during the CR value does not exceed 10%, or 0.10, the value given paired comparisons are considered consistent.

5. Priority calculate Alternatives There are two types of data on the alternative, namely the qualitative as well as quantitative data types. The calculating a priority of these two data types are different, the qualitative data is by comparing each alternative. Comparisons were by pairwise comparison matrix similar to determining the priority criteria in step number two above. Quantitative data on the priority type depends on the type of criteria (sub-criteria), namely, the cost (cost) and gain (benefit) ((Distel, 2018).

2.3 Stage Data Collection

Collecting data is through observation and literature study. The observations were to collect data and information, as well as exploring and comparing the system, interviews were conducted with the management of the department, a literature study is to understand the application well as understand the concept of the application of AHP and TOPSIS via the internet, papers, journals, and books that are relevant.

2.4 Preliminary Analysis Phase

Initial analyzes do an analysis of the criteria and the application of methods in selecting the FOS for the development of academic information systems (Uskov et al., 2017) . There are two application methods in this case is the method of AHP and TOPSIS. Then they will be compared to find more relevant method used to select the appropriate FOS.

2.5 Testing Phase

The testing phase is done by analyzing the comparative analysis with conformity to calculate the degree of conformity (Tki) on each method using the formula: -

$$Tk_i = \frac{Xi}{DataFADM(100\%)} \qquad (1)$$

Where Tki = Suitability, Xi = average scores of data methods. Looking Xi using the formula:

$$X_i = \frac{\Sigma DataAHPorTOPSI}{n} \qquad (2)$$

Concordance rate is measured by the percentage level at Table 1.

Table 1: Table Percentage level of concordance

The percentage rate of conformity	Category
31% - 45%	Unsatisfactory / no good
46% - 60%	Unsatisfactory / poor
61% - 75%	Quite satisfactory / good enough
76% - 85%	Satisfactory / good
86% -100%	Very satisfactory / good

3 RESULT AND DISCUSSION

The initial phase of the analysis is to describe the alternative open source applications are required selection criteria to give weight to the criteria in order of importance and needs. As an alternative application is given as follows; (1) Campus Academic Information System (Siakad), (2) Integrated Academic Information System (Sikadu), (3) SISFOKOL.

Six criteria were used here; features, technology, source code program, flexibility and support the developer. Each criterion is determined whether the nature of cost/benefits, costs mean less value the good, while the profits instead. On the criteria here, all categorized advantage. Furthermore, each criterion is weighted based on the results of the third exploration application, interview-related needs, and interview some expert programmers, further testing using AHP and TOPSIS.

3.1 Calculation Method of AHP

In the hierarchy there are six main criteria of Ease (Kem), Features (Fit), Source Code (Sourc), Flexibility (Fleks), as well as support the Developer and the Community (Duk).

Step 1. Develop a pairwise comparison matrix using the concept of Saaty intensity scale, as shown in Table 2.

Table 2: Pairwise Comparison Matrix

Criteria	Kem	Fit	Tek	sourc	reflex	kerchief
Kem	1	3	3	1	4	3
Fit	0.33	1	1	0.33	3	1
Tek	0.33	1	1	0.33	3	1
sourc	1	3	3	1	4	3
reflex	0.25	0.33	0.33	0.25	1	0.33
kerchief	0.33	1	1	0.33	3	1
total	3.24	9.33	9.33	3.24	18	9.33

Step 2. Normalization of each column (A') and calculating the average of each row (W).

a) Normalization of each column (A'), each entry matrix divided by the total number of columns.

b) Calculating the average of each row (W). The average of each row of the matrix entries and the results are expressed as a priority vector.

Step 3. Calculate the consistency index (CI): count (A) (W^t)

CR = 0.0162 / 1.24 = 0.0131

CR < 0.1, so consistent.

CR = 0.0162 / 1.24 = 0.0131 CR < 0.1, so consistent.

Step 5. Ranking of the calculation based on the weight of each criterion, do multiplication weighting each criterion to the weights of the level of interest among the criteria. The results can be seen in Table 3.

Table 3: Ranking of results tables

	Result	Rank
SISFOKOL	.2495	3
Sikadu	.3262	2
Siakad	.3514	1

3.2 Calculation Method of TOPSIS

Step 1. Determine the importance scale of each criterion (C1), features (C2), technology (C3), program source code (C4), flexibility (C5), developer and community support (C6), rated on a scale up to five and decision makers give preference to weight on the same scale. The results can be seen in Table 4.

Table 4: Scale the importance of each criterion

Alternative	Criteria					
	1	2	3	4	5	6
Siakad						
Sikadu						
SISFOKOL						

Step 2. Normalize matrix (R) decision.

Step 3. Calculation of weighted normalized matrix (Y), that is by multiplying the normalized matrix (R), by weighting preference (W)

Step 4. Determine the positive ideal solution (A+) and the ideal negative solution (A-)

Step 5. Determine the distance between the weighted values of each alternative to the ideal positive solution (Si+) and the ideal negative (Si-) solution.

Step 6. Calculate the proximity of each alternative to the ideal solution Analysis of AHP calculations and TOPSIS.

Criteria ranking is determined based on rules that have the highest weight value are in the first priority to be chosen and occupy the first rank. Sequential ranking starts from the criteria having the largest to the smallest weight value. The results of ranking with the AHP and TOPSIS methods can be seen in the following Table 5:

Table 5: AHP and TOPSIS ranking

Alternative	Weight value		AHP ranking	TOPSIS ranking
	AHP	TOPSIS		
Siakad	0,3514	0,7228	1	1
Sikadu	0,3262	0,3741	2	4
SISFOKOL	0,2495	0,5728	3	2

Based on the table above, an analysis is conducted to find out the relevant methods for the problem by calculating the level of suitability (Tki) of each method. To find out the results of the level of conformity (Tki), the first step is to find out the average value in each method. calculated using the following formula:

$$Xi_{AHP} = \frac{1,1005}{4} = 0,275125$$

$$Xi_{TOPSIS} = \frac{2,217}{4} = 0,53175 \quad (3)$$

4 CONCLUSIONS

Based on the results of a comparison analysis between the level of conformity (Tki) of AHP method and TOPSIS, both methods are in a very satisfying range in assisting decision making in the MADM model but for cases that use qualitative data and multicriteria AHP method is more suitable to use than TOPSIS. The ranking results using the AHP and TOPSIS methods are the same in rank 1 category, but different in the

next ranking. Siakad can be taken as FOS to develop academic information systems. The AHP method has a higher level of suitability than the TOPSIS method, so the use of the AHP method is more relevant to the problem and can be used as one of the decisionmaking models for the MADM application that best meets the criteria. This research still has deficiencies in terms of determining the weight of criteria and determining the level of importance because it is still based on the perceptions of decision makers obtained from interviews and some experts in their fields are not based on processing the results of the questionnaire.

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Recommendation of SAW "Simple Additive Weighting" Model Employee Acceptance Decision Support System with Analysis Regression

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Keywords: Decision Support System, Employee acceptance , Simple Additive Weighting and Regression

Abstract: Decision support system as a tool for decision makers that is integrated directly with computers provide useful information to help make structured and unstructured decisions. This study aims to implement the SAW (Simple Additive Weighting) Model to calculate the weights of the criteria that become benchmarks for the feasibility of prospective applicants in providing optimal solutions. The results of correlation and regression in building this application analysis for the sixth criteria used in the assessment of employee acceptance for each alternative candidate there are five criteria that can be recommended in the employee acceptance decision support system, with the result that the correlation criteria value for work experience is 0.300, Educational Level criteria 0.253, Psychological Test criteria 0.479, criteria for the Administrative Test is 0.723 and the criteria for the Interview Test 0.748 shows a sufficient and very high relationship, while for the Age criteria -0.112 for a weak relationship so it is not recommended.

1 INTRODUCTION

An institution or college is driven by humans who are trained and have certain skills and have experience. Human resources in an institution or college are very important things to support the progress and quality of institutions or universities in achieving their goals (Sinaga et al., 2016).

Employees are one of the resources used as a driving force in advancing a company(Umar et al., 2018). Employee acceptance selection is a very important factor for the smooth process in an institution or college to fill in a position that is classified as suitable criteria for occupying a position proposed by an institution or college (Sinaga et al., 2016). In accordance with the goals of institutions or universities, it is very necessary for the process of receiving human resources in a professional and accurate way to produce human resources that can support the quality and success of institutions or universities.

Problems encountered in employee recruitment are difficulties in determining standards that will be used to measure selection qualifications objectively(N, 2014). Difficulty in getting the right, honest and objective selector(Hidayat, 2015), and to determine applicants in accordance with specifications do not have a standardized decision system that can assess the feasibility of prospective job applicants in

accordance with the needs of the agency or university(Sinaga et al., 2016). Decision is a series of activities to choose an action in solving a problem. The act of choosing from an alternative faced based on facts and carried out through a systematic approach that can provide the best solution done by the leader is called decision making(Palasara, 2017).

The study entitled The Effect of Financial Performance on Stock Prices (Rinianty and Sukardi,) aims to develop theory and problem solving through systematic analysis. In managing data, the analysis used in this paper is descriptive, in the form of hypothesis testing using statistical tests, namely Statistical Product and Service Solution (SPSS).

Assessment of employee soft skills by applying four criteria has been discussed (Umar et al., 2018). These four criteria are communication skills, ability to work together, honesty, and interpersonal skills. Data analysis applies the Analytical Hierarchical Process (AHP) method, which allows mathematical calculations with various criteria. The results showed the value of the consistency ratio of 0.053 which means less than the value of the consistency ratio used in the AHP method that is 0.1, so the results of the calculation are valid, and can be used. This study resulted in the competency competency skills assessment required by the company as follows: 48% of Communication, 27% of Cooperation, 16% of Honesty, and

10% of Interpersonal. The results of this study prove that the AHP method can be used in the assessment of employee soft skills.

In a study of the best decision making system for employee selection using Analytic Hierarchy Process (Komalasari, 2020) shows clear differences in prioritization because there is data until the 4th digit is behind the comma still has the same numbers, which is ranked 2 and 3 with the same value - equal to 0.1040 and at rank 6 and 7 with a value equal to 0.0980.

This study implements the SAW (Simple Additive Weighting) Model to calculate the weights of the criteria that become benchmarks for the feasibility of applicants in providing optimal solutions and information as a tool for making employee acceptance decisions, and knowing the relationship between the criteria contained in the employees acceptance system using Correlation and Regression analysis.

2 METHODOLOGY

2.1 Research Mechanism

For the calculation of criteria with each weight that has been determined, this study was taken using the calculation of Simple Additive Weighting.

The SAW method can assist in the decision-making of a case, in a calculation that produces the greatest preference value that will be chosen as the best alternative. SAW method is more efficient because the time needed in the calculation is shorter (De Christin and Djamain, 2015).

The SAW method requires the process of normalizing the decision matrix (X) to a scale that can be compared with all available alternative ratings. Where determining the transformation value into a decision matrix (X) is a value from the results of the above match rating table made into a matrix form as follows:

$$\begin{bmatrix} x1 & x2 & x3 \\ x4 & x5 & x6 \\ x7 & x8 & x9 \end{bmatrix} \quad (1)$$

The formula for normalizing it (De Christin and Djamain, 2015) is as follows:

$$r_{ij} = \begin{cases} \frac{x_{ij}}{Maxx_{ij}} \\ \frac{Minx_{ij}}{x_{ij}} \end{cases}$$

Where r_{ij} is the normalized performance rating of the alternative A_i in the attribute C_j; i=1,2,...,m and j=1,2,...,n. The preference value for each alternative (V_i) the following.

$$v_i = \Sigma_{j=1}^{n} w_j r_{ij} \quad (2)$$

Larger V_i values indicate that alternatives A_i are more chosen.

Following is the flow diagram of the calculation using the SAW method, can be seen in figure 1 below.
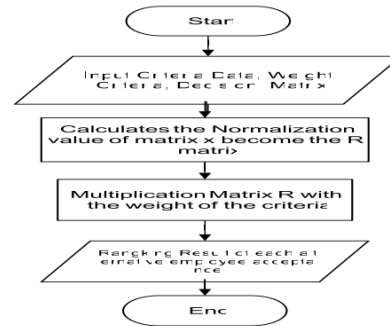
Figure 1: Flowchart for calculation of SAW method

2.2 System Requirements

In this study used 6 criteria symbolized by C, that is work experience (C1), education level (C2), age (C3), administrative test (C4), interview test (C5), and psychological test (C6). Making Alternative Data used in this employee acceptance system are prospective employees who submit applications. From several applicants who submitted applications, 12 alternative people were taken. Next is the determination of the weight of each criterion for each Alternative Value (Ai) in each Criteria (Ci) that has been determined. Each component of the criteria must be given a weight or value, according to the degree of importance, the weight value of the criteria component is obtained from the results of interviews related to which value is greater or smaller.

the importance of each criterion is shown in Figure 2, judged by weights 1 to 4, where weight 1 (KP) is less important, weight 2 (CP) is quite important, weight 3 (P) is important and weight 4 (SP) is very important shown in the following figure 2
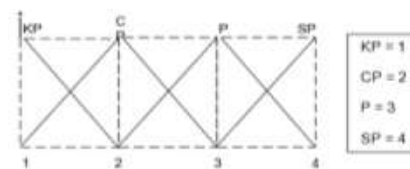
Figure 2: Weighted fuzzy numbers

In this study decision-making will be carried out using the Simple Additive Weighting (SAW) Model. Suppose the data used is as in Figure 3.

No	Alternative / Applicants	Criterias					
		C1	C2	C3	C4	C5	C6
1	A1	4	3	2	2	3	1
2	A2	2	1	4	3	2	3
3	A3	4	3	4	4	3	2
4	A4	1	3	4	2	2	1
5	A5	1	2	4	1	2	3
6	A6	2	3	3	2	4	4
7	A7	4	1	2	2	3	3
8	A8	4	4	3	3	2	1
9	A9	4	1	2	2	3	3
10	A10	4	2	3	3	2	1
11	A11	3	2	3	4	4	4
12	A12	3	2	2	4	3	4

Figure 3: Rating match alternatives and criteria.

Based on the alternative suitability rating table and the above criteria, an X decision matrix can be formed (Figure 4) as follows.

$$x = \begin{Bmatrix} 4 & 3 & 2 & 2 & 3 & 1 \\ 2 & 1 & 4 & 3 & 2 & 3 \\ 4 & 3 & 4 & 4 & 3 & 2 \\ 1 & 3 & 4 & 2 & 2 & 1 \\ 1 & 2 & 4 & 1 & 2 & 3 \\ 2 & 3 & 3 & 2 & 4 & 4 \\ 4 & 1 & 2 & 2 & 3 & 3 \\ 4 & 4 & 3 & 3 & 2 & 1 \\ 4 & 1 & 2 & 2 & 3 & 3 \\ 4 & 2 & 3 & 3 & 2 & 1 \\ 3 & 2 & 3 & 4 & 4 & 4 \\ 3 & 2 & 2 & 4 & 3 & 4 \end{Bmatrix}$$

Figure 4: Alternative match matrix and criteria

1) Normalizing the matrix X to be the matrix R based on equation

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{Max x_{ij}} \\ \dfrac{Min x_{ij}}{x_{ij}} \end{cases}$$

The results of normalization of the X matrix are obtained by the R matrix, presented in the following Figure 5:

$$R = \begin{Bmatrix} 1 & 0.75 & 0.5 & 2 & 3 & 1 \\ 0.5 & 0.25 & 1 & 3 & 2 & 3 \\ 1 & 0.75 & 1 & 4 & 3 & 2 \\ 0.25 & 0.75 & 1 & 2 & 2 & 1 \\ 0.25 & 0.5 & 1 & 1 & 2 & 3 \\ 0.5 & 0.75 & 3 & 2 & 4 & 4 \\ 1 & 0.25 & 2 & 2 & 3 & 3 \\ 1 & 1 & 3 & 3 & 2 & 1 \\ 1 & 0.25 & 2 & 2 & 3 & 3 \\ 1 & 0.5 & 3 & 3 & 2 & 1 \\ 0.75 & 0.5 & 3 & 4 & 4 & 4 \\ 0.75 & 0.5 & 2 & 4 & 3 & 4 \end{Bmatrix}$$

Figure 5: Matrix of normalization results

2) Perform ranking process by doing multiplication process using equation

$$v_i = \Sigma_{j=1}^{n} w_j r_{ij} \qquad (3)$$

The weight vector (W) that has been determined is: W = [3, 4, 3, 3, 4, 4]

V1 = (3)(1) + (4)(0.75) + (3)(0.5) + (3)(0.5) + (4)(0.75) + (4)(0.25) = 3 + 3 + 1.5 + 1.5 + 3 + 1 = 13

V2 = (3)(0.5) + (4)(0.25) + (3)(1) + (3)(0.75) + (4)(0.5) + (4)(0.75) = 1.5 + 1 + 3 + 2.25 + 2 + 3 = 12.75

V3 = (3)(1) + (4)(0.75) + (3)(1) + (3)(0.5) + (4)(0.5) + (4)(0.25) = 3 + 3 + 3 + 3 + 3 + 2 = 17

V4 = (3)(0.25) + (4)(0.75) + (3)(1) + (3)(0.5) + (4)(0.5) + (4)(0.25) = 0.75 + 3 + 3 + 1.5 + 2 + 1 = 11.25

V5 = (3)(0.25) + (4)(0.5) + (3)(1) + (3)(0.25) + (4)(0.5) + (4)(0.75) = 0.75 + 2 + 3 + 0.75 + 2 + 3 = 11.5

V6 = (3)(0.5) + (4)(0.75) + (3)(0.75) + (3)(0.5) + (4)(1) + (4)(1) = 1.5 + 3 + 2.25 + 1.5 + 4 + 4 = 16.25

V7 = (3)(1) + (4)(0.25) + (3)(0.5) + (3)(0.5) + (4)(0.75) + (4)(0.75) = 3 + 1 + 1.5 + 1.5 + 3 + 3 = 13

V8 = (3)(1) + (4)(1) + (3)(0.75) + (3)(0.75) + (4)(0.5) + (4)(0.25) = 3 + 4 + 2.25 + 2.25 + 2 + 1 = 14.5

V9 = (3)(1) + (4)(0.25) + (3)(0.5) + (3)(0.5) + (4)(0.75) + (4)(0.75) = 3 + 1 + 1.5 + 1.5 + 3 + 3 = 13

V10 = (3)(1) + (4)(0.5) + (3)(0.75) + (3)(0.75) + (4)(0.5) + (4)(0.25) = 3 + 2 + 2.25 + 2.25 + 2 + 1 = 12.5

V11 = (3)(0.75) + (4)(0.5) + (3)(0.75) + (3)(1) + (4)(1) + (4)(1) = 2.25 + 2 + 2.25 + 3 + 4 + 4 = 17.5

V12 = (3)(0.75) + (4)(0.5) + (3)(0.5) + (3)(1) + (4)(0.75) + (4)(1) = 2.25 + 2 + 1.5 + 3 + 3 + 4 = 15.75

3) From the calculation of the final value, the biggest value is found in V11 so that alternative V11 is the alternative chosen as the best alternative. The following ranking for prospective applicants can be seen in Figure 6 and Figure 7 below.

Figure 6: Ranking for prospective applicants.
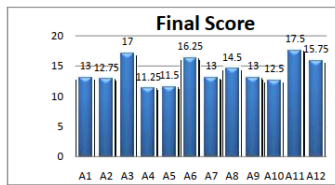
Figure 7: Chart ranking prospective applicants

From the graph in Figure 7 above shows the first rank 17.5 for A11 and second rank 17 for A3 as a recommendation for hiring employees

3 RESULTS AND DISCUSSION

3.1 Test System for Users

In this study, there are 4 step in the trial Implementation of the SAW Method and Regression in the Employee Acceptance decision support system, as follows:

1. The technique used in this trial uses a questionnaire

2. The trial implementation of the SAW Method and Regression in the Employee Acceptance System was tested at the Janabadra University Campus

3. Determine the average user rating of the system with a Likert scale

4. Calculate the percentage of user ratings of the system.

(a) Determining the answer score, is the answer value that will be given by the respondent (Sugiyono, 2017), the answer score can be seen in Figure 8 below:

Scale Answer	Value
Very Good	4
Good	3
Pretty good	2
Not Good	1

Figure 8: Score Answers.

(b) Calculating the ideal score, is a score used to determine the rating scale and the number of all answers, (Sugiyono, 2017). To calculate the number of ideal scores (criteria) of all items, use the following formula:

$$CriteriumScore = Scale\,value\,x$$
$$Number\,of\,respondents \quad (4)$$

The ideal score results are presented in Figure 9 below:

Ideal score	Value
4 x 2 = 8	4
3 x 2 = 6	3
2 x 2 = 4	2
1 x 2 = 2	1

Figure 9: Ideal score (Kriterium).

(c) Calculating the Scale, the scores that have been obtained are then entered into the rating scale presented in Figure 10 below:

Value Answer	Scale
7-8	Very Good
5-6	Good
3-5	Pretty good
0-2	Not Good

Figure 10: Skor rating scale.

NO	Question	Very Good	Good	Pretty Good	Not Good
1	Is this system easy to operate ?	1 %			
2	Are the instructions for use easy to understand ?	0.87%			
3	Is this system able to help staffing and foundations as a result of employee recruitment recommendations ?	0.87%			
4	Is the use of language in this system easy to understand?	0.87%			
5	Does this system have an attractive appearance ?		0.75%		
6	Does this system have easy navigation in switching pages?	1%			

Figure 11: User trials are presented.
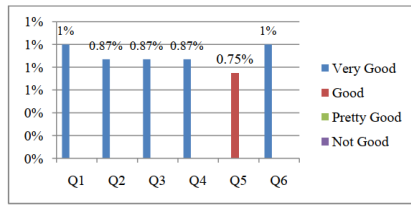
Figure 12: Percentage of System Assessment

From the graph in Figure 12 above shows Q1 1% average value for very good, Q2 0.87% average value, Q3 average value 0.87%, Q4 average value 0.87%, Q5 average value average average 0.75% and Q6 average value of the average value of 1% of the results of the quiz assessment of users.

3.2 Results of Correlation and Regression Analysis

1. Correlation Analysis of Relationships between Criteria

   Correlation is a statistical method that is used to test the presence of relationships and the direction of relationships or two variables, (Ary,).

   The results of data processing (see below) to see the relationship between criteria for employee acceptance using SPSS 17 software, can be seen in Figure 13 below:

Figure 13: Correlation values between criteria

   Correlation (relationship) Work Experience to Levels of Education, Age, Administrative Tests, Interview Tests and Psychological Tests. There are four criteria that have a Sig (Significant)> 0.05 value which indicates a very high relationship with Work Experience namely Education, Age, Administrative Tests, Interview Tests, Psychotest Tests while Age has a low relationship with Work Experience because of the Sig (Significant) < 0.05.

2. Regression Analysis Based on the results of data processing from each criterion as shown in figure

8, a regression (R) value of 1,000 is obtained. This value (R) shows that the influence between independent variables (Work Experience, Level of Education, Age, Administrative Test, Interview Test, Psychological Test) with total dependent variable (overall value) has a positive nature and has a very strong relationship, because correlation value of 1,000. (Ary,) And the coefficient of determination (R2 Square) is 1,000. This indicates that the overall criteria greatly affect employee acceptance.

Figure 14: Results of Data Processing Criteria for Regression analysis

4 CONCLUSIONS

From the research that has been done, it can be concluded as explained below:

1. Decision support system application for employee acceptance method of Simple Additive Weighting (SAW) and Regression that is built can help in evaluating according to predetermined criteria, so that there is no exact final value.

2. Based on the results of regression analysis for the criteria used in building this application has an R-sqaure value of 1,000, it can be recommended in the employee acceptance decision support system where the criteria have a very high relationship.

3. Correlation for the sixth criteria used in the assessment of employee acceptance for each alternative candidate there are five criteria that can be recommended in the employee acceptance decision support system, with the result that the correlation criterion value for work experience is 0.300, Educational Level criteria 0.253, Psychological Test criteria 0.479, criteria for the Administrative Test is 0.723 and the Criteria for the Interview Test 0.748 shows a sufficient and very high relationship, while for the age criteria -0.112 for a weak relationship so it is not recommended.

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Assessing the Potential of Tambakboyo Retention Basin for Raw Water Supply in the City of Yogyakarta Indonesia

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Keywords: Water resources, retention basin, water potential.

Abstract: This paper presents an assessment of the potential of Tambakboyo basin as one of the potential new water sources due to the water shortage in some areas of the city of Yogyakarta. It is a retention basin located in the Sleman Regency, Special Province of Yogyakarta, Indonesia. The basin has overflow elevation of +147,00 m and retrieval pipe elevation of +141,00 m. This assessment includes an analysis of the inflow, rain fall on the surface of the reservoir, outflow for water requirements, water loss from evaporation and seepage. By using the scales of water balance and simulation of water retrieval, we are able to determine water potential of the basin for clean water.

1 INTRODUCTION

Some areas in Yogyakarta City have experienced water crisis. The region consists of 5 (five) subdistricts, namely District Gondokusuman, Mergangsan, Mantrijeron, Jetis and Umbulharjo. To overcome the problem, water sources that can be utilized for water daily usage should be reduced.

The increasing demand for water causes some areas in Yogyakarta to experience water shortages. These short comings can be met by utilizing the potential of existing water resources. In Kabupaten Sleman there is a potential source of water that is likely to be used to meet water shortages. The source is Embung Tambakboyo which until now has not been utilized up to its potential. In addition to the overflow, the embung location is also higher than areas that require water, making it possible to stream the water using gravity.

Embung Tambakboyo is one of water retention basin that was built from 2003 until 2008 in Tambakboyo River upstream or in the meeting between Klanduan River and the downstream of Sembung River. The embung location is in Condongcatur Village, Depok District, Sleman Regency, Special Region of Yogyakarta. According to the interviews with local residents around the embung, in the dry season Tambakboyo Embung pond is always fully charged and water always overflowed through the spillway. The condi-tion gives an illustration that Embung Tambakboyo has water potential that can be utilized for raw water usage (Pengairan, 1986) (Kamiana, 2011).

For that we need a study of how much potential water Embung Tambakboyo can be utilized to meet the lack of water in the city of Yogyakarta. The study will be conducted by simulating water retrieval based on the water balance of embung which is the relationship between inflow, outflow and the number of containers (Gustian, 2014).

2 LITERATURE REVIEW

2.1 Water Resources Development

According to (Triatmodjo and Terapan, 2008), water resources development can be grouped into two activities, namely water utilization and water management (Figure 1). Water utilization activities include the provision of water for irrigation water needs,households, offices, hospitals, education, houses of worship, hotels, river maintenance/raiding, fisheries, livestock, industry and so on. These various needs can be served by available water which can be either surface water or ground water with certain reliability. Water regulation activities include flood control, drainage and waste management. These activities are conducted to

overcome the existence of excessive water in the form of floods that can cause harm to the community.
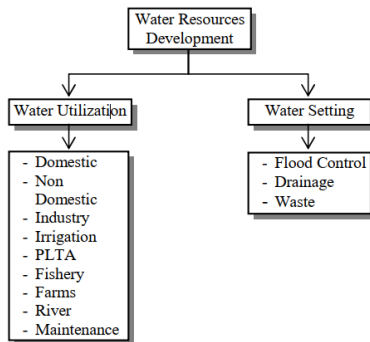
Figure 1: Water Resources Development Activities.

The relationship between the two activities is in the rainy season the water will be abundant so that should be thrown into the sea so as not to cause flood. But in the dry season the availability of water is significantly reduced, making itdifficult to meet the needs of water that is relatively fixed and even increases along with the increase of population. To that end, it takes facilities such as embung to accommodate excess water in the rainy season and use it in the dry season.

Water utilization includes the study of water availability and water requirements as well as planning facilities/buildings that can meet these needs from available water availability. For that we need to know the amount of water available and the current water needs and predictions of future needs. From both analysis, we can calculate water balance in a watershed, by comparing the availability and the need for water.

2.2 Water Balance

Embung is a water retention structure that serves to store water while at the time of excess water and released in the event of water shortage. The water balance of the embung is based on the continuity equation which is the relationship between inlet water, outlet water and the number of containers. Figure 2 shows the water balance in the embung, which can be mathematically expressed in terms of the following equation (Asdak, 2018), (Brotowiryatmo, 1993)(Hadisusanto, 2010):

$$Q + P = O + E + I + \Delta S \qquad (1)$$

where Q is inlow from the river, rainfall that falls on the surface of the reservoir, O is outflow for irrigation water needs; raw water and so on, E is evaporated, I is water loss from seepage, and ΔS is the water reservoir in the reservoir.
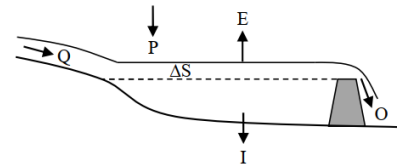
Figure 2: Embung's water balance.

3 METHODOLOGY

3.1 Location

The research was conducted at Embung Tambakboyo in Tambak Bayan River, Condongcatur Village, Depok District, Sleman Regency, Yogyakarta Special Region as presented in Figure 3.
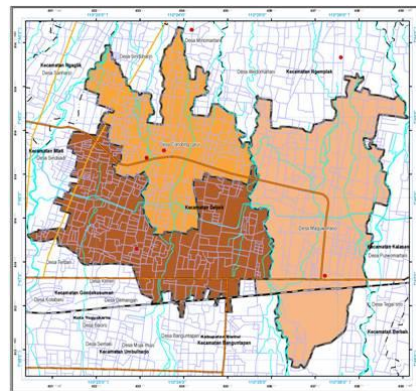
Figure 3: The location of Embung Tambakboyo.

3.2 Inflow

The inflow water discharges consists of the flow of streams and rain falling on the surface of the embung. River flow discharge in question is the result of Mock simulation that has been calibrated with debit data . While the rain falling on the surface of the embung multiplied by the surface area of the embung.

3.3 Outflow

The outflow water discharges consist of water requirements for various purposes (water requirements for irrigation and fisheries), and water loss from evaporation and seepage.

3.4 Water Balance Simulation of Water Retrieval

The availability of Tambakboyo water pond comes from the inflow and outflow. Analysis of water availability is estimated based on the water balance of the reservoir calculated using equation (1), then the simulation of water harvesting was conducted to determine the maximum limit of water retention ponds.

4 RESULT AND DISCUSSION

4.1 Inflow

The inflow of Embung Tambakboyo consists of 90% (Q90) mainstay discharge of Mock simulation result and 90% rainfall (R90) result of area rainfall analysis multiplied by embung pond area of 60,542.4 m2 as presented in Figure 4. The table shows that the largest inflow was in February, which was 1989.29 lt/sec while the smallest inflow was in December, which was 36.12 lt/sec.

Month	Q90 (lt/sec)	R90 x pond area (lt/sec)	Inflow (lt/sec)
January	1522.93	10.70	1533.63
February	1978.06	11.23	1989.29
March	1204.29	6.21	1210.50
April	557.40	2.00	559.40
May	563.73	2.67	566.39
June	315.78	0.08	315.85
July	213.91	0.00	213.91
August	149.74	0.00	149.74
September	108.31	0.00	108.31
October	73.37	0.00	73.37
November	53.07	0.00	53.07
December	35.95	0.16	36.12

Figure 4: Inflow (Q + P).

4.2 Water Loss due to Evaporation

Water loss due to evaporation above the water surface of the embung is calculated from the evaporation value of modified Penman method multiplied by the surface area of the pond. In full conditions, the water level elevation is at + 147.00 m elevation with a surface area of 60,542.4 m2. The results of Embung Tambakboyo evaporation calculations are presented in Figure 5.

The table shows that the largest water loss due to evaporation was in October, which was 3.37 lt/sec while the smallest water loss due to evaporation was in July, which was 2.49 lt/sec.

Month	Evaporation (lt/sec)
January	2.62
February	2.69
March	2.68
April	2.79
May	2.47
June	2.45
July	2.49
August	2.99
September	3.28
October	3.37
November	2.94
December	2.52

Figure 5: The evaporation of Embung Tambakboyo.

4.3 Water Loss from Seepage (I)

The flow-net projection (Hardiyatmo, 2012), resulting in 8 (eight) flow lines (Nf) and 30 (thirty) equipotential lines (Nd). If the water level is at + 147.00 m elevation, there is a high energy difference (h) between the beginning and end (9,89 m) equipotential energy line (Nd). From the depiction presented in Figure 6, water loss from seepage that occurred in Embung Tambakboyo is 0.073 lt/sec, the full calculation is presented in Figure 7. The table shows that the largest water loss from seepage (I) is at + 147.00 m elevation, which was 0.075 lt/sec while the smallest water loss from seepage (I) is at + 141.00 m elevation, which was 0.028 lt/sec.
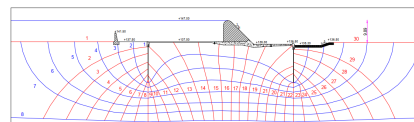
Figure 6: Flownet of Embung Tambakboyo.

Elv.	k=1.1x10⁻⁴ (cm/sec)	k=1.1x10⁻⁶ (m/sec)	h (m)	Nf	Nd	n (m)	q (m³/sec/m)	q (lt/sec/m)	Q (lt/sec)
147	0.00011	0.0000011	9.5	8	28	25	0.0000030	0.003	0.075
146	0.00011	0.0000011	8.5	8	28	25	0.0000027	0.003	0.067
145	0.00011	0.0000011	7.5	8	28	25	0.0000024	0.002	0.059
144	0.00011	0.0000011	6.5	8	28	25	0.0000020	0.002	0.051
143	0.00011	0.0000011	5.5	8	28	25	0.0000017	0.002	0.043
142	0.00011	0.0000011	4.5	8	28	25	0.0000014	0.001	0.035
141	0.00011	0.0000011	3.5	8	28	25	0.0000011	0.001	0.028

Figure 7: Calculating the seepage of Embung Tambakboyo.

4.4 Water Balance and Simulation of Water Retrieval

The water scale of Embung Tambakboyo Watershed is the ratio between the inflow and the outflow. The difference from the comparison provides information

on water availability from January to December. In the case of a water surplus (+) or water deficit (-), the pond retention pond remains fully charged at 387,947.47 m3 at +147.00 m elevation. The water balance of the Tambakboyo Embung Watershed is presented in Figure 8.

Elv.	k=1.1x10⁻⁴ (cm/sec)	k=1.1x10⁻⁶ (m/sec)	h (m)	Nf	Nd	n (m)	q (m³/sec/m)	(lt/sec/m)	Q (lt/sec)
147	0.00011	0.0000011	9.5	8	28	25	0.0000030	0.003	0.075
146	0.00011	0.0000011	8.5	8	28	25	0.0000027	0.003	0.067
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143	0.00011	0.0000011	5.5	8	28	25	0.0000017	0.002	0.043
142	0.00011	0.0000011	4.5	8	28	25	0.0000014	0.001	0.035
141	0.00011	0.0000011	3.5	8	28	25	0.0000011	0.001	0.028

Figure 8: Water balance of Embung Tambakboyo.

In the case of surplus water (excess water), the fulfillment of water needs for various purposes (outflow) using the inflow of water (inflow). If there is still any residual from the inflow, the water is considered to be melted.

In the state of water deficit (lack of water), the fulfillment of water needs for various purposes (outflow) using water reservoir embung. This situation resulted in decreasing embung volume and decreasing of surface water level. Change of embung water storage is calculated based on water balance of embung.

In Embung Tambakboyo at the rear of the drain door, there is a 16-inch galvanized tube at + 141.00 m elevation. The pipe is fitted with the purpose can be utilized if there is a plan of utilization of Tambakboyo water pond for raw water.

Based on the water balance of the embung, the volume of the containment and the presence of the pipe, a simulation of water harvesting to determine the maximum limit of water retention ponds from elevation +147,00 m to elevation + 141,00 m. The simulation uses alternate picking, 10 lt/sec, 20 lt/sec, 30 lt/sec, 40 lt/sec, 45 lt/sec and 48 lt/sec. The calculation of the complete water-taking simulation is presented in Figure 9.
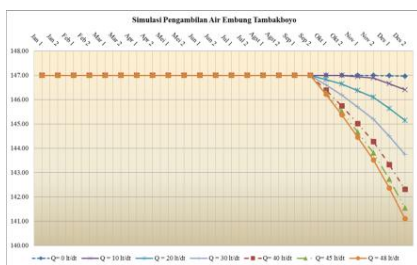
Figure 9: Graphical simulations of water retrieval at Embung Tambakboyo.

Figure 9 provides information on the influence of each of the water-taking alternatives. The information will be explained as follows:

1. Take water of discharge 0 lt/sec The utilization of the catchment water occurred in December when

Embung Tambakboyo was ina state of water deviation. When uses 0 liters/second of water retrieval, leaving a volume of 385,928.30 m3 of contained water at an elevation of + 146.97 m.

2. Take water of discharge 10 lt/sec The utilization of shelter water occurs from November to December at the time of Embung Tambakboyo in a state of water deviation. When a 10 liters/second water discharge is used, it will leave the volume of water in the reservoir 352,676.69 m3 at elevation + 146.41 m.

3. Take water of discharge 20 lt/sec The utilization of shelter water occurs from October to December when Embung Tambakboyo is in a state of water deviation. When a 20 liters/second liquefaction discharge is used, it will leave a water volume in the reservoir of 278,698.03 m3 at an elevation of + 145.15 m.

4. Take water of discharge 30 lt/sec The utilization of shelter water occurs from October to December when Embung Tambakboyo is in a state of water devisit. When a 30 liters/second water discharge is used, the volume of water in the container will be 199.210.03 m3 at elevation + 143,74 m.

5. Take water of discharge 40 lt/sec The utilization of shelter water occurs from October to December when Embung Tambakboyo is in a state of water deviation. When a 40 liters/second water discharge is used, it will leave a water volume in container of 119.722.03 m3 at elevation + 142.31 m.

6. Take water of discharge 45 lt/sec The utilization of shelter water occurs from October to December when Embung Tambakboyo is in a state of water deviation. When a 45 lt/sec water discharge is used, it will leave a volume of 79,978.03 m3 of water in storage at + 141.54 m elevation.

7. Take water of discharge 48 lt/sec The utilization of shelter water occurs from October to December when Embung Tambakboyo is in a state of water deviation. When a water harvesting rate of 48 lt/dt is used, it will leave a volume of water in the reservoir of 56,131.63 m3 at elevation + 141.09 m.

5 CONCLUSIONS

1. Embung Tambakboyo is a very strategic water source that can be used to help overcome the lack of water in some areas in Yogyakarta city. This is because the location is higher than the area in the city of Yogyakarta that requires the water.

2. By utilizing the volume of the embung embankment to reach the dead storage elevation (+141.00), then dry season with 90% reliability, the water in Tambakboyo embung can be collected by 48 lt/sec without disrupting the utilization of exsisting water, such as for Irrigation and fish ponds.

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Juridical Review of Land Dispute Decisions in the Administrative Court of Yogyakarta

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Abstract: The results showed that land disputes handled by the Yogyakarta State Administrative Court, 11 from 12 lawsuits, when it is viewed from the subjects (Plaintiffs and Defendants), the one who sued were individuals and only one is a Private Legal Entity, while the defendant is the Head of the Land Office and Village Chief. Most of the objects of the dispute are the Land Certificates , the Decree of Giving Rights and the silence of the officials (negative fictitious). This negative fictitious dispute object no longer exists after the Act No. 30 of 2014, because the provisions regarding negative fiction have been changed to positive fictitious provisions. However, because fictitious positive State Administrative decisions are relatively less published than negative fictions, even positive fictional claims to the State Administrative Court are less frequent. Until this research was conducted, there was no land suit that consisted of Positive Fictitious decisions that entered the Yogyakarta Administrative Court. The basis of the land dispute lawsuit at the Yogyakarta State Administrative Court is generally because the Plaintiff feels aggrieved because of the object of material disability, formal disability, and a violation of the Principles of Good Governance. The form of judges' decisions in land disputes at State Administrative Court is Court is mostly "NO" (Niet OnvarkelijkVerklaard, which is 6 cases in 12 cases. This happened because the lawsuit registered was often made in such a way by the Advocates, as if it should be examined up to the point of the case. After examining the subject matter, through verification and examination of witnesses, it was discovered that the exception was the object of the dispute.

1 INTRODUCTION

According to the Ombudsman member for Agrarian and Agriculture, Alamsyah Saragih, (kompas.com, 2018) community reports related to land are included in the category of the five highest public reports. Complaints related to land reached 14 (fourteen) percent of all public reports received by the Ombudsman. Of the total reports related to the land, 23 percent are land conflicts or disputes.

It is undeniable that land disputes, judging from the juridical aspect alone, are not simple solutions. In a case, it often involves several agencies, which are directly or indirectly related to the problem or dispute. Need the same concept and perception to produce a solid and fair solution for those who demand justice. Without intending to generalize, it appears that an understanding of the concepts and perceptions underlying the resolution of land disputes in Indonesia is still very deficient, which is disadvantageous to justice seekers. (Istijab, 2018) In fact, according to S.F.Marbun in (Syaha, 2016), philosophically the

purpose of establishing a State Administrative Court (PTUN) is to provide protection for individual rights and community rights, so that accord, balance and harmony is achieved between individual interests and the interests of the community or the public interest.

According to Aju Putrijanti (Putrijanti and Leonard, 2019), the role of the State Administrative Court is increasingly important to enforce the justice function which is carried out together with the supervisory function. Supervision of the running of the government needs to be done and improved, so that it can realize good governance. The supervision function by State Administrative Court is important to guarantee the protection and fulfillment of the rights as citizens, and the enforcement of state administrative law within the legal state framework. Administrative law enforcement in several fields does not seem to work according to the existing conditions.

Like disputes in other fields, there are two ways of resolving land disputes that are common in Indonesia, namely through nonlitigation channels and litigation channels. How the competence of the Court, es-

pecially the State Administrative Court, in handling land disputes is still unclear to the public, so that land claims that are registered with the State Administrative Court are forced to be unacceptable because of the plaintiff's ignorance of the competence of the State Administrative Court in handling land cases, so also happened in the Yogyakarta Administrative Court.

Based on this background, the problem in this research is a land dispute handled by the Yogyakarta State Administrative Court, the basis of the claim of the plaintiffs in a land dispute at the Yogyakarta State Administrative Court, as well as a judge's decision in resolving land disputes at the Yogyakarta State Administrative Court.

2 METHOD

The research was conducted by having normative legal research with a legal case study approach in the form of a State Administrative Court Decision regarding land disputes. The research data was obtained by reviewing the decisions of the State Administrative Court, also supported by data from interviews with Yogyakarta State Administrative Court Judges and various laws and regulations and other legal material relating to land disputes and the State administrative judicature. The data obtained were analyzed using a qualitative descriptive method to obtain a clear picture relating to land disputes in the Yogyakarta State Administrative Court.

3 DISCUSSION

3.1 Land Disputes Handled by the Yogyakarta State Administrative Court

Based on the results of the study, it was obtained data from the research object in the form of an incraacht decision that has permanent legal force and has entered the legal archives, for the period 1 January 2014 to 31 December 2018 there were a number of 12 land dispute decisions. In 2014 there were 4 (four) disputes, in 2015 there were 3 (three) disputes, in 2017 there were 4 (four) disputes, whereas in 2018 there were 1 (one) dispute that had been decided by the Yogyakarta State Administrative Court. The location of the 12 (twelve) disputes included: Yogyakarta City 5 (five) disputes, 4 (four) disputes occurred in Sleman Regency, 2 (two) disputes occurred in Bantul Re-

gency, 1 (one) dispute occurred in Gunungkidul Regency.

Land disputes handled by the Yogyakarta State Administrative Court are divided into 2 (two), namely from the side of the Subject of the Dispute and the Object of the dispute.

Referring from the subject of land disputes in Yogyakarta Administrative Court which became the plaintiffs, most (11 of 12 lawsuits) are individual or person, only 1 (one) plaintiff is a legal entity, namely PT. Papua Regional Development Bank. Even though the plaintiff is an individual, there are a number of lawsuits with more than one plaintiff. While most of the defendants were the Head of the Land Office, namely the Yogyakarta City Land Office 5 claims, the Sleman District Land Office, 3 (three) claims of the Head Office of Bantul Regency 2 (two) claims, the Head of the Land Office of Gunungkidul Regency, 2 (two) two) claim and Head of Caturtunggal Village Besides the main defendant, in several cases there was also defendant II, as Defendants of the Reconvention.

Based on the object, land disputes that enter the Yogyakarta State Administrative Court include:

a. Certificate of Land Rights, either in the form of a Right of Ownership Certificate, Right to Build (HGB), Right to Use and Management Right. The land certificate which is part of the State Administration Decree on the other hand is also an acknowledgment of the rights of the state to citizens regarding ownership of land, sothere is also a civil law dimension. It can clearly be said that the certificate in this case stand in two legal environments namely the State Administrative Law and Civil Law. Therefore, if there is a dispute over the land certificate, the authority to adjudicate can be carried out by the Administrative Court and the General Court, depending on the absolute authority of each court in accordance with the applicable laws and regulations.

b. Other decisions relating to the granting of land rights issued by State Administration Officers in the ranks of the National Land Agency (BPN), namely:

1) Letter of the Head of the Sleman Regency Land Office concerning Termination of Letter C Land Conversion because there is already a Certificate of Using Rights (dispute No.18/G/2017/PTUN.YK)

2) Letter of the Head of the Republic of Indonesia National Land Agency concerning House / Land Sales and Conferral of Management Rights.(dispute No.01/G/2018/PTUN.YK)

3) Decree of the Head of the Land Office

District. Sleman regarding Application for Issuance of Mortgage Certificates (dispute No.24/G/2017/PTUN.YK

c. The Silence act from State Administrative Court Officials outside the National Land Agency ranks, namely:

1) The silent act of the Head of the Caturtunggal Village to the request for a sign of supporting evidence for the Land Conversion Letter C. The plaintiff in this case wanted to carry out his Letter C Land Conversion, and then submitted a request to the Defendant to sign the supporting evidence. However, the Defendant responded by ignoring the request for several months. The Plaintiff felt disadvantaged because of being obstructed in his Letter C Land Conversion process. (Dispute Number 01 / G / 2014 / PTUN.YK)

2) The silent act towards the request to cancel the write-off of the Plaintiff's name Revocation of the Plaintiff's name and replaced with the name of another person in the Plaintiff's Title Certificate is deemed a procedural defect. The Plaintiff submitted a request to the Defendant to cancel the write-off, but the Defendant responded with a silence for months. (Dispute Number 09 / G / 2014 / PTUN.YK)

The two disputes are similar because they both have a negative fictitious object of dispute (regulated in Article 3 UUNo. 5 of 1986 concerning Peratun), and occurred before the enactment of Law No. 30 of 2014 concerning Government Administration. This negative fictitious dispute object no longer exists after the Act No. 30 of 2014, because the provisions regarding negative fiction have been changed to positive fictitious provisions. However, because fictitious positive State Administrative decisions are relatively less published than negative fictions, even positive fictional claims to the State Administrative Court are less frequent. This is a benefit of the enactment of Law No. 30 of 2014 because before that, the lawsuit against the decision of a negative fictional State Administrative Court dominated the disputes in the State Administrative Court, not least in the Yogyakarta State Administrative Court.

After the enactment of Law Number 30 Year 2014 Regarding Government Administration, the authority of the Administrative Court no longer hears a Negative Fictitious decision, but a Positive Fictitious Decision. The authority of Administrative Court was expanded, not only to adjudicate th State Administration dispute which object was in written State Administration decision. The authority of PTUN includes:

a. Assess the positive fictive TUN decision. If there is a request from the community members to the TUN official to issue a TUN decision, but that has not been implemented until a certain period of time has passed, then the TUN decision is deemed to have granted the request.

b. Assess the actual actions or actions taken by government officials;

c. Assess the TUN decision or actions of government officials in the executive, judicial, legislative and other state administration circles;

d. Assess the abuse of authority by government officials;

e. Assess general government officials' decisions. (Putrijanti, 2015)

Article 47 of Law No. 5 of 1986 concerning State Administrative Court states that the court has the duty and authority to examine, decide upon and resolve state administrative disputes. The discussion regarding the authority possessed is closely related to the object of the dispute that must be examined, decided upon and resolved. The object of the dispute examined is the written stipulation issued by the State Administration Agency or Officer which contains state administrative legal actions that are concrete, individual, final and have legal consequences for a person or a legal entity. In Article 21 paragraph (1) of Law Number 30 Year 2014 Regarding Government Administration, it states that the court has the authority to accept, examine and decide whether there is an element of abuse of authority by government officials. The formulation of the contents of the two articles is different, which may arise with the thought that: one, the authority of concerning State Administrative Court becomes broader, not merely examining, deciding and resolving state administrative disputes, but also assessing whether or not there is an element of abuse of authority by Government Officials. Second, that the Court's decision regarding whether or not there is abuse of authority can be appealed to the State Administrative High Court whose decision is final and binding. Both of these things are an extension of the authority of concerning State Administrative Court, that is, not only the number of the administrative authorities, but also the settlement of state administrative disputes only. (SANTOSO and SADJIJONO, 2018).

Related to the positive fictitious decision/verdict (acceptance) as the object of government disputes in the competence of the State Administrative Court to test the government's silence when carrying out duties and functions based on authority norms can be justified according to the law or contrary to the laws and

regulations, general basis of good governance and the principle of good governance. (Setiawan and Hadiatmodjo,)

Until this research was conducted, there was no land suit that consisted of Positive Fictitious decisions that entered the Yogyakarta Administrative Court.

3.2 Basic Lawsuits to the State Administrative Court

Regarding the reasons that are commonly used as the basis for filing a State Administration lawsuit is regulated in Article 53 paragraph (2) of the Law on Administrative Law of the State, namely:

a. The State Administration decision sued is contrary to the applicable laws and regulations, if:

1) Contrary to the provisions in the laws and regulations which are procedural / formal in nature,

2) Contrary to the provisions in the laws and regulations that are substantial / material,

3) Issued by unauthorized State Administration official.

b. The State Administration Decree sued contravenes the general principles of good governance.

The legal procedure aspect is one of the important requirements that must be fulfilled by a decision or decree issued by a state administration agency or official. In Article 53 paragraph (2) a, Law no. 5 of 1986 concerning the Judicial System of State Administration as amended by Law No. 9 of 2004, one of the reasons that can be used in a lawsuit is that the state administration's decision is contrary to the applicable laws and regulations. In the explanation of the article, it is determined that a state administrative decision can be considered contrary to the applicable laws and regulations if the person concerned (the decision) contradicts the provisions in the "procedural" laws and regulations. Therefore, the legal procedure aspect is one of the basis for a state administrative court decision to cancel a certificate of land rights because the state administrative body or official has made a legal act issuing a decision or stipulation due to an error in the nature of "legal procedure" in its issuance, it means that the decision of the state administration body or official is in conflict with applicable laws. With the discovery of a procedural error, the court's rationale in its decision to declare "null" (nietig) the decision.(Wahyunadi, 2016)

Besides the procedural aspects, a decision must also fulfill the material aspects. Although the demands are in principle always the same, the basis of the lawsuit certainly varies depending on what and how the case is and the object of the dispute. Therefore, they must look into the documents of the Lawsuit one by one, the contents of which are also written in the copy of the decision. However, there are similarities in all the grounds of the lawsuit, namely 'because the Plaintiff feels that his interests were impaired by the State Administration Decree issued by the Defendant'

If it is viewed from the grounds of a land suit filed with State Administrative Court of Yogyakarta, it is mostly related to the issuance of certificates and requests for revocation of certificates, on various grounds: the defendant exceeds authority, the data in the certificate issued is legally flawed due to error in persona, because the head of the land office is inaccurate in listing rights subjects, the defendant violated the General Principles of Good Governance (AAUPB) especially the principle of expediency, legal certainty and the principle of accuracy. Besides that, the lawsuit that entered PTUN was also based on the silence of the defendant. Silence as the basis of a lawsuit can be seen in Dispute Number 01 / G / 2014 / PTUN.YK and Dispute Number 09 / G / 2014 / PTUN.YK

Dispute Number 01 / G / 2014 / PTUN.YK. The silent act of the Head of the Caturtunggal Village to the request for a sign of supporting evidence for the Land Conversion Letter C. The plaintiff in this case wanted to carry out his Letter C Land Conversion, and then submitted a request to the Defendant to sign the supporting evidence. However, the Defendant responded by ignoring the request for several months. The Plaintiff felt disadvantaged because of being obstructed in his Letter C Land Conversion process.

Dispute Number 09 / G / 2014 / PTUN.YK. The silent act towards the request to cancel the write-off of the Plaintiff's name Revocation of the Plaintiff's name and replaced with the name of another person in the Plaintiff's Title Certificate is deemed a procedural defect. The Plaintiff submitted a request to the Defendant to cancel the write-off, but the Defendant responded with a silence for months. The two disputes are similar because they both have a negative fictitious object of dispute (regulated in Article 3 UUNo. 5 of 1986 concerning Peratun), and occurred before the enactment of Law No. 30 of 2014 concerning Government Administration. This negative fictitious dispute object no longer exists after the Act No. 30 of 2014, because the provisions regarding negative fiction have been changed to positive fictitious provisions. However, because fictitious positive State Administrative decisions are relatively less published than negative fictions, even positive fictional claims to the State Administrative Court are less frequent.

This is a benefit of the enactment of Law No. 30 of 2014 because before that, the lawsuit against the decision of a negative fictional State Administrative Court dominated the disputes in the State Administrative Court, not least in the Yogyakarta State Administrative Court.

The concept of positive fictitious decisions in Law No. 30 of 2014 is very different from the negative fictitious decisions stipulated in the Peratun Law. Contrary to the concept of negative fiction, it means that the silence of the official's attitude is considered to be refusing, while the positive fictional is considered granted. Even in positive fictitious decisions, the applicant does not automatically obtain the results of his application, but must first submit a request to the Administrative Court to obtain a decision on receipt of the request. PTUN must decide on the application no later than 21 (twenty one) working days after the application is submitted. State Administration Decree is final and binding, there are no other legal remedies. Government Agencies and / or Officers must determine the Decree to implement the PTUN decision no later than 5 (five) working days after the decision of the Court is determined. (Abdullah, 2010)

In general, the legal basis used by the plaintiff to sue the State Administrative Court is the first reason that a TUN official or TUN body has committed an act that violates the applicable laws and regulations and the second has violated Good Governance General Principles (AUPB) both AUPB in Law No. 28 of 1999 (before the enactment of Law No.30 of 2014) and Good Governance General Principles contained in Law No. 30 of 2014.

Good Governance General Principles as a doctrine is universal that has been recognized and applied in many countries, where there are formulated (codified) formally and some are not codified. In essence, the functions of the Good Governance General Principles are: 1) As a guideline or code of ethics for State Administration Agencies / officials in carrying out government affairs (including in order to issue State Administration Decree), the ultimate goal is for the realization of good and clean governance (clean and good governance) ; 2) As a benchmark as well as a reason (beroepsgronden) for parties who feel their interests have been impaired by a decision issued by the State Administration Agency / Officer to file a claim against the decision; 3) As a basis or criteria for testing (toetsingsgronden) for the court or State Administration judge to assess whether the decision issued by the State Administration Agency / Official has been in accordance with legal norms and justice, so that a decision can be made regarding the validity of the decision. (Wahyunadi, 2016)

The concept of positive fictitious decisions in Law No. 30 of 2014 is very different from the negative fictitious decisions stipulated in the State Administrative Law. Contrary to the negative fiction concept, it means that the silence of the official's attitude is considered to be refusing, while the positive fictional is considered to be granted. Even in positive fictitious decisions, the applicant does not automatically obtain the results of his application, but must first submit a request to the Administrative Court to obtain a decision on receipt of the request. State Administrative Court must decide on the application no later than 21 (twenty one) working days after the application is submitted. State Administrative Court decision is final and binding, there are no other legal remedies. Government Agencies and / or Officers must determine the Decree to implement the State Administrative Court decision no later than 5 (five) working days since the decision of the Court is determined. (Limbong, 2012)

3.3 Form of Decision

he decision made by the Judge on land disputes that entered throughout 2014 to 20 18 consisted of:

a 4 (four) cases with a 'Grant' decision

b 1 (one) case with a 'Granting Partly' verdict

c 1 (one) case with the decision 'Refusing'

d 6 (six) cases with the decision of 'NO (Niet Onvarkelijk Verklaard)' or 'cannot be accepted

The decisions on land disputes are explained in detail as follows

1 4 (four) cases with a 'Grant' decision There are 4 (four) State Administrative Court decisions that grant all plaintiff's requests. Formally the plaintiff's request against State Administrative Court can be grouped into 2 (two), the first is the main lawsuit, namely requesting State Administrative Court to cancel / revoke the disputed state administration decision letter and the second, an additional lawsuit consisting of requesting a new administrative decision, request for compensation and the last request for rehabilitation.

a dispute based on the fact that the issuance of the dispute object was flawed in procedure, the Judge declared the object of the dispute null or invalid and ordered the revocation of the object of dispute. (Dispute No.05/G/2015/PTUN.YK,

b on the fact that the issuance of the dispute object was flawed in procedure and violated AAUPB, especially the principle of accuracy

and the principle of legal certainty. (Dispute No.26/G/2015/PTUN.YK),

c based on the consideration of a District Court decision that had to be carried out, because the object of the dispute was considered juridical defect in material and formal aspects so that it was deemed invalid or invalid and had to be revoked(Dispute No. 18/G/2017/PTUN.YK)

d based on the reasons for discovering various procedural defects and violations of the General Principles of Good Governance in the issuance of the object of the dispute, (Dispute No.01/G/2018/PTUN.YK)

2 1 (one) case with a 'Granting Partly' verdict because the object of the lawsuit was proven legally and convincingly to contain material defects that is contrary to the laws and regulations of Article 19 paragraph (1) of the Basic Agrarian Law. Therefore, the object of the dispute is declared void or invalid and must be revoked by the Defendant, and the Defendant is ordered to follow up on the Plaintiff's request. Meanwhile the demands besides and the rest were rejected by the Panel of Judges.

3 1 (one) case with the decision 'Refusing' with consideration of finding evidence that the Certificate of Property Rights that would be encumbered by the Underwriting Right had the status of inheritance which had not been divided and was still blocked.. Therefore, the Defendant / Head of the Sleman Regency Land Office refuses to issue the Mortgage Certificate submitted by the Plaintiff.

4 6 (six) cases with the decision of 'NO (Niet OnvarkelijkVerklaard)' or 'cannot be accepted' Judges' considerations for deciding "NO" or "Unacceptable" lawsuit from the defendant can be detailed as follows

a Dispute Number 02 / G / 2014 / PTUN.YK This dispute was decided 'NO' or 'unacceptable' by the Panel of Judges for several reasons. The first reason is because of absolute competence, that aside from State Administrative Court of Yogyakarta, it turns out that this dispute was also registered in the Yogyakarta District Court. The second reason is that this lawsuit has no legal basis or legal standing. The third reason is because the lawsuit is subject to declarative (declanatoir) exceptions (because of absolute or relative competence of the court) and premortal (premetoir) exceptions because they have passed the deadline or have expired. The fourth reason is because the plurium litis consortium, that the Plaintiff acknowledges that there are other heirs who are entitled, so this lawsuit is lacking of parties.

b Dispute Number 09 / G / 2014 / PTUN.YK This dispute was decided 'NO' or 'unacceptable' on the grounds that the Plaintiff did not have a direct relationship with the object of the dispute. The arguments and evidence are considered irrelevant with the case and object of the dispute. Based on that, the lawsuit is considered to have no legal standing.

c Dispute Number 10 / G / 2014 / PTUN.YK This dispute was decided 'NO' or 'unacceptable' on the grounds that the State Administrative Court was not authorized to examine, decide on and resolve the dispute in lititis. This means that the dispute is not the absolute authority of the Yogyakarta Administrative Court but the absolute authority of the Religious Court because the subject of the dispute is actually an inheritance case. The Panel of Judges is of the opinion that the subject matter of the dispute in casu does not need to be further considered and legally, the Plaintiff's claim has legal grounds to be declared not accepted.)

d Dispute Number 22 / G / 2015 / PTUN.YK The Panel of Judges decided that this dispute was not accepted or 'NO' for various reasons. The first reason is because the lawsuit has expired. The second reason is because the claim does not have a legal standing because the plaintiff's claim does not explain the origin of the object of thedispute, so there is actually no legal relationship between the Plaintiff and the object of the dispute. The third reason is because obscuur libel lawsuit because there is no correlation between the title of the claim, the basis of the claim (posita), and the claim (petitum).

e Dispute Number 16 / G / 2017 / PTUN.YK This dispute was decided by the Yogyakarta State Administrative Court Judge with the 'NO' argument based on the reason that the lawsuit has expired. This fact is known at the time of examination of the subject matter of the dispute, namely at the examination of evidence and witnesses, where the evidence and witnesses show conclusively that the Plaintiff has known about the object of the dispute in advance and has passed the time limit of the claim.

f Dispute Number 26 / G / 2017 / PTUN.YK The Panel of Judges decided 'NO' on this dispute because it considered that this dispute was not a State Administration dispute but a dispute of ownership (civil) therefore State Administrative Court was not in an authority to try it.

From these data it is known that the Yogyakarta State Administrative Court Judges very often decide cases that contain land disputes with a decision 'NO' or niet ontvankelijke verklaard. The 'NO' verdict is a ruling stating that the claim cannot be accepted on the grounds that the claim contains formal defects. The causes of formal defects in the lawsuit are, among other things, because the lawsuit does not meet the requirements given in Article 123 paragraph (1) HIR j.o. SEMA No. 4 of 1996, in the form of:

1 A claim has no legal basis or legal standing;

2 An error in persona suit in the form of disqualification or plurium litis consortium;

3 Claims containing defects or obscuur libel; or

4 The suit violates absolute or relative competence.

The 'NO' decision at the Yogyakarta State Administrative Court often occurs because the Judge is not sure yet, or there is no convincing evidence, to fulfill dismissal as stipulated in Article 62. The registered claim is often made in such a way by the Advocate, as if it should be examined to the point of the matter. After examining the subject matter, through verification and examination of witnesses, it was discovered that the exception was the object of the dispute. For this kind of outcome, the Judge will inevitably have to give a 'NO' or 'unacceptable' verdict after the main examination.

The mandate of SEMA Number 4 of 2014 does require the Judge to be careful and not careless in giving a decision "NO" in dismissal. This is related to the 90 day lawsuit that is feared to be missed so that the lawsuit is not subject to questioning only because the lawsuit has to be filed repeatedly as a result of not passing the dismissal.

The basis for granting the "NO" verdict can be seen in the Indonesian Supreme Court Jurisprudence No. 1149 / K / Sip / 1975 dated 17 April 1975 j.o. Decision of the Supreme Court of the Republic of Indonesia No. 565 / K / Sip / 1973 dated August 21, 1973 j.o. Decision of the Supreme Court of the Republic of Indonesia No 1149 / K / Sip / 1979 dated April 7, 1979 which states that against the object of the claim that is not clear, the claim cannot be accepted. In the State Administrative Judiciary, regarding the "NO" verdict is regulated in Article 77 of the TUN Judicial Law (51/2009) that basically a decision cannot be accepted because of an exception. The exception is three categories, namely:

1 The exception of the absolute authority of the Court, can be filed at any time during the examination, and although there is no exception to the Court's absolute authority (from the Defendant),

if the Judge is aware of it, he is obliged to declare that the Court is not authorized to adjudicate the dispute;

2 Exception of the relative authority of the Court, submitted before being given an answer to the subjectmatter of the dispute, and the exception must be decided before the dispute is examined;

3 Other exceptions that do not concern the Court's authority can only be decided along with the subject matter of the dispute.

The fact that occurs in society, there is still confusion or misunderstanding of the community in determining a land case in the realm of the General Court or State Administrative Court.

At present, there are three justice systems that can handle a land case, namely Civil Court, Criminal Court and State Administrative Court. Land cases can be an accumulation of civil, state administration, or criminal cases at the same time. (Simanjuntak, 2017)

In general, land disputes can be resolved either through civil or religious justice (if it involves ownership of land rights), criminal justice (if the criminal element is contained in the dispute), or administrative justice (if it involves the validity of land rights). The liquidation of the jurisdictional authority boundaries in resolving land issues makes the land problem a gray legal area. This ambiguity can be seen from the problematic relationship between administrative law and civil law in solving land issues. In such conditions, it is often not easy to determine the meaning of "certificate validity" or "certificate ownership" for both the General Court and the State Administrative Court. Both in the context of the General Courts and the Religious Courts, in civil disputes involving land related to land titles, the Court often states that the "legality" and land title certificates are first tested by State Administrative Court. Likewise on the contrary, the plural found by the State Administrative Court stated that the General Court must first decide the matter of ownership, even if the sued is the validity of a certificate.

4 CONCLUSIONS

Based on the results of research and discussion on Land Dispute Settlement through the State Administrative Court in Yogyakarta, conclusions can be drawn as follows:

1 Land disputes handled by the Yogyakarta State Administrative Court can be determined by two variables, namely: (a) based on the subject (Plaintiff and Defendant), and (b) based on the object of

the dispute:The results showed that land disputes handled by the Yogyakarta State Administrative Court, 11 from 12 lawsuits, when it is viewed from the subjects (Plaintiffs and Defendants), the one who sued were individuals and only one is a Private Legal Entity, while the defendant is the Head of the Land Office and Village Chief. Most of the objects of the dispute are the Land Certificates , the Decree of Giving Rights and the silence of the officials (negative fictitious). This negative fictitious dispute object no longer exists after the Act No. 30 of 2014, because the provisions regarding negative fiction have been changed to positive fictitious provisions. However, because fictitious positive State Administrative decisions are relatively less published than negative fictions, even positive fictional claims to the State Administrative Court are less frequent. Until this research was conducted, there was no land suit that consisted of Positive Fictitious decisions that entered the Yogyakarta Administrative Court.

2 The fundamentals of the lawsuit in each land dispute in the Yogyakarta State Administrative Court can generally be grouped into 3 (three) groups, namely the Plaintiff feels his rights and interests are harmed because:

a The object of dispute (State Administrative Decree) issued contains material defects;

b The object of dispute (State Administrative Decree) issued contains formal defects; and

c The object of dispute (State Administrative Decree) issued ignores Good Governance Principles.

3 The decision made by the Judge on land disputes that entered throughout 2014 to 2018 consisted of:
4 (four) cases with a 'Grant' decision1 (one) case with a 'Granting Partly' verdict
1 (one) case with the decision 'Refusing'
6 (six) cases with the decision of 'NO (Niet OnvarkelijkVerklaard)' or 'cannot be accepted

The form of the decision of the Yogyakarta Administrative Court which adjudicates land disputes is mostly in the form of a "NO" verdicts, which are as many as 6 out of 12 disputes. This happened because the lawsuit registered was often made in such a way by the Advocates, as if it should be examined up to the point of the case. After examining the subject matter, through verification and examination of witnesses, it was discovered that the exception was the object of the dispute.

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The Influence of Transformational Leadership, Work Environment and Job Satisfaction toward the Performance of Employees in the Office of Public Works, Housing, and Energy of Mineral Resource in the Special Region of Yogyakarta

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Keywords: Transformational Leadership, Work Environment, Job Satisfaction and Employee Performance

Abstract: This study aims to determine the influence of transformational leadership, work environment and job satisfaction on employee performance in the office of public works, housing, and energy of mineral resource in the Special Region of Yogyakarta (PUP Department Office and ESDM DIY). Totaling respondents in this study is 204 with proportional stratified random sampling method. The analytical tool used multiple regression with F test and T test to test the hypothesis in this study. The results of this study concluded that variables of transformational leadership, work environment and job satisfaction have a significant effect simultaneous on the performance employees of the office of PUP Department and ESDM DIY and variables of transformational leadership, work environment and job satisfaction have positive effect and significant individually on the performance employees of the Office of PUP Department and ESDM DIY.

1 INTRODUCTION

An organization that is always developing is everyone's dream. Both the government and the private sector expect their organizations to grow and develop well. With these developments, the organization is expected to be able to compete and accelerate with the progress of the times. The fact shows that organizations that are not able to accelerate with the progress of the times will be left behind to then sink into the times. The level of success of an organization can be seen from how the organization manages its resources. Organizations with good performance, have effectiveness in handling human resources, determine goals that must be achieved both individually and in their organizations.

Employee performance is one of the important aspects that must be considered in the organization, because employee performance guides the organization to achieve its objectives. Employee performance is a work achievement, a comparison between work results that can be seen clearly with the work standards set by the organization (Dessler, 2006). The factors that affect the decline in employee performance at the Office of PUP and ESDM DIY are the gaps in mindset/ perspective between leaders and employees,

a less ideal work environment, timeliness in completing tasks, abilities possessed to utilize resources or potential that exists, open communication is also one of the factors that affect the decline in employee performance. Communication that is established in the PUP and DIY EMR Office between leaders and employees is quite good, only because the level of leadership is high enough so that it does not allow time for any time to meet face to face or communicate directly, this causes a gap in communication relations between leaders and employees. The delay or absence of employees entering the office is also one of the causes of the decline in employee performance, so this certainly will affect the receipt of employee benefits. These problems are part of the causes of declining employee performance. Some of these problems are indicated by three things: transformational leadership, work environment and job satisfaction.

The Office of PUP and ESDM DIY has the duty to carry out the affairs of the Regional Government in the fields of public works, housing, spatial planning, and energy mineral resources and Deconcentration and Co-Administration tasks provided by the Government. (PERGUB DIY No. 47 of 2008), while the WWTP outline of this WWTP has three benefits, namely protection of water bodies (rivers and wells)

from household pollution, improvement and environmental aesthetics, utilization of IPAL products in the form of organic fertilizer from mud wastewater. Balai PSDA is in charge of carrying out operational services to the community in the field of water resources, and operational management of conservatio/preservation of water and water resources and technical training in water resources. (article 47) and BPIPBPJK (Center for Testing, Settlement and Building Information and Construction Services Development), tasked with supervising the quality control process of development tasks in order to realize the control system and quality assurance, delivery of residential and building information and construction services. (article 53).

From this description, the researcher needs to conduct research using the title: "The Influence of Transformational Leadership, Work Environment and Job Satisfaction Toward the Performance of Employees in The Office of Public Works, Housing, And Energy of Mineral Resource in The Special Region Of Yogyakarta" Based on this background, the problem can be formulated as a problem as follows:

1. How is the effect of transformational leadership, work environment and job satisfaction simultaneously on employee performance at the PUP Office and ESDM DIY?

2. How is the partial /individual influence of transformational leadership, work environment and job satisfaction on employee performance at the PUP Office and ESDM DIY?

2 HYPOTHESIS DEVELOPMENT

2.1 Transformational Leadership and Employee Performance

(Burns and Leadership, 1978) states that the transformational leadership model essentially emphasizes that a leader needs to motivate his subordinates to carry out their responsibilities more than they expected. Transformational leaders must be able to define, communicate and articulate the organization's vision, and subordinates must accept and recognize the credibility of their leaders. (Hater, 1998) states that "the dynamic of transformational leadership involve strong personal identification with the leader, joining in a shared vision of the future, or going beyond the self-interest exchange of rewards for compliance".

Transformational leadership style can improve job satisfaction for employees and in turn will improve the performance of employees, because of the higher

needs of employees such as self-esteem needs and self-actualization. The results of this study also reinforce the opinion of (Nicholls, 1994), Pawar and Eastman (1997) that the practice of transformational leadership style is able to bring more fundamental changes such as employee values, goals, and needs and these changes have an impact on increasing employee performance. Whereas (Bycio et al., 1995) and Howell and Avolio (1993) suggest that transformational leadership has a positive relationship to employee performance because employees feel valued existence, then transformational leadership style influences employee performance. From the description, the hypothesis can be derived as follows:

H1 : Transformational leadership has a significant positive effect on employee performance, at the PUP Office and DIY ESDM.

2.2 Work Environment and Employee Performance

(Sedarmayanti and Pd, 2001) work environment is all the factors that surround the workplace for work purposes. The work environment includes the physical work environment is a physical form of situation that is around the workplace that can affect employees both directly and indirectly. Whereas the non-physical work environment is all the situation that occurs relating to work relations, both relationships with superiors and relationships with colleagues, or with subordinates. This work environment both directly and indirectly will determine the level of comfort in work.

(Ruky, 2001) states that "performance is a translation of English" performance "which is interpreted by Bernadin and Russel as a record of the results obtained from certain job functions or certain activities during a certain period of time). In this definition, it is clear that they emphasize the notion of achievement as a result or thing that comes out of a job and their contribution to the organization.

While an inadequate work environment can interfere with the concentration of employees in carrying out their work so as to cause errors in work and employee performance will decrease (Siagian, 2002). According to Nunung Ristiana (2012) there is a positive and significant influence on the variables of the work environment, the more comfortable the work environment, the more employee performance will be.

H2: The work environment has a significant positive effect toward employee performance, at the PUP Office and DIY ESDM Office.

2.3 Job Satisfaction and Employee Performance

According to (Hasibuan, 2013) job satisfaction is an emotional attitude that is fun and loves his job. Employee job satisfaction must be created as well as possible so that work morale, dedication, love and discipline increase. This attitude is reflected by work morale, discipline, and work performance. Job satisfaction enjoyed in work, outside work, and a combination of in and outside work.

(Rivai and Basri, 2005), states that performance is a person's overall results during a certain period in carrying out tasks, such as work outcome standards, targets or targets or criteria predetermined and agreed upon. According to (Sudarmanto, 2009) there are three levels of performance, namely; (1) organizational performance, is an outcome (out come) at the level or unit of analysis of the organization related to organizational goals, organizational design, and organizational management; (2) process performance, is a performance in the stage process in producing a product or service that is influenced by process objectives, process design, and process management; (3) the performance of individuals / jobs, is the achievement of effectiveness at the level of employees or jobs that are influenced by job objectives, work design, and job management and individual characteristics.

The relationship of Job Satisfaction with Performance is more appropriately called the "management myth" and it is difficult to determine in what direction the causal relationship between the two. But from various studies found evidence that organizations that have more satisfied employees tend to be more effective than organizations that have employees who are less satisfied (Robbins and Judge, 2008).

H3: Job satisfaction has a significant positive effect on employee performance, at the PUP Office and DIY ESDM Office.

2.4 Transformational Leadership, Work Environment, and Job Satisfaction and Employee Performance

The presence of leaders in the company is very important because of the backbone and has a strategic role in achieving organizational goals. The right leadership style can lead to employee motivation for achievement, because the success or failure of employees in carving work performance can be influenced by leadership style. The work environment is related to everything that is around the work and which can affect employees in carrying out tasks including employee service, working conditions, employee relations in the company concerned (Agus Ahyari, 1994). A good work environment is a pleasant work environment and can provide security. That work environment is what everyone wants. This can motivate employees to work better, so that it will improve employee performance. In addition, more satisfied employees tend to be more effective than organizations that have employees who are less satisfied. H4: Transformational leadership, work environment and job satisfaction partially/individually have a significant positive effect on employee performance, at the PUP and DIY ESDM Office.

3 RESEARCH METHODOLOGY

3.1 Object of Research

The research was carried out at the DIY PUP and ESDM Office, which was located at Kyai Mojo Yogyakarta Street and various Balai which was part of the DIY PUP and ESDM Office, with the object of research being the employees of DIY PUP and ESDM Office, Balai PSDA, Balai BPIPJK, and the IPAL Hall.

3.2 Data Source

The data sources used in this study are primary data and secondary data. Primary data means data obtained directly from the source, using instruments or questionnaire tools that contain a number of structured written questions to obtain information from respondents, both about the person and other things needed in this study.

Secondary data is a way of collecting data obtained from various library materials, both in the form of books, magazines, journals or other documents that have to do with the study material. Secondary data is obtained by using documentation and literature.

3.3 Sampling Technique

Population is the object of the overall research whose characteristics are to be expected (Djarwanto and Subagyo, 1996). In this study, the population is 414 employees. Samples are a portion of the population whose characteristics will be examined and considered to represent the whole of the population (Djarwanto and Subagyo, 1996). In this study, the determination of sample size was calculated based on the

opinion of Solvin (Husein, 2005), so the sample numbered 203.4 respondents, rounded up to 204 respondents.

The sampling technique used is proportional stratified random sampling method which is a sample selection which can be done by first classifying a population into sub-populations.

3.4 Data Analysis Method

To test hypotheses one to four, the data analysis method used in this study uses multiple linear regression. Multiple linear regression analysis is used to determine the effect of several independent variables on the dependent variable (Wiratna, 2007). The multiple linear regression models in this study are as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e \qquad (1)$$

4 DISCUSSION

4.1 The Effect of Simultaneous Transformational Leadership, Work Environment and Job Satisfaction on Employee Performance of PUP Office and DIY ESDM

Based on the results of the F test, it shows that significantly transformational leadership, work environment and job satisfaction affect employee performance at the PUP and DIY ESDM Office simultaneously, because the calculated F value is greater than the F-table (3.866> 2.65). This means that if the transformational leadership is good, the work environment is good and the job satisfaction of the employees is more satisfied, it will improve the performance of employees of the PUP Office and DIY ESDM.

The results of this F test also show that the regression model in this study can be declared fit, because the probability of significance is 0.003, where this value is smaller than 0.05, and the contribution of the independent variables (transformational leadership, work environment and job satisfaction) on the performance of employees it can be said that it fulfills the requirements because of the magnitude above 0.5, which is 0.527. This indicates that this equation model can be applied by the leadership in order to improve the performance of the PUP and DIY ESDM staff employees.

The results of this study are supported by several previous studies which were carried out among others

by (Aulia, 2015), (Mangkunegara and Huddin, 2016), (TARTIB, 2013) (Handayani, 2013). From some of these studies, concluded that transformational leadership, work environment and job satisfaction simultaneously have a significant effect on employee performance.

4.2 The Influence of Transformational Leadership on Employee Performance of PUP Office and DIY ESDM

Based on the results of the t test, transformational leadership has a positive and significant effect on the performance of employees of the PUP and DIY ESDM Office. This is evident from t count¿ t table (3.719> 1.962) and Sig ¡0.05 (0.002 <0.05). This means that if transformational leadership is carried out well, it will increase the performance of employees of the DIY PUP and ESDM Office offices.

Based on the positive responses of the respondents, where in the respondent's answer from 204 respondents it was known that 58.33% of respondents agreed and 35.78% of respondents stated strongly agree with the statements contained in the questionnaire of transformational leadership variables, and 5.88% expressed doubt. This indicates that the transformational leadership style is appropriately applied to the Office of PUP and DIY ESDM.

The results of this study are supported by several previous studies that have been carried out, among others, by (Yuliandi,)(Cahyono et al., 2014), (Sofyan, 2013)(Setiawan, 2013) where the conclusions from their studies are that transformational leadership has a positive and significant effect on performance employee. For this reason, the transformational leadership style that has been applied to the PUP Office and ESDM DIY Office needs to be maintained and it will be even better if the quality is improved.

4.3 Effect of Work Environment on Employee Performance of PUP Office and DIY ESDM Office

Based on the results of the t test, the work environment has a positive and significant effect on the performance of employees of the PUP and DIY ESDM Office. This is evident from t count¿ t table (2.359> 1.962) and Sig <0.05 (0.007 <0.05). This means that if the work environment supports it, it will improve the performance of the employees of the DIY PUP and ESDM Office offices.

These results indicate that the working environment at the PUP and DIY ESDM Office is ideal. This is reinforced by the results of the analysis of respondents' answers to the statements contained in the work environment variable questionnaire, which states agree at 59.80%, and which states strongly agree at 39.71%. Nevertheless, there were still 0.49% who expressed doubts. This indicates that in relation to the work environment according to the PUP and DIY ESDM staff, there were still some respondents who actually wanted to disagree, but maybe because of shame and so on they finally answered doubtfully.

The results of this analysis stating that the work environment has a positive and significant effect on employee performance is supported by several previous studies, including (Yunanda, 2013) (Sofyan, 2013)(Putra, 2013) (Suryani, 2013), where the results of their research concluded that the work environment has a positive and significant effect on employee performance.

4.4 Effect of Job Satisfaction on Employee Performance of PUP Office and DIY ESDM

Based on the results of the t test, job satisfaction has a positive and significant effect on the performance of employees of the PUP and DIY ESDM Office. This is evident from t count$>$ t table (2,072$>$ 1,962) and the Sig value $<$0,05 (0,009 $<$0,05). This means that if the employees are more satisfied, then this will improve the performance of employees of the DIY PUP and ESDM Office offices.

The results of this study are supported by several studies that have previously been carried out by among others (Hakim, 2013), (Sofyan, 2013), (Stiven et al., 2014)(Furi, 2012). Their results show that job satisfaction has a positive and significant effect on employee performance. Thus, the results of this study are the same as the results of previous research studies.

Job satisfaction has a significant effect on the performance of employees of PUP Office and DIY ESDM, so the situation that causes employee job satisfaction needs to be improved, among others: From the dimensions of the work itself, it is necessary to increase the self-confidence of employees in order to work more seriously and Responsible for his work. From the dimensions of promotion, an open promotion system can be accepted by all employees, because with a clear promotion system, employee expectations for a career will be more real, so that it will have an impact on the performance of employees. From the supervision dimension, the inherent supervision that has been carried out, needs to be improved, for example by monitoring the work results of employees, and providing direction and guidance to employees. From the dimensions of woker a good relationship between employees will have an impact on the calm and comfort of employees in work so that it can improve employee performance.

5 CONCLUSIONS

Based on the result of this study, it is proven that the transformational leadership, work environment, and job satisfaction have a signifiant effect both partially and simultaneously on the performance of PUP and DIY ESDM staff employees.

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Intention to Online Transaction: Empirical Study on Go-Med Applications

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Keywords: Intentions to Shop Online, Service Quality, Perceived risk, Trust.

Abstract: This research aims to identify the effect of trust in moderating the intention of online transactions using the GoMed application. The sampling technique was purposive sampling with 240 samples according to the sample adequacy requirements in the Structural Equation Model (SEM) test. The results of this study indicate that trust moderates the intention of online transactions using the Go-Med application. The intention to online transactions using the Go-Med application in the large trust group is not affected by risk perception, whereas in the low trust group. Service quality affects the intention of online transactions using the Go-Med application in high and low trust groups. Service quality affects the intention of online transactions using the Go-Med application in high and low trust groups. Chi-square values The effect of service quality in high and low trust groups is different because of the different chi-square test.

1 INTRODUCTION

The development of internet-based shopping applications has changed customer shopping behaviour (Yannopoulos, 2011) and encouraged companies to keep abreast of online shopping trends (Lim et al., 2016). The Internet has increased the ability of customers to find information, choose products, and make payments (Yannopoulos, 2011) The increasing number of online shopping applications has increased customers who move from shopping in traditional stores to online stores, including shopping for health products. Online shopping is perceived by customers to be superior and more profitable than traditional stores (Lee et al., 2017). Previous research indicates that online shopping affects buying behaviour because it provides convenience in finding information and purchasing, saving time and flexible payments (Meixian, 2015)(Liu, 2012)(Delafrooz et al., 2009)

The Go-Med application is an online drug shopping service application that makes it easier for customers to buy drugs. In the context of online drug shopping in Indonesia, various benefits in online

shopping have not been able to increase customers' intention to online transaction. Go-Med service users are still low compared to other services from the same online service provider. The phenomenon of online drug shopping is interesting to study because Go-Med is the first online drug shopping application in Indonesia. Online shopping transactions in Indonesia in 2017 are 43% increase compared to 2015 (Iskandar, 2018). The Global Web Index records 86% of internet users in Indonesia make online transactions in 2018, the most significant percentage in the world (Wicaksono, 2019). This study aims to identify the phenomena of Go-Med online shopping applicationusers who have little indication that various Go-Med features cannot attract the attention of customers to use them. Medicines are pharmaceutical products that are related to health. Health is essential for customers; trust in the reliability of an application is the main thing for customers. Although customers consider that online shopping offers several benefits, online transactions tend to have more significant uncertainty than traditional retail formats (Lee and Tan, 2003). Online transactions have a risk of fraud, which can lead to financial losses for customers who reduce on-

line purchases (D'Alessandro et al., 2012). The perceived risk reduces the willingness of customers to buy goods over the Internet (Barnes et al., 2007). Higher perception of risk on the part of customers' acts as a deterrent to their purchase intentions.

This study will identify the role of trust in the intention to shop online using the Go-Med application. Trust is the perception that the other party does not behave opportunistically, and that the other party will pay for the promise (Gefen et al., 2003). This study divides the trust in high and low trust groups. Previous research regarding the role of trust in the context of consumer behaviour was more as an independent variable (Abbad et al., 2011) (Gefen et al., 2003)(McKnight et al., 2002). (McCole et al., 2010) developed a research model of the role of trust as moderating consumer attitudes, that conceptualize that customer trust depends on the level of consumer concern on online purchases. Low customer trust inhibits electronic transactions (Dinev et al., 2006).

2 LITERATURE REVIEW

2.1 Intention to Online Transaction

The intention of online shopping is the willingness of consumers to make online transactions (Pavlou, 2003). The intention of online shopping reflects the customer's desire to buy a particular product or service because the intention is an essential predictor of actual buying behaviour. The intention of online shopping is a predictor of customer purchasing behaviour, so the higher the aim of online shopping, the higher the customer's desire to shop online (Ling et al., 2010). The purpose is the tendency to take action or behaviour or something that immediately precedes actual buying behavior. Aim to use is the tendency to conduct to keep applying a technology (Davis, 1989). The desire to add supporting devices, continue to use computers, and attempt to influence other users indicates the level of computer usage. Online shopping is a form of e-commerce that allows customers to buy goods or services directly from sellers through the Internet. Customers find products that are in demand by visiting retailers' sites directly or by searching among alternative the online shop using shopping search engines. The retailer site displays the availability and price of the same product in various electronic retailers (Lim et al., 2016). In the context of online shopping, previous research shows that service quality, perceived risk (Nasser et al., 2015) and trust (Liu, 2012) affects intention. The intention for online transactions is related to customer experiences such as information retrieval, a website search, ease of payment transactions, post-purchase guarantees, and reliability of the online store.

2.2 Service Quality

E-commerce is a relatively new transaction channel, the quality of service expected by customers does not have a concrete form, customers are still looking for the appropriate form that is expected (Zeithaml et al., 2002). Online shop faces the challenge of identifying service quality attributes that are considered by customers in online transactions (Yang and Fang, 2004).

E-service quality is an evaluation and assessment of customers regarding service excellence in electronic transactions (Zemblytė, 2015). Online customers thus expect service quality levels to be the same or higher than traditional channel customers (Lee and Lin, 2005). Attributes and measures of service quality are essential to determine. (Trocchia and Janda, 2003) identified that customers consider five dimensions of the quality of online store services. Performance, access, security, sensation, and information are attributes that are most considered by customers in assessing the quality of online shop services.

Service quality compares perceived services and customer expectations (Grönroos, 2001). Superior service quality if the quality received, is higher than expected. Highservice quality benefits the online store because it increases customer purchase intention (Hartwig and Billert, 2018)(Özer et al., 2014)

Previous research on the effect of service quality on purchase intentions in various backgrounds indicates that the higher the quality of services offered can increase purchase intention (Purcărea et al., 2013)(Özer et al., 2014)(Sá et al., 2016)

H1: The higher the quality of services provided, increases the intention of shopping online

2.3 Perceived Risk

There is no agreement regarding the definition of perceived risk, but many researchers define the perceived risk of the results of adverse decisions (Gefen, 2002). (Barnes et al., 2007)(Gefen, 2002) divided the risk of online shopping into two concepts, focusing on the uncertainty of the decision to make a purchase and the consequences of online purchases. Customers have different tolerance limits in accepting risk. Personal characteristics influence the perceived risk of customers (Gidycz et al., 2001).

Although customers consider that online shopping offers several benefits, online transactions tend

to have more significant uncertainty than traditional retail formats (Lee and Tan, 2003). The perceived risk reduces the willingness of customers to buy goods over the Internet (Barnes et al., 2007). Higher perception of risk on the part of customers' acts as a deterrent to their purchase intentions.

Previous research on the perceived risk in the context of customer behaviour has provided evidence that perceptions of risk influence purchase intentions (Barnes et al., 2007) (Liu, 2012) (Mitchell, 1999)(Sweeny et al., 1999). Previous research shows that perspectives of risk are negatively and significantly related to online purchases, if customer perceptions of risk are high, then customer attitudes toward online shopping are low (Barnes et al., 2007)(Liu, 2012) (Mitchell, 1999)(Sweeny et al., 1999)

H2: The higher the risk perception, the lower the intention of online shopping.

2.4   Trust

The definition of trust is very diverse, and there is no single understanding of trust. In conditions of risk, uncertainty and threat, need trust (Gefen et al., 2003). (Mayer et al., 1995) define trust as the willingness of the other party to accept the risk of another person's actions based on the expectation that the other party performs specific necessary actions, whether supervised or not. One party does not take advantage of the weaknesses of the other (Barney and Hansen, 1994), gives the other party the power to take actions that represent themselves, the perception that the other party pays an appointment (Gefen et al., 2003) because other parties have integrity, kindness, and competence (Gefen, 2002).

Trust affects online shopping ((Abbad et al., 2011), (Gefen et al., 2003). In the context of online shopping, trust in the online store is essential for customers because customers are willing to accept the risks that occur due to the online store activities (Mc-Cole et al., 2010). Online transactions have a significant risk. Online transactions meet uncertainties, weak controls, and opportunities for other parties to cheat (Hoffman et al., 1999). Communication over the Internet has a greater vulnerability than face to face communication. The buyer does not have access to check the product before purchase physically and has a vulnerability to the security of personal information and credit cards (1). Previous research indices the higher customer trust in online stores, the higher the intention of online shopping (Liu, 2012). This study divides the beliefs grouped as high and low. Trust involves a person's willingness to behave in a certain way because of the belief that the other party will give

satisfaction so that the words, promises, or statements of others can be trusted. Trust is all knowledge held by customers and all conclusions made by customers about objects, attributes, and benefits. This understanding shows that trust is a subjective assessment of customers because customer knowledge distinguishes customer trust. In the context of online shopping, the difference in the level of trust is the justification that trust moderation customer behaviour.

H3: Trust moderates the effect of service quality on the intention of shopping online.

H4: Trust moderates the effect of perceived risk on the purpose of online purchase.
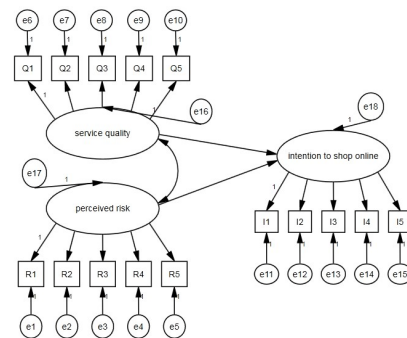
Figure 1: Research Model

2.5   Research methods

This research is causal, which explains the causal relationship between dependent and independent variables. This research is a cross section that explains the phenomenon in the study period and does not explain the phenomenon of the next period. The research sample 240 was by the requirements of sample adequacy in the structural equation model test. The population in this study were individuals who had the intention to shop online in Greater Solo. Sample collection uses the random sampling method. To increase the rate response, wait for the respondent to answer all questionnaire questions and take them directly.

3   RESULT AND DISCUSSION

Table 1: Descriptive Test

Variable	Mean
Service Quality	3.7
Perceived Risk	3.6
Trust	2.4
Intention to online transaction	3.1

The detailed test results show that the average service quality is 3.7, which indicates that the quality of service in this study is perceived by customers as good. The service quality of Go-Med is seen to be reliable because it is recognized that Go-Med can provide services as promised, capable of carrying out its functions as an excellent online shopping application, serving customers quickly, and being able to understand customer needs.

The Descriptive test results show that the average of perceived risk is 3.6, indicating that customers have a perception that shopping through the Go-Med application faces risks. Customers have an impression that spending on using the GoMed application faces the threat of the drug brand being delivered not according to the order, the amount of drug given is not according to the rule, the medication ordered cannot be served, thecustomer has a perception that the price is higher than the pharmacy.

The detailed test results show that the average of trust is 2.4, indicating that customers have a perception that spending through the GoMed application faces low customer trust. Customers know that the Go-Med use does not provide products according to order, does not have a favourable price, does not have a complete product, and does not fulfil customer orders. The detailed test results show that the common intention to the online transaction is 3.1, indicating that customers have the plan to online purchase and if they need to buy drugs, they will use the Go-Med application.

Table 2: Results of the Regression Test Before Moderation

			β	S.E.	C.R
Intention to online transaction	←	Service Quality	0.217	1.163	1.988
Intention to online transaction	←	Perceived Risk	-0.092	0.148	2.104

The research model test was conducted by analyzing the significance level of the effect of independent variables on the dependent variable based on the C.R. value (z-count) greater than or equal to the z-table value (z-count ≥ z-table). The z-table value at the 5% significance level is 1.96.

This study develops a research model to test the effect of service quality on buying intention in the context of online shopping. The regression test results before moderation indicate that service quality has a

positive and significant effect on the intention of the online transaction using the GoMed application (β = 0.217; C.R. = 1.988).

The results of the regression test before moderation indicate that service quality has a positive and significant influence on the intention of online transactions using the Go-Med application. This study supports Hypothesis 1, which indices that the higher the quality of service, the higher the intention to purchase online. The results of this study are support with previous studies showing that service quality has a positive and significant effect on intention to shop online (Purcărea et al., 2013)(Özer et al., 2014)(Sá et al., 2016).

The analytical result from this study indicates that overall service quality affects the customer's intention to conduct online transactions using the Go-Med application. The analytical results indicate that service quality is the driver of the intention to buy for health products using the Go-Med application. Service quality is an essential variable in customer behaviour. Increasing positive behaviour towards online shopping can be done by providing superior quality services (Li and Suomi, 2009). Increasing positive behaviour towards online shopping can be done by providing superior quality services (Li and Suomi, 2009). Superior service quality can improve online store competitiveness compared to competitors. Service quality has a role as essential in maintaining longterm relationships with customers, building customer loyalty, and encouraging repeat purchases (Li and Suomi, 2009). Service quality has an impact on determining the failure and success of the online business. Increasing positive behaviour towards online shopping can be done by providing superior quality services (Li and Suomi, 2009). This study indicates that the relationship between service quality and intention for online transactions leads to relationships that have a positive and consistent effect because being tested on different backgrounds has the same relationship direction. This finding has a contribution in designing marketing strategies to increase the intention of online shopping by considering service quality.

The regression test results before moderation indicate that the perception of risk has a negative influence and significance on the intention for online transactions (β = -0.092; C.R. = 2.104). The results of this study support.

Hypothesis 2, which shows that the higher the risk perceived by customers, reducing the intention to online transactions using the Go-Med application. Consumer behaviour in shopping tends to avoid risk and choose profitable shopping. The negative influence of risk perceptions on online transaction intentions

supports previous research that shows that risk perceptions have a negative and significant influence on the intention of online shopping (Mitchell, 1999)(Teo, 2002) (Sweeny et al., 1999).

This research is consistent with previous research that the perception of risk and intention for online transactions is negatively related even though tested on different backgrounds has the direction of the relationship in line. To design effective strategies to increase the intention of online transactions can consider reducing the potential losses paid by customers.

If the customer has a risk perception that is too high, the customer tends to delay the transaction and choose a store that provides security guarantees that reduce the risk because the perceived risk is an essential variable in purchasing decisions (Salam et al., 2005). To reduce perceived risk, the online store needs to maximize service effectiveness, improve the timeliness of delivery, provide a guarantee of purchase guarantees and guarantee security standards. Research by(Salam et al., 2005) indicates that financial incentives reduce perceived risk. Online stores can minimize the risk that consumers feel by offering products at competitive prices.

Table 3: Results of the Regression Test Before Moderation

		High Trust			Low Trust		
		β	S.E.	C.R.	β	S.E.	C.R.
Intention to online transaction	Service Quality	0.256	0.118	2.81	0.13	1.552	2.11
Intention to online transaction	Perceived Risk	-0.063	0.101	1.04	-0.27	0.179	2.147

difference in chi square test (Δχ2) = 632.465 -601.662 = 30.803 difference of df (Δdf) = 704 -672 = 32 chi square table (32;0,05) =42,585 chi square table (χ2) > difference in chi square test (Δχ2) The Constrained model is significantly different from the Unconstrained Model

The regression test results based on the multigroup method after being moderated by the trust (see table 3) shows that in the high trust group, service quality has a positive and significant effect on the intention to the online transaction (β = 0.256; C.R. = 2.81). The findings indicate that in the high trust group, there is a phenomenon that tends to be that service quality affects the intention of the online transaction.

In the low trust group, service quality had a positive and significant effect on the intention of online transaction (β = 0.13; C.R. = 2.11). The findings indicate that in the low trust group, there is a phenomenon that tends to be that service quality affects the intention of the online transaction.

Multi-group regression test results in high and low trust groups; in fact, there are differences in the effect of service quality on the intention to conduct online transactions. Statistical tests show that the chi-square table (χ2)> chi-square count (Δχ2) so that the effect of service quality on intentions for online transactions in the high and low trust groups is indicated to differ significantly. Trust moderates the importance of the quality of service online purchase plans in the high and low trust groups. The results of the moderation test support Hypothesis 3, a trust that moderates the effect of service quality on the intention of shopping online.

The finding indicates that service quality in high and low trust groups affects online purchase intention. The results mean that in high and low trust groups, both consider the performance of products and services during the process and postpurchase. Ease of access to online stores is essential because it makes it easier for customers to find and surf. The security of personal data and the possibility of loss during the purchase and post-purchase process are essential considerations for the customer. A pleasant and memorable experience during the buying process forms positive customer behaviour. The completeness and accuracy of product information offered to make it easy for customers to choose the product to be purchased. The results of the multi-group regression test showed that there were significant differences between high and low trust groups. Further tests on different conditions are needed so that the concepts hypothesized in this study can be applied more broadly regarding the different objects and background of the study.

The regression test results based on the multigroup method after being moderated by a trust (see table 3) shows that in the high trust group, perceived risk has a positive and significant effect on the intention to the online transaction (β = -0.063; C.R. = 1.04). The findings of this study indicate that in the high trust group, there is a phenomenon that tends to be that service quality no affects the intention of the online transaction. Whereas in the low trust group, the fact was that the perception of risk had a significant

adverse effect on the intention of the online transaction (β = -0.27; C.R. = 2.147). The findings of this study indicate that in the low trust group, risk perceptions of the intention to online transaction tend to lead to negative and consistent phenomena. The higher the risk perception, the purpose of the online purchase is getting lower. From the results of the multi-group regression test on high and low trust groups, the fact is that there are differences in the influence of risk perceptions on the intention to online transaction. This is supported by the fact that chi-square table ($\chi 2$)¿ chi-square difference count, so that the influence of risk perceptions on intention to online transaction in high and low trust groups is indicated to differ significantly, or in other words that trust moderates the importance of perception risk of purpose to online purchase at high and low trust groups. The results of the moderation test indicate that H4 is supported.

The test results in this study indicate that in the high trust group, risk perception does not affect the intention of shopping online. Customers who have high trust in online stores minimize perceived risk. Minimize perceived risk by increase integrity in carrying out their business. An online store that has kindness by not taking profits that harm its customers. Online stores that pay as promised and have the competence to run their businesses will increase trust.

On the other hand, customers who have low trust tend to doubt the competence of online stores in running their businesses. Online stores that fail to pay their promises will reduce customer trust so the chances of getting losses increase. Customers who are known to take higher profits have an impact on customers' perceptions of financial losses. This study provides an understanding that to reduce perceived risk, online stores need to develop strategies to increase customer trust.

The results of the multi-group regression test showed that there were significant differences between the high and low trust groups that supported the research hypothesis. To test the generalization of research concepts, it requires further testing in different conditions to find out the consistency of the research concepts in different backgrounds and contexts.

4 CONCLUSIONS

The findings indicate that before trust differentiates the intention of online shopping, service quality, and risk perception influence online purchase intentions.

After dividing the high and low trust groups, in the low trust group, service quality and risk perception influence the intention of online shopping. In

the high trust group, online buying intention is not affected by perceived risk. High trust groups do not feel the opportunity to lose on online shopping because customers know the benefits and advantages of online shopping that can minimize perceived risks.

This study focuses on high and low trust; previous research has not explained the moderation of trust in the online transaction intention model. The question in the questionnaire of this study is the Indonesian context. The final theoretical implications in this study indicate that trust is proven to moderate the intention of online transactions.

The internet has increased transactions between sellers and customers virtually. In the context of online shopping, trust is essential for customers to accept the risks that occur related to transactions. Minimizing risk needs to be done by online stores to increase transactions.

This study implies that to increase customer purchase intention, online stores must develop marketing strategies taking into account the quality of service. Online stores can pay dearly for the attributes of excellent service quality. This study made an essential contribution to the role of trust in moderating service quality and perceived risk towards the intention of online shopping.

Further research is needed to test the generalization of research concepts in the context of the intention to buy online and in other contexts. Future research is also needed to examine the role of trust in the online transaction by considering the role of knowledge (Gefen et al., 2003) and the level of customer involvement (Delgado-Ballester and Munuera-Aleman, 2014) on trust.

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Investor Decisions with Pecking Order Theory Method: Strategy of an Investor to Get Right Issue

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Keywords: Investor Decision, Pecking Order, Right Issue, Operating cash flow ratio, debt to equity, Return on Assets, Net Profit Margin, Assets turnover, Price earnings ratio.

Abstract: The purpose of the study is: (1) to tempt and prove empirically Investor strategy on Operating Cash Flow Ratioof company before and after right issue; (2) on Debt to Equity Ratio ; (3) on Return on Asset ; (4) on Net Profit Margin ; (5) on Asset Turnover; (6) to tempt and prove empirically Investor strategy about Price Earning Ratio . This study method implemented purposive sampling. The results showed : (a) there is no difference on Operating Cash Flow Ratio between before and after right issueto performance improvement of Cash Flow Ratio is insignificant; (b) there is no diference onDebt Equity Ratio between before and after right issue to decreasing Debt Equity Ratio performance is insignificant; (c) there is no difference onReturn on Asset between before and after right issue to improvement of Return on Asset performance is insignificant; (d) there is no difference onNet Profit Margin between before and after right issue toinsignificant improved performance; (e) there is a difference onAsset Turnover between before and after right issue to significant decrease.

1 INTRODUCTION

Capital Market Law Number 8 Year 1995 has explained about the mechanism of trading in the capital market. According to the Decision of the Chairman of the Capital Market Supervisory Agency no. KEP-26 / PM / 2003 describes Rights Issue is an additional share capital of a company that has conducted a Public Offering of shares or Public Company. This capital increase activity through Preemptive Rights or Public Offering of Warrants or Conversion Securities. Investors will be more strategic with pecking order theory to gain maximum profit.

Pecking Order Theory states that companies tend to choose funding that comes from internal rather than external companies (Ghosh, 2011) which explains that corporate priorities have a main role in choosing funding. The priority begins with internal funding as the first option, if internal funding is considered less, both companies will propose a debt.For the last option, if the debt is considered less, the company will issue shares. issuing some shares can be done through action one of which is a right issue. The last option is what is the explanation of why the company should issue a stock back or right issue.

Right issue is a right that is purposed to the current shareholders to buy shares which will be reissued by the company (Dewi and Rahyuda, 2014). When investors buy rights issue shares then the company get capital for the issuance of their shares. There are several important dates around the right issue; 1) Cum date is the date the investor can register to earn their right issue, 2) Ex date is the date if an investor is no longer registered, 3) Rec date is the date of recording and 4) Distribution date is the date of the right issue is distributed. This theory can be explained why companies are able to gain high profit with low debt. An investor who gets the rights to a right issue should have several options that must be done. There are three options: (a). Use or exploit the right whereveran investor will buy them which offered in the right issue by filling out the form or purchasing mechanism provided by the securities; (b). Sell right issue rights wherever investors have no more rights to purchase shares which offered by the company; (c). Investors should ignore the right to right issue wherever this action will result loss of rights after the distribution date passes.

2 RESEARCH PROBLEMS

(Wijaya, 2015) explains the company's financial performance before and after the occurrence of corporate action by issuing a right issue, through observing six company financial performance variables, namely: Operating cash flow ratio (OCR), Debt to equity ratio (DER), Return on Assets (ROA), Net profit margin (NPM), Assets turnover (AT), and Price earnings ratio (PER) on the Indonesia Stock Exchange, are different. Of the 12 companies that issued a rights issue in 2011 on the Indonesia Stock Exchange, if described in a graph of financial performance based on these six variables, it appears that some fluctuated sharply, some experienced changes but were not significant, some were not so influenced by the existence of issue rights issue.

The strategies alternative for investors in responding to the issuance of rights issues for new shares are: (1) using the right issue to buy new shares, or (2) selling rights on the right issue, or (3) ignoring the rights on the rights issue. The choice of an alternative strategy depends on whether or not there is an improvement in the company's financial performance after the issuance of a rights issue. Based on the results of (Wijaya, 2015) research, the writer is interested in conducting further research with the title "Investor Decision with Pecking Order Theory Method: Investor's Strategy to Get Rights on Right Issues"

The problem formulations of this study are as follows: (1) How the Investor's strategy with the company's Operation Cash Flow Ratio performance before and after the rights issue; (2) How the Investor's strategy with the company's Debt to Equity Ratio performance before and after the rights issue; (3) How the Investor's strategy with Return on Asset performance before and after the rights issue; (4) How the Investor's strategy towards the Net Profit Margin before and after the rights issue; (5) How the Investor's strategy with Asset Turnover performance before and after the rights issue; (6) How the Investor's strategy with Price Earning Ratio performance before and after the rights issue.

The purposes of the study are : (1) to tempt and to prove empirically Investor strategy on Operating Cash Flow Ratioof company before and after right isuue; (2) to tempt and to prove empirically Investor strategy on Debt to Equity Ratio of a company before and after right isuue; (3) to tempt and to prove empirically Investor strategy onReturn on Asset before and after right issue; (4) to tempt and to prove empirically Investor strategy on Net Profit Margin before and after right issue; (5) to tempt and to prove empirically Investor strategy on Asset Turnover before and after right issue; (6) to tempt and to prove empirically Investor strategy on Price Earning Ratio before and after right issue.

3 LITERATURE REVIEW

Pecking Order Theory: The Pecking Order Theory was first presented by Modigliani and Miller in 1958 (Sheikh et al., 2012). Pecking Order Theory states that companies tend to choose funding that comes from internal rather than external companies (Ghosh, 2011). In this theory it is explained that there are corporate priorities in choosing funding. The priority begins with internal funding as the first option, then if internal funding is still considered less then the choice of both companies is debt and the last option if the debt is still considered less then the company will issue shares. Issuing shares can be done through corporate action one of which is a right issue. The last option is what explains why the company is issuing a stock back or right issue. Pecking Order Theory: Pecking Order Theory differs from the trade-off theory where in trade-off theory it is explained that companies must achieve their debt targets. Target debt is a balance target which the benefits can be taken and debt should be balanced with the costs incurred in the presence of such debt. One of the benefits of the debt is to disminish taxes. However, this theory simply explains the funding needs based on the priority order only. Therefore, there should be an explanation why companies can have high profitability with low debt.

Company Performance: Performance is the result of work in quality and quantity achieved by an employee in carrying out its duties in accordance with the responsibilities that have been given (Nazaruddin and Basuki, 2015). Quality work can be presented in a narrative or descriptive way. The quantitative work can be mathematically analyzed. Performance can be interpreted as a result or output obtained from the existence of a process. The value of a process can be seen in the performance of the process itself. Performance appraisal requires analysis of a process. Performance is either a result or a process undertaken by the organization. There are three types of performance that are: (a) Strategic performance as the result obtained from the strategy made by corporate managers; (b) Administrative performance relating to the relationships among work units; (c) The operational performance of the company is related to the effectiveness of organization in using the resources. Performance is the result of the quality and quantity achieved by a person or organization in carrying out the responsibility given (Mangkunegara and Ha-

sibuan, 2009). Performance according to the above definition can be interpreted that performance has two types, namely: (a) Financial performance related to the performance of a measurable individual or organization of economic activities that can be quantified. For example comparison of sales level from year to year; (b) Non-financial performance relates to the performance of an individual or organization that can not be measured by numbers. For example, customer satisfaction over services provided by employees. In (Ediningsih and Yacobus, 2009) explained that the performance of the company is an evaluation of how the company is considered successful or not in running its business. In evaluating the financial of company performance required tool called the ratio. Subramanyam and (Subramanyam et al., 2010) explain that there are ratios that can be used to measure the performance of a company such as liquidity ratio, capital structure ratio and leverage, investment rate return ratio, operating performance ratio, asset utilization ratio, and size ratio market. Each ratio has its own usability and interpretation.

4 HYPOTHESIS

4.1 Operating Cash Flow Ratio before and after Right Issue

Operating cash flow is the cash flow generated from the core activities of company (Amuzu, 2010). This ratio shows the cash received by the company from customers. Cash in operating cash flows is the cash flow received from customers from the core activities of company. Each company has different core activities. Debt payments will increase the value of the operating cash flow ratio (Amuzu, 2010). Cash earned from operating cash flows will not be too used to pay off corporate debt. Operation Cash Flow Ratio is derived from total operating cash flows divided by total current liabilities (Subramanyam et al., 2010). The value of the operating cash flow ratio is derived from dividing the operating cash flow to current liabilities. If the cash flow is higher, the value will be higher. (Simanullang and Daljono, 2013) stated that a company uses the funds obtained from the right issue in order to reduce their debt level. If current liabilities are less, the value will be high. The data is used to calculate the cash flow ratio which is obtained in the financial statements. Information on the operating cash flow of the company can be obtained in the financial company statements in the cash flow statement. Meanwhile, information on current liabilities can be

obtained in the financial of company statements in the consolidated statements of financial position. If the cash flow from operating activities increases then the operating cash flow ratio will be better with a fixed obligation record. If the right issue is used by the company to settle the obligation, the amount of corporate liabilities is reduced, the ratio will be better with the record of operating cash flow remains. Researchers have conducted international and national online and offline journal surveys, but have not found any research which using the ratio of cash flow operations as a measure of the financial performance of a company doing a right issue. The theory development of these variables uses theories derived from Subramanyam and (Subramanyam et al., 2010), (Amuzu, 2010). Considering the theory described by (Amuzu, 2010) and the logic of thought, hypotheses have one direction. From the description above, it can be derived hypothesis as follows;

H1: Suspected there are differences in operating cash flow ratio before and after right issue

4.2 Differences Debt to Equity Ratio (DERR) before and after Distribution Date Right Issue

Debt to Equity Ratio (DER) is a ratio that measures the capital structure of company derived from total liabilities divided by shareholder equity (Subramanyam et al., 2010). This ratio shows the ratio between liabilities and corporate equity. The assets owned by the company come from their own capital and debt or loans. Given the Debt to Equity Ratio (DER) ratio the proportion between capital and debt will be seen clearly. Another theory mentions the relationship between debt with the right issue. Research conducted by (Simanullang and Daljono, 2013) states that companies tend to use funds obtained from rights issue activities in order to reduce the level of corporate debt. However, in practice the company not only uses the funds from the rights issue to pay off the debt alone, but also to conduct an expansion or buy assets. Research conducted by (Ediningsih and Yacobus, 2009) states that there are differences in Debt to Equity Ratio (DER) before and after the Right Issue. The sample used by the research is as many as 14 companies doing Right Issue. In the research the significant value for the Debt to Equity Ratio (DER) variable is 0.023 or below 0.05 alpha level. Research conducted by (Simanullang and Daljono, 2013) states that there is no significant difference of Debt to Equity Ratio (DER) before and after right issue. The population of the study used a company listed on the Indonesia Stock Exchange 2008-2010. Research con-

ducted by (Ediningsih and Yacobus, 2009) states that there is difference of Debt to Equity Ratio (DER) before and after right issue. This indicates that funds obtained from the rights issue are used to pay off the liabilities of company. Debt repayment by the company will affect the value of Debt to Equity Ratio (DER). Less debt will increase the proportion of capital to debt. Therefore, if the company tends to use the cash earned from the right issue to pay off the debt of company, the Debt to Equity Ratio (DER) value will tend to decrease. From the description above, it can be derived hypothesis as follows;

H2 : Suspected there is difference Debt to Equity Ratio before and after Right Issue

4.3 The Defferences between Return on Assets (ROA) before and after Right Issue

Return on Assets (ROA) is a financial ratios used tomeasure the relationship between profits and asset investment needed to generate profit. Companies use their assets to generate income. They are machines, buildings, and intangible assets such as brands. Return on Assets (ROA) is derived from net income divided by the average total assets of the company (Subramanyam et al., 2010). It will be higher if the value of denominator (net profit) is greater than the value of the numerator (average total assets). The informations are required to calculate the Return on Asset ratio can be found in the Financial Statements. Net income can be found in the Income Statement. The value of the company's assets can be found in the Financial Position Report. Research conducted by (Ediningsih and Yacobus, 2009) states that the value of Return on Assets (ROA) is significantly different between before and after the right issue. This study uses the company population listed on the Indonesia Stock Exchange in 2001-2003. From the description above, it can be derived from hypothesis as follows:

H3: Suspected There are difference in Return on Assets before and after Right Issue

4.4 Differences Net Profit Margin before and after Right Issue

Net Profit Margin (NPM) is the ratio used to measure the level of a company's operating performance derived from net income divided by sales (Subramanyam et al., 2010). This ratio reveals how much net profit can be generated from the sales / revenue earned by the company. Research conducted by (Ediningsih and Yacobus, 2009) states that there is no significant

difference between Net Profit Margin before and after Right Issue. The population of the research are companies listed on the Indonesia Stock Exchange from 1997 to 2001. Research conducted by (Khajar, 2010) states that there is no significant difference in the ratio of Net Profit Margin before and after the right issue. Research conducted by (Ediningsih and Yacobus, 2009) states that there is a difference Net Profit Margin (NPM) before and after right issue. From the description above, it can be derived hypothesis as follows.

H4: Suspected There Are Difference Between Net Profit Margin before and after Right Isuue

4.5 Defferences in Assets Turnover before and after Right Issue

Asset Turnover (ATO) is the ratio used to measure the efficiency of companies in using their assets (Hofstrand., 2013). It assesses ability of a company in utilizing assett to generate sales. ROA assesses the return on investment on assets viewed from net income. ATO is a ratio that shows the activity of the company obtained from dividing sales by total assets (Khajar, 2010). This ratio is used to measure the level of firms in utilizing their assets. In addition, this ratio explains the ability of firms in utilizing their assets to generate revenue. The research conducted by (Khajar, 2010) states that there is no significant difference in turnover assets before and after the company exercises a right issue. The study examined the differences in the financial performance of firms by using two pre- and postperiods to measure differences. Research conducted by (Ediningsih and Yacobus, 2009) states that there is no difference in Asset Turnover (ATO) before and after the right issue. This is because the funds obtained from the rights issue are not invested to buy assets but are used to pay off the liabilities of company. If the company can effectively utilize its assets to generate sales then the value of Asset Turnover (ATO) will improve. Companies with multiple assets may not necessarily produce decent sales when compared to their asset holdings. From the description above, it can be derived hypothesis as follows.

H5: Suspected there is sifference between Assets Turnover before and after Right Issue

4.6 Differences Price Earnings Ratio (PER) before and after Right Issue

Price Earning Ratio (PER) shows the stock price that the investor is willing to pay for the profit of company. PER is the ratio of the firm's stock price to earnings per share of the company. Price Earning Ratio (PER)

is the ratio used to show the stock performance of a company obtained from share price divided by earnings per share (Khajar, 2010). The greater the value of PER then the more expensive the price of a stock. Previous research conducted by (Khajar, 2010) showed a significant difference in Price Earning Ratio (PER) before and after the Right Issue. This shows that there is a difference in the company's stock performance. If the company's stock price is high while earnings per share is low, it will produce a high Price Earning Ratio (PER) value. High Price Earning Ratio (PER) marks the value of an expensive company's stock in other words investors do not like it. If the firm price is low with high earnings per share, it will result in low Price Earning Ratio (PER). From the description above, it can be derived hypothesis as follows:

H6: Suspected there is difference between Price Earnings Ratio (PER) before and after right issue

5 REAEARCH METHOD
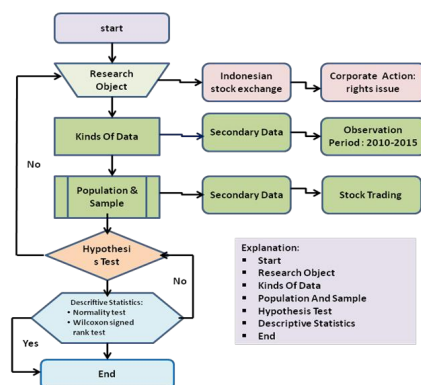
Figure 1: Flowchart Of Research Methods and Processes

The object of this research is all companies listed on the Indonesia Stock Exchange that carry out corporate actions issue a rights issue during the observation period, namely in 2010-2015(Indonesia, 2015). The type of data used is secondary data about the company's financial performance seen from six variables, namely: Operating Cash Flows Ratio, Debt to Equity Ratio, Return on Assets, Net Profit Margin, Assets Turnover, and Price Earnings Ratio. This research is an Event Study that is by looking at the impact of corporate action issuing rights issues on stock trading 25 days before and 25 days after corporate action. The analytical method used to prove the hypothesis proposed in this study is the normality test and the Wilcoxcon signed test. By comparing the value of each variable before and after the company carries out a corporate action issue a rights issue. The conclusions obtained will also be an alternative strategy

that should be chosen by investors according to the variables tested.

6 RESEACH RESULTS AND DISCUSSION

6.1 There is No Difference between Operting Cash Flow Ratio before and after Right Issue

Operating Cash Flow Ratio is the ratio used to assess the financial performance of company in paying off current liabilities by using cash obtained from the company's operating activities. Right issue is the issuance of stock returns by the company to increase the company's capital. Wilcoxon Signed Ranks test results show that there is no difference in Operating Cash Flow ratio before and after the right issue with a non-significant performance increase. This shows that there is no change in the company's ability to pay off current liabilities by using cash obtained from operating activities between before and after the right issue. According to Amuzu (2010) states that corporate liability payments will increase the value of Operating Cash Flow Ratio. Therefore, the payment of liabilities has not been done significantly by the company. The lack of performance difference in Operating Cash Flow Ratio is caused when the cash obtained from the right issue has not been used significantly to improve the company's operating performance. In addition, the cash earned from the right issue has not been used significantly by the company to pay its current liabilities. PT Indoritel Makmur International / DNET is one of the samples of this study that has not focused on the right issue proceeds to increase sales. The news reported on the web britama.com explains that DNET or PT Indoritel Makmur International uses the right issue proceeds for investments in several companies

6.2 There is No Difference between Debt to Equity Ratio before and after Right Issue

Debt to Equity Ratio (DER) is a ratio that measures the capital structure of company derived from total liabilities divided by shareholder equity (Subramanyam et al., 2010). This ratio shows the proportion between liabilities and corporate equity. Right issue is the issuance of stock returns by the company to increase the capital of company. Wilcoxon Signed Ranks test results show that there is no dif-

ference of Debt to Equity Ratio before and after right issue although there is a significant decrease. This indicates that before and after right issue there is no change of capital structure of company. The comparison between shareholder liabilities and equity did not change significantly. According to Sunarjanto in (Simanullang and Daljono, 2013) stated that the change of Debt to Equity Ratio is not significant due to the proceeding rights issue funds are not used to pay off the debt. The results are not conducted by (Ediningsih and Yacobus, 2009) states that there is difference on Debt Equity Ratio before and after right issue. This makes sense because in research of (Ediningsih and Yacobus, 2009) that companies are more likely to use funds from the rights issue to pay the matured obligations. However, the results of this study should support (Fahmi and Saputra, 2013) states that there is no difference in solvency before and after the right issue. The absence of a Debt to Equity Ratio difference is caused when the company does not significantly use funds from the rights issue to pay corporate liabilities. Therefore, the composition of liabilities does not change significantly compared to equity although the composition of equity changes due to capital increase through right issue.

6.3 There is No Difference between Return on Assets before and after Right Issue

Return on Assets (ROA) is the financial ratios used to measure the asset investment relationship used to generate profit (Lindo in Diminica et al, 2012). Right issue is the issuance of stock returns by the company to increase the company's capital. Wilcoxon Signed Ranks test results show that there is no difference in Return on Assets before and after the right issue and there is no significant increase in performance. This shows that before and after right issue there is no change in the increase in profits resulting from the use of company assets. The results are not supported by research conducted by (Ediningsih and Yacobus, 2009) states that there is no difference in ROA before and after the right issue. This makes sense due to the research (Ediningsih and Yacobus, 2009) , companies are more inclined to invest the proceeds of rights issue to buy company assets such as machinery, buildings and other equipment to increase the company's net profit. The absence of a difference in ROA is caused when the firm does not significantly use data from a rights issue to invest in assets. If the company invests its assets in order to increase the company's productivity, its net profit will increase as it is followed by revenue and production efficiency.

6.4 No Net Profit Margin Differences before and after Right Issue

Net Profit Margin is a ratio that measures the ratio of net income to sales. This ratio measures the effectiveness of the company in generating net income by minimizing the cost. Right issue is the issuance of stock returns by the company to increase the company's capital. Wilcoxon Signed Ranks test results showed no difference Net Profit Margin before and after the right issue significant increase in performance. This shows that before and after the right issue does not change the company's ability to minimize costs. The results of this study supported research conducted by (Ediningsih and Yacobus, 2009) which states that there is no significant difference Net Profit Margin before and after right issue. The results of this study also supported research conducted by (Khajar, 2010) which states that there is no significant difference Net Profit Margin before and after right issue. The absence of a difference in Net Profit Margin is due to the fact that the company does not use the funds obtained from the rights issue to minimize costs. These costs represent costs incurred when the company generates revenue

6.5 Differences in Assets Turnover before and after Right Issue

Asset Turnover is a ratio that shows the level of ability of a company to use assets to generate sales (Hofstrand., 2013). Company assets that are rarely used or even unused but still recognized are called null assets. Right issue is the issuance of stock returns by the company to increase the company's capital. Wilcoxon Signed Ranks test shows that there is a difference in Asset Turnover before and after the right issue and a significant decrease in performance. This shows that before and after the right issue there is a change in the company's ability to use assets to generate sales. The results of this study are not supported by research conducted by (Khajar, 2010) which states that there is no significant difference in asset turnover before and after right issue. The results of this study are also not supported by research conducted by (Ediningsih and Yacobus, 2009) states that there is no difference in asset turnover before and after the right issue. The difference in the decrease in Asset Turnover is because the company has not used the funds from the right issue to increase sales. The company is still focusing funds from the rights issue for other things. PT Indoritel Makmur International is one of the samples of this study that has not focused the right issue proceeds to increase sales. The news reported on the

web britama.com explains that DNET or PT Indoritel Makmur International uses the right issue proceeds for investments in several companies.

6.6 No Price Earnings Ratio Differences before and after Right Issue

Price Earning Ratio (PER) is the ratio used to show the stock performance of a company obtained from the share price divided by earnings per share (Khajar, 2010). Investors tend to choose or buy companies with low PER Right issue is issuing of shares re-done by the company to increase the company's capital. Wilcoxon Signed Ranks test shows there is no difference Price Earning Ratio before and after the right issue increase Price Earning Ratio is insignificant. This indicates that right issue is not a good indicator for investors to buy shares of the company. Although the company does a right issue, investors tend to avoid the stock of the company. The results of this study are unsupported by previous research conducted by (Khajar, 2010) states that there is no difference in Price Earning Ratio before and after the right issue. Differences in results are possible due to the use of different time periods. The absence of differences in Price Earning Ratio is because the market does not call the right issue. Therefore investors will tend to avoid companies doing the right issue. PT Lipppo Karawaci is one of the company's samples of research avoided by investors. The news reported in Kontan.co.id by (Taqiyyah, 2010) explains that the related rights issue plan of PT Lippo Karawaci shares decreased by -16.18% to Rp 570 per share.

7 CONCLUSIONS

Based on this data analysis and testing, the conclusions are:

a There is no difference of Operating Cash Flow Ratio between before and after right issue with performance improvement of Operating Cash Flow Ratio is insignificant; Investor's strategy does not use the right to buy shares in a rights issue.

b There is no difference of Debt Equity Ratio between before and after right issue with decreasing Debt Equity Ratio performance is insignificant. Investor's strategy does not use the right to buy shares in a rights issue.

c There is no difference of Return on Asset between before and after right issue with performance increase Return on Asset is insignificant. Investor's

strategy does not use the right to buy shares in a rights issue.

d There is no difference in Net Profit Margin between before and after right issue with insignificant performance improvement. Investor's strategy does not use the right to buy shares in a rights issue.

e There is a difference between the Asset Turnover before and after the right issue with a significant decrease. Investor's strategy does not use the right to buy shares in a rights issue.

f There is no difference in Price Earning Ratio between before and after right issue with the increase of Price Earning Ratio is insignificant. Investor's strategy does not use the right to buy shares in a rights issue.

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The Determinant of the Debt Policy of the Firm

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Keywords: debt policy, free cash flow, institutional ownership, leverage

Abstract: This study aims to examine and analyze the effect of independent variables in the form of, institutional ownership, free cash flow, and leverage on the dependent variable in the form of debt policy. The population in this study are insurance companies listed on the Indonesia Stock Exchange for the period 2015 to 2017. Based on the purposive sampling technique, a sample of 35 companies was obtained. The data analysis technique used is descriptive statistics and hypothesis testing in the form of multiple linear regression analysis. The test results show that the free cash flow variable does not have a negative and insignificant effect on debt policy. Institutional ownership variables do not have a positive and insignificant effect on debt policy. Leverage variables have a significant negative effect on debt policy. Free cash flow, institutional ownership and leverage are able to influence debt policy together by 29.5%.

1 INTRODUCTION

YA firm is established to increase its values so it can give the stockholders a welfare. Wahyudi and Parwestri (2006) in (Nuraina, 2010) stated that in long term objective is to optimize its value. The higher the value, the more welfare the owner. The value reflects the stock market price. One of the determinant is the firm's ownership structure. Some researchers believed that the structure will be able to affect the running of the firm which will affect its performance in purpose of the goal, it is the value maximization. This is caused by their control. The stock market is expected to react positively if the firm is managed by qualified competent management or it owned by good credible image stockholders. The control that owned by the owner will affect its performance. Free Cash Flow describes the financial flexibility level of the firm. Jensen (1986) in J(Lucyanda et al., 2012) stated that a manager should have incentive to enlarge the firm more than its optimum size, so they keep doing their investment in spite of their negative net present value. If the firm has free cash flow, a better firm should divide it in form of dividen to prevent the waste of funds on not profitable project. According to Mamduh and Hanafi (2013) in (Geovana, 2015) that a firm which implements fixed cost in high proportion must implement high operating leverage. In other word, Degree of Operating Leverage (DOL) of the company is high, if it has high DOL, thus high sale

level will generate high revenue, on the other side if the sale decreased significantly, the firm will experience loss.

2 RESEARCH METHOD

2.1 Samples Population and Selection

The population for this research is taken from all 2015-2017 Indonesia Exchange Stock registered insurance firm. The selection is determined by implementing purposive sampling technique. The purpose is to obtain representative samples. The process is as following:

The company has annual financial report which ispublished during researching period, and also it has outlier data.

Based on that criteria, they obtained 35 samples which consist of 10 firms within 2015, 13 companies within 2016, and 12 firms within2017.

2.2 Data Normality Test

The result of this test with One-Sample Kolmogorov-Smirnov Test showed "Asymp. Sig. (2-tailed)" is 0,056. It results more than α is 0,05, so sample data distribute normally.

2.3 Multi Collinearity Test

Each of Tolerance and Variance Inflation Factor (VIF) variables shows all independent variable have Tolerance more than 0,1 while VIF less than 10 Thus, there is no multi collinearity for this regression model.

2.4 Autocorrelation Test

The result of this test is 2,228 for D-W. Determined α is 5% and all sample is 35 in D-W table, then obtaining du is 1,6528 and dl is 1,2833. Based on Decision Taking table whether there is autocorrelation or not, D-W or d is between du and 4-du is $1,6528 \leq 2,228 \leq 2,3472$. Thus, there is no autocorrelation for this regression model.

2.4.1 Heteroscedasticity Test

The Glejser test shows there is no significant independent variable (lesser than 0,05) which affects dependent variable is absolute residual (abs_res). This can be seen from its each significance (Sig) variable is more than α is 0,05. Thus, there is no heteroscedasticity for this regression model.

2.4.2 Multiple Linear Regression Analysis

Table 1: Multiple Linear Regression Analysis.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Constant	-1,309	,341		-3,838	,001		
FCF	-,038	,039	-,086	-,971	,339	,970	1,031
INST	,007	,046	,014	,161	,873	,955	1,048
LEV	5,298	,535	,875	9,903	,000	,981	1,019

Data processed Based on the result, it obtained this regression equation as shown below:

$$DER = -1,309 – 0,038 FCF + 0,007 INST + 5,298 LEV + \varepsilon \quad (1)$$

The determination coefficient test result shows 0,74, it means that free variables such as FCF, INST, and LEF affect debt policy variable up to 74% while the rest is 26% that affected by other factors which is not studied in this research.

2.5 F Test (Uji Goodness of Fit Test)

The result of goodness of fit model reveals free cash flow influence, institutional policy, and leverage simultaneously toward debt policy. Counted F is 33,182 while the significance is 0,000 so it is lesser than 0,05.Therefore, this model is recommended to predict free cash flow influence, institutional policy, and leverage simultaneously affect debt policy (DER) on insurance company listed in Bursa Efek Indonesia during period 2015- 2017.

2.6 T-test (Partial Test)

Based on the test, it obtained the constant is negative 1,309 which is significant due to the significance is 0,001 lesser than 0,05, FCF affects negative 0,038 insignificant against company value which is 0,339 more than 0,05. INST affects positive 0,007 insignificant against company value which is 0,873 more than 0.05. LEV affects positive 5.298 significant toward company value which is 0,000 lesser than 0,05.

3 DISCUSSION

3.1 Free Cash Flow Effect toward Debt Policy

First Hypotesis states that the indication of negative effect between fee cash flow and debt policy. This hypotesis is unsupported by the research result. The free cash flow (FCF) test obtained negative and insignificant effect toward debt policy. The coefficient is negative 0,038 with significant is 0,339 more than 0,05. Thus, free cash flow hypothesis with negative and significant effect is unsupported statistically.

However, the result of this research is accordance with Faisal (2004). The result shows that firm with high free cash flow will be capable to pay off high debt. So sufficient free cash flow is expected to affect the debt policy. Provided free cash flow reflects the ability of the firm to pay its debt. The firm pays the debt by using free cash flow so if a firm expects high debt, it should provide sufficient free cash flow for debt payment. The more free cash flow provided, the

more a firm is able to pay it, so a firm is expected to use high debt.

What made the acceptance of the first hypothesis in this research is its free cash flow probability which is shown that the firm is less survived, which means that the firm is less active in applying free cash flow maximally, or it is less aggressive in searching for profitable projects so the debt is used minimally.

3.2 Institutional Ownership Effect toward Debt Policy

The second hypothesis states that the ownership institutional has negative effect toward debt policy. It is supported by the research result. The institutional policy (INST) test indicated insignificant positive effect toward debt policy with coefficient positive 0,007 and significant 0,873 more than 0,05. Thus, significant negative institutional ownership is unsupported statistically. This result is reconfirmed by (KARTINAH, 2006) that despite positive institutional ownership toward debt policy, it is still insignificant. This research result is research by Jensen and Meckling (1976) in (Nabela, 2012) states that the ownership is more higher, causes stronger external control of the firm, so it can diminish agency costs. The higher the ownership, the lower the operational debt. It is caused by supervision of other institutions on firm performance such as bank and insurance company. If the firm spends big amount debt for failure possibility high risk project, the stockholders will sell out their stocks.

3.3 Leverage Effect toward Debt Policy

Third hypothesis states that leverage negative effects toward debt policy. This hypothesis is unsupported by the research result. Leverage (LEV) test is significant positive effect proof toward debt policy. The coefficient is positive 9,903 with significance is 0,000 lesser than 0,05. Thus, hypothesis on significant negative effect leverage is unsupported statistically.

The research result is opposite to the third hypothesis that a company with low operating leverage is able to enlarge financial leverage. Due to both interaction can affect net profit, so if it is in low operating leverage, it will increase the debt, on the other hand if it is in high level, debt is unnecessary. It relates to pecking order theory that in company internal finance is a priority if the operational profit can cover its operational activity.

Factor that the third hypothesis is not supported is shown by high operating leverage that will describe

high sensitivity of operational profit against sale fluctuation. The higher operating leverage, the more profit the more sensitive profit against the fluctuation, so in purpose of gaining high profit, the company will expand the sale in all way. This causes they will spend external source of funds instead of debt policy as their investment finance source.

4 CONCLUSIONS, RESEARCH LIMITATION, SUGGESTION

4.1 Conclusion

Cash flow, institutional ownership and leverage are able to affect debt policy up to 74%. It is reflected from adjusted R2 up to 0,740 while the rest is 26% affected by other factors which are not studied in this research.

Free cash flow, institutional ownership and leverage have significant effect toward debt policysimultaneously. It is shown that counted equals to 33,182 with significance 0,000 lesser than α equals to 0,05.

Free cash flow (FCF) has no negative effect and no significance toward debt policy on insurance company in BEI (Indonesia Stock Exchange) during period 2015–2017. It is shown that counted t equals to –0,971 with significance 0,339 more than 0,05.

Institutional Ownership (INST) has no positive effect and no significance toward debt policy on insurance company in BEI (Indonesia Stock Exchange) during period 2015–2017. It is shown by counted t equals to 0,161 with 0,873 more than 0,05.

Leverage (LEV) has positive significance toward debt policy on insurance company in BEI during period 2015- 2017. It is shown that counted t equals to 9,903 with significance 0,000 lesser than 0,05.

Based on the analysed result, the most dominant effect variable toward debt policy is leverage compared to the other two variables. Due to leverage has counted t equals to positive 9,903 at most. Thus, leverage is the most affecting factor on debt policy.

4.2 Limitations of Research

This research has limitations such as : three years relatively short observation period only by researcher during 2015-2017, so it less reflects long term condition. They implemented three independent variables only, which actually there are still many variables can affect debt policy.

4.3 Suggestion

An investor needs to notice the amount of debt policy and some affecting factors such as free cash flow, institutional ownership and leverage before making decision for investing. A manager should consider some factors which are affecting debt policy in determining the amount of fund, both from the debt and own money. Hopefully, the funding is able to cost operational activity and company investment, also creating an optimum debt policy. To following researchers: hopefully, there will be more variables which possibly affect the debt policy since in this research, independent variable has only explained the dependent one up to 74%.

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Experimental Study of Aluminum Composite Material by the Percentage Variation of Volcanic Ash Reinforcement

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Keywords: Aluminum composite, volcanic ash, percentage of reinforcement, stir casting, material testing.

Abstract: This research is using the volcanic ash from the eruption of Mount Kelud as material composite reinforcement. Information about large amounts of Silica (SiO_2) on Mount Kelud volcanic ash and its abundant amounts in Yogyakarta after the eruption, were the reason for choosing this material as reinforcement in the making of aluminum metal composite. This composite is using the recycled aluminum material as their matrix. Stir casting method used during the experiment. 1%, 3%, 5% of volcanic ash used with 300 rpm stirring rotation and 4 minutes stirring rotation. Microstructure testing, hardness testing, impact testing and tensile testing were carried out to determined changes in material characteristic. The result showed that the addition of 1% volcanic ash reinforcement gives the highest hardness and toughness number to aluminum composite material, but the lowest ductility value. The highest aluminum composite material ductility value reached in the addition of 3% volcanic ash reinforcement.

1 INTRODUCTION

Aluminum material is widely used because it has several advantages, including formability and tensile strength which can be improved through cold working processes or a heat treatment process (Callister, 2007)) . In the aluminum industry, it is usually combined with other elements to get better product characteristic. Composite is a material that composed from a combination of two or more types of material which are differentially macro in shape and composition(Waddoups and Halpin, 1974). It is produces new material which is very different from the basic material. Al-Si-Cu-Mg is the aluminum composites that quite widely used in the industrial world because of their pour ability and good mechanical characteristic in heat treatment conditions (Runxia et al., 2010). The Stir casting method is the process of casting by melting the metal until it boils and then stirring continuously until a vortex is formed (Hashim et al., 1999). The reinforcement (in the form of powder) is mixed gradually through the edges of the formed vortex (Ajiriyanto, 2010).

Bhushan and Kumar (Bhushan and Kumar, 2011)

have conducted research on the the distribution effect of SiC particles on Al-7075 with the stir casting method and maintained temperature in the range of 750 to 800o C. This experiment result shows that the 5 to 15% SiC reinforcement added will increase the 10.48% hardness value. In stirring with a rotation of 500 rpm, metallographic result shows a uniform distribution of granule structure with clearly visible granule boundaries. This study took the stir casting method from Bhushan and Kumar experiment by using the volcanic ash as a reinforcement material. The stir casting method are suggested to reduce the porosity in material composite (Wilastari et al., 2011).

Volcanic ash often referred to volcanic sand or pyroclastic fall. It is a falling volcanic material that sprayed into the air during an eruption, consisting of large to fine-sized rocks. The volcanic ash that usedon this experiment coming from the eruption of Mount Kelud. Mount Kelud erupted on February 13th 2014 and sent wind-erupted volcanic ash in the form of fine material falling in Yogyakarta. The result from European Satelite Agency shows the chemical analysis of Kelud volcanic ash which contains minimum of 55.05% silica (SiO_2) (Guidebook et al., 2000). This

information and abundant amount of Kelud volcanic ash are the reason for choosing this material as reinforcement for Aluminum metal composite.

Few research on Mt. Kelud volcanic ash utilization has been done particularly on the agriculutre and building material (concrete and brick) (Bahri, 2015), (Saputra, 2011). The chemical characteristic of Indonesia volcanic ash has been research with SEM-EDS test. This research obtained Si content of the three types of volcanic ash ranges 45-60% and elements of Al ranges 14-20% (Latif et al., 2016). The research on the field of metal composite material just has been done in this research. The volcanic ash contain mineral and silica that never change into time. This material expected to improve the aluminum composites characteristic, such as tensile strength, hardness and toughness value.

2 METHODOLOGY

This experimental study was conducted to determine the physical and mechanical characteristic of Aluminum metal composite material with volcanic ash reinforcement by the stir casting process (Bhandare and Sonawane, 2013).

2.1 Material Preparation

The main material used in this study was recycled aluminum bars, with 80% aluminum and Kelud volcanic ash.

Figure 1: Aluminum bars and mount Kelud volcanic ash.

2.2 The Making of Composite Material

1. Smelting Process
   This smelting process used the smelting furnace with the LPG fuel. Heat the crucible then put the aluminum until its melt.

2. Mixing process
   Mixing Process is the mixture process of aluminum composite matrix with the volcanic ash as reinforcement, strain the volcanic ash with smooth sieve, then heat to $600°C$ nearly the molten aluminum temperature. The little amount of volcanic ash was put gradually into the molten

aluminum. This mixture done with the stir casting method, by the 300 rpm stirring speed and 4 minutes stirring time. This mixing process was done with three variation of volcanic ash reinforment percentage (1%, 3%, and 5%). The percentage of volcanic ash was have to be under 5% to avoid mixture clotted.

Figure 2: Stir Casting furnace

Figure 3: Material Mixing Process

3. Pouring & Dismantling Process
   Pouring process used crucibles ladel, molding pattern with gating system, green sand, and molding frame. Pour the molten aluminum on 650oC temperature. The molding dismantling process took after 15 minutes.

Figure 4: Material Casting Process and Casting Results

3 RESULT AND DISCUSSION

3.1 Composition Test Result

The result obtained from Spectrometer at the Engineering Materials Laboratory, Department of Mechanical and Industrial Engineering, Faculty of Engineering, Gajah Mada University. From the table above, we can see that the raw material of aluminum contains 13,3651% of Zn element. It means, the raw material itself was Al-Zn alloy. From the results of the composition test, it can be seen that the silica content addition does not addded Si composition to the composite material. A large percentage of Zn (Zinc) element will affect the nature of the composite material. The higher content of Zn (Zinc) in the composite soften the granule of the matrix but it will increase the composite brittleness (E8, 1992). The addition of 5% volcanic ash reinforcement decreased Al content until 78.35%.

Specimens	Original	1%, 300rpm, 4'	3%, 300rpm, 4'	5%, 300rpm, 4'
Element	(%)	(%)	(%)	(%)
Si	2.3387	2.2714	2.5118	2.1722
Fe	0.7118	0.873	0.8989	3.9102
Cu	1.0887	0.9892	1.134	2.2344
Mn	0.2397	0.2845	0.2591	0.2495
Mg	0.0034	0.0008	0.0006	0.001
Cr	0.0133	0.0152	0.0145	0.015
Ni	0.0551	0.0526	0.0563	0.0558
Zn	13.3651	11.9488	13.0086	12.3766
Pb	0.6139	0.7124	0.5995	0.6499
Sn	0.0259	0.0239	0.0261	0.0321
Al	81.5	82.81	81.71	78.35

Figure 5: Composition Testing Result.

3.2 Microstructure Testing Result

The microcrostructure testing in this experiment using 200x magnifition. The size and granule form observation method are using in the discussion of this microstructure result. Planimetri method is used to observe the granule size, which a circle with the certain size made on the microscope photograph.

The amount of granule on the circle, measured with the formula :

$$n_{eq} = \frac{n_c}{2} + n_i \qquad (1)$$

n_i = the amount of granule on the circle n_c = the amount of granule cut in circles
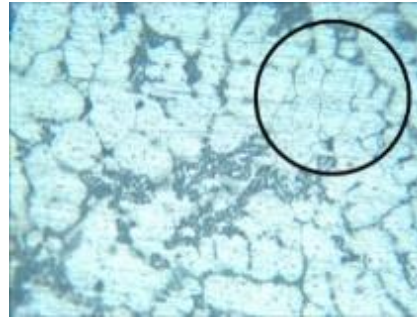

Figure 6: 1% of volcanic ash (Amount of granules = 12)

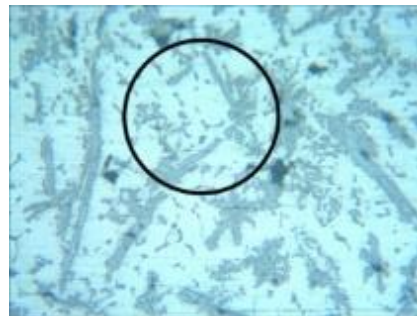Figure 7: 3% of volcanic ash (Amount of granules = 6)

Figure 8: 5% of volcanic ash (Amount of granules = 4)

The number of granule affects the material mechanical characteristic. The more number of granule, the higher value of material hardness and toughness.

3.3 Hardness Testing Result

No.	Specimens	Point 1	Point 2	Point 3	Average
		Hardness (HR$_C$)			
1	Volcanic ash: 1% n : 300rpm t : 4 minute	29	27	27	27.67
2	Volcanic ash: 3% n : 300rpm t : 4 minute	27,5	24	25.5	25.67
3	Volcanic ash: 5% n : 300rpm t : 4 minute	24,5	26.5	26	25.67

Figure 9: Hardness Testing Result.

This hardness test uses Rockwell scale C (HRC) hardness method. The highest hardness value was obtained on aluminum composites with 1% volcanic ash reinforcement of 27.67 HRC. The addition of reinforcement with a percentage of 3% and 5% reduces the hardness of the composite. Another research shows that the SiC added will increase the hardness value. This contary results shows from the existance of Silicone Carbida as reinforcement addition (Nugroho et al., 2014).

The microstructure test calculation result shows that the highest amount of granule were obtained from 1% volcanic ash reinforcement which reach 12 granule. The amount of granule on 3% volcanic ash reinforcement addition is 6 and on 5% volcanic ash reinforcement is 4 granule. The higher addition amount of granule, addition the higher material hardness value. On contrary, the fewer amount of granule, the lower material hardness value.

3.4 Impact Test Result

No.	Specimens	A (mm^2)	U (Joule/mm^2)	E (Joule)
1	Volcanic ash: 1% n : 300rpm t : 4 minute	80	1.49	119.5
2	Volcanic ash: 3% n : 300rpm t : 4 minute	80	1.41	113.1
3	Volcanic ash: 3% n : 300rpm t : 4 minute	80	1.44	115.3

Figure 10: Impact Testing Result.
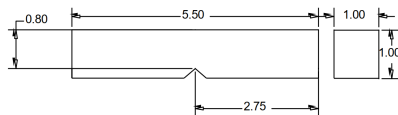
Figure 11: Impact Testing Result.

The result on the Figure 10 shows that absorbed energy to break the specimen are not much different among others. The calculation shows that the highest value from 1% volcanic ash reinforcement addition is equal to 119.5 Joules, while the lowest of 3% volcanic ash reinforcement addition is equal to 113.1 Joule.

The microstructure testing shows that 1% of volcanic ash reinforcement have the highest amount of granule and the highest energy to break the specimen. Therefore higher volcanic ash reinforcement will decrease the thoughness value.

3.5 Tensile Test Result

Specimens	F (N)	L$_1$ (mm)	ΔL (mm)	σ (MPa)	ε	E (MPa)
Volcanic ash: 1% n : 300rpm t : 4 minute	7573.3 5846.8 5689.8	36.6 36.8 36.7	1 1.2 1.1	102.4	0.031	3362.32
Volcanic ash: 3% n : 300rpm t : 4 minute	9653 6317.6 6631.6	36.6 36.6 36.7	1 1 1.1	121.2	0.029	4198.44
Volcanic ash: 5% n : 300rpm t : 4 minute	8515.1 7730.3 6160.7	36.7 36.6 36.6	1.1 1 1	120.1	0.029	4128.33

Figure 12: Tensile Testing Result.

The test was carried out with a Servopulser machine using 4 tons load. With data spesimens are: L0=35.6mm, D=8.9mm, A=62.18mm2. The test founded that the highest average tensile on 3% volcanic ash reinforcement addition was 121.2 MPa and the smallest was 1% volcanic ash reinforcement addition was 102.4 MPa. The tensile value increases with the addition of volcanic ash reinforcement. The microstructure test and granule amout calculation shows the amount of granule on the 3% and 5% volcanic ash reinforcement added has less granule from 1% of volcanic ash reinforcement added. It means the less amount of granule, the higher tensile strength.

4 CONCLUSIONS

This research result shows that the composition of raw material is known as Al-Zn alloy. The addition of volcanic ash reinforcement does not add Silica elements to the composite material significantly. The addition of 1% volcanic ash reinforcement produces the highest hardness and toughness of aluminum composite material and provides the lowest tensile strength value. The addition of 3% and 5% volcanic ash reinforcement decreases the hardness and toughness of aluminum composites, but its increases the tensile strength.

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Innovation on Accessible and Low Cost Deflection Measurement Devices

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Keywords: Optic mouse, deflection, innovation, low cost, measurement device modification

Abstract: Deflection occurs mostly in structures, especially those that accept lateral loads. Excessive deflection can cause damage, especially in the supporting structure therefore deflection must be measured but the deflection measurement device is still expensive so the application is limited. Modification of the deflection measurement device can be done using an optical mouse. The ability of optical mouse is expressed in the ability to scan the number of points in each area, the bigger the smaller the displacement that can be measured. we use a cheap mouse and the results show the mouse is able to measure deflection to accuracy of about 0.04 mm. Optical mouse is cheap so it is expected to use it more widely, except for practitioners and universities, it is hoped that it can also be used in vocational schools where the needs are large but the budget are limited.

1 INTRODUCTION

Monitoring of building structure deformation and durability testing of materials and structures is a very important process in development and production with the aim of maintaining safety and strength of the structure. Deflection occurs a lot in structures that cause deformation so it needs to be monitored by measuring it, especially when receiving maximum loads. Fibre optic sensors used for monitoring bridges (Yoneyama and Ueda, 2012). However the cost of fibre optic sensors is too high and the installation of the sensors is not easy for existing bridges. Another approach to bridge deflection measurement is the use of noncontact measurement method for example photogrammetry, moiré and laser scanning. A laser system has a potential to measure deflection distribution of bridge by scanning, however, at higher cost. Structural deflections represent a critical response parameter often measured for structural health monitoring (Attanayake et al., 2011). Laser tracker records position coordinates at few discrete points while laser scanner captures points of clouds representing deformed and undeformed shapes of a structure. These technologies present distinctive advantages, capabilities and limitations for field applications. Innovations in deflection measurement devices that are low cost (Guo and Wei, 2015) have to be created. This research tries to make a cheap deflection measurement device from a computer mouse. This aims to expand the use of these devices in practical and academic environments. This research is limited to the use of optical mouse to read shift points only in one direction (Ali and Al-garni, 1996), (Simm et al., 2016). Computer mouse that are modified only for one-way shifts. It is mainly for measuring very small distances. Deflection is very small, so it is precisely measured by this tool. The depth of drilling holes that require high accuracy can also be measured with this tool (Peng et al., 2007). There are still many kinds of very small distance measurements in daily work. This can be seen from the development of tools that are getting smaller in size so that the size needs to beaccurate in the design and manufacture. Vocational school students and university students really need to develop skills in designing and manufacturing tools or machines. Of course this cannot be separated from the use of measuring instruments. A cheap measuring instrument can be used even though it is not as precise as a high-tech measuring instrument which of course is expensive. However, the main objective is for students to master the basic principles of measurement that will not be separated from design. Cheap measuring instruments are expected to be used more widely so that it will increase the number of students who have better skills to support their future. The rest of this paper is structured as follows. After this introduction of study, some previous study related to this research are presented in theoretical background, materials and methods. Result and discussion presents

139

findings and lessons from the test and the innovation of measurement device. Finally, the conclusion presented including the implication of this study.

2 METHODOLOGY

The beam that receives the lateral load will be deflected according to the resultant direction of the load. In this study the beam (4) only accepts the concentrated load (5) in the middle of the span in a vertical direction. Therefore the point shift that occurs is only one direction, namely vertical deflection. The load is increased little by little so that the deflection that occurs also increases. Deflection is a change in the shape of the beam from horizontal to curve in the direction y due to the vertical loading. The deformation of the beam is very easily explained based on the deflection of the beam from its position before experiencing loading. Deflection is measured from the initial neutral surface to a neutral position after deformation occurs. The assumed configuration with neutral surface deformation is known as the elastic curve of the beam. Deflection that occurs along the beam can be determined by making a form of equation which is often called the curve deflection equation (or elastic curve) of the beam. Structural systems are placed horizontally especially for carrying lateral loads, i.e. loads that work perpendicular to the axial axis of the beam. Deflection is measured only at one point, which is near the point of loading. Mouse is one of the computer hardware that receives input in the form of movement, button pressure and scroll. The mouse used is a type of optics that does not use a mechanical system at all but uses a laser beam to detect shifting points. Technology in the optical mouse makes its performance far more precise than the type of mouse with a mechanical system. In recent years all digital accessories are no exception the mouse leads to the wireless trend. This mouse does not require a cable to transmit movement signals but via wireless messages received by the receiver device on the chip. With a wireless mouse, the installation will be more flexible on a series of research tools; it can even be installed at long distances according to the specifications of the mouse. But this type of mouse requires a battery in operation, considering that it has no cable so that the weight increases. Optical mouse (1) as a deflection measurement device is connected to a beam near the loading point. Shifting the point of the beam position or deflection at the point being reviewed is recorded directly at every second. The beam used is in the form of iron plate or rectangular cross section beam. This aims to make the beam only deflects in one direction

and does not experience bending in the other direction due to loading. The plate cross section size is adjusted to the length so that the plate is still in a straight state when it is not loaded. This aims to fulfil the requirements in using the formula for deflection and slope equations derived from the moment equation.
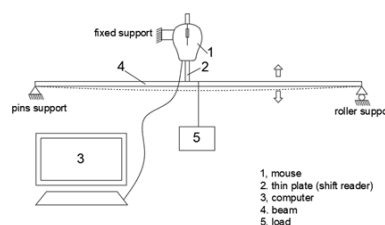
Figure 1: Deflection measurement scheme
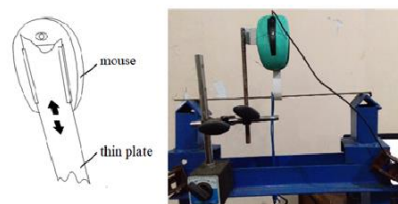
Figure 2: Mechanism of shift reader

The slope along the beam is zero when there is no load. Beams are supported by pins and roller orsimple beams so that there must be no shift in the horizontal direction. The load is applied to the beam little by little. Every second there is an increase in load and deflection. Additions to the load are carried out slowly so that changes in data can be read clearly in each second. Point shift will be recorded by the shift reader consisting of a thin plate (2) mounted on the mouse, but this plate can still be shifted. Data are recorded and displayed on a computer screen (3) with the help of program in the form of numbers and can be graphed. The graph shows the amount of deflection in each second. If an error occurs such as installing a shift reader on a beam that is connected to a mouse or a load movement that is not supposed to be, then it can be analysed from the graphic form.

3 RESULT AND DISCUSSION

The test is carried out by giving a concentrated load on 3 specimens in the form of iron plate. Iron plate cross section is 22,0 mm x 2,7 mm. Load is given manually because of the small beam size so it cannot use load cell because the load is small. The load is given gradually with a weight increase of 6.38 N as many as three steps. The data taken from this study is

the amount of deflection that occurs near the point of loading. A shift reader that connects the mouse and specimen is made of thin plates that are flexible or from paper. The way the thin plate works is like using a computer mouse that is installed with a small distance from the bottom side of the mouse. If the beam has a deflection, the thin plate shifts so that there is a point shift and recorded by the mouse. The underside of the mouse is mounted on a rail so that the thin plate can move or shift freely but the distance to the underside of the mouse remains The results of deflection measurements are displayed in graphical form with deflections on the axis and seconds on the ordinate as follows.
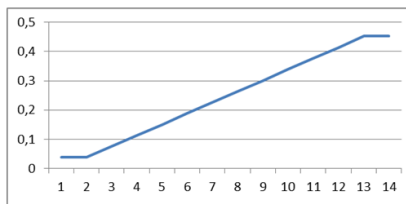
Figure 3: Graph of deflection with load start at 0 N
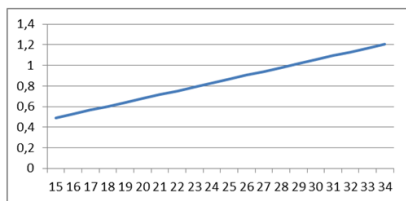
Figure 4: Graph of deflection with load start at 6,38 N
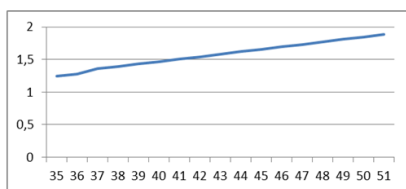
Figure 5: Graph of deflection with load start at 12,77 N

This measurement device has given result both magnitude and graph of deflection. The mouse computer is capable of detecting point shifts in very small distances as shown in the table results of measurement of deflection. In this study the shift of points read only one direction, has not been able to read the shift of points in various directions (Chen et al., 2018) , (He et al., 2017), (Yang et al., 2018). Therefore the test object must be ensured that there is no shift in the other direction. This is done by attaching the beam to a strong support even though the rod is free to move because it is a simple beam. The point shift on the beam from the horizontal position

to the deflection, which is downward, is read accurately because the beam is not in contact with the reader on the mouse, that is the laser (Szade et al., 2015) , (Maekawa et al., 2016) . However, the mouse is mounted on a fixed pedestal and does not shift following the shift of points on the beam. Therefore the point that is read is only at a certain position so that it is necessary to move the field along with the beam because of the area of the beam is small when viewed from the side. The field is in the form of a thin plate tied to the beam and passed to the gap under the mouse with the smallest possible distance. The point shift is read from the side or direction perpendicular to the direction of deflection. The cross section and the length of the test object are chosen with the consideration that they can be deflected in small loads and not deflected due to the load itself. This is intended so that the condition remains qualified in thecalculation of deflection (Ghuku and Saha, 2018). Another consideration is that the beam must be weighed little by little so that the increase in the deflection magnitude can be read every second. However, loading is not done with load cell because load cell are only for large load.

4 CONCLUSIONS

At the beginning of the load 0 N it turns out there has been a deflection of 0,038 mm. This happens because there is a place or container for loads that have their own weight and has not carried load yet. As shown in Figure 3, in the 1st and 2nd second, there had been a deflection due to the weight of the container. This is evidenced by the same initial conditions for specimens 2 and 3, namely at the time of load 0 N the amount of the deflection is 0,038 mm. The average increase in the amount of deflection on the specimen 1 per second is 0,03 mm. With the same steps of experiment for specimens 2 and 3, the average amount of deflection increase is the same for each second which is equal to 0,03 mm. The results of this study were the cheap mouse can measure deflection with accuracy about 0,04 mm. This innovation of measurement device proves that it will be easy and cheap for practical and academic environments.

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Analysis of Embung Abimanyu Utilization in Temanggung, Central Java, Indonesia

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Keywords: Embung Abimanyu, Performance analysis, Operation and Maintenance.

Abstract: A retention basin, named Embung Abimanyu, has been built as an effort to fulfill water requirement for the local community, especially for horticulture crops in Temanggung area, Central Java of Indonesia. It covers an area of approximately 90 x 70-meter square with a depth of 3.5 meters. This paper presents the results of performance analysis of the basin by using the following approaches; physical aspects, utilization aspects, and operational and maintenance aspects. We use the descriptive method with quantitative approach by collecting some technical data. In addition to technical aspects, non-technical ones are also included, which are attitude, opinion, and perception regarding the utilization of the basin.

1 INTRODUCTION

Embung is a small reservoir that serves to collect water during periods of excess water during the wet season, and is used in times of water shortage in the dry season, for various purposes, such as drinking water, irrigation, tourism, flood control, etc. (Kasiro,).

According to Law no. 11 year 1974 on Watering, it stated that the community should participate in the implementation of operation and maintenance water resources, including the building of embung. Operation of embungs/reservoirs is the effort to utilize the water that is accommodated in the optimal containment effectively. While the maintenance of embung is a business effort to keep the existing infrastructure facilities so that it can always function well, during the period of embung building and the planned service period (Suripin, 2004).

Embung Abimanyu is located in Ngabeyan Village, Ngropoh Village, Kranggran Subdistrict, Temanggung Regency, Central Java. Embung Ngropoh is one of several artificial lakes built by Temanggung District Government in 2013 by the Environment Department of Temanggung Regency, which built on the land owned by the local village. This embankment has an area of about 90 x 70 meters with 3.5 meters depth.

The embung water capacity is planned to reach 13,000 m^3 and can flow water up to 25 hectares of land around the embung area. Embung Abimanyu, in addition to functioning to accommodate water during excessive water in the rainy season, is also being used in times of lack of water in the dry season as well as for activities of tourism objects of interest. Ngropoh village is famous for its durian commodity which is quite famous in Temanggung and surrounding areas because it has a sweet taste and in the location of the embung from year to year is becoming the location of the Durian Festival held an interesting events and attract lots of crowds.

The purpose of this research is to uncover the benefit of development of Embung Abimayu in Ngropoh village for people in Ngropoh village and its surroundings in terms of Physical aspect, Utilization aspect, Operation aspect and Purchasing aspect, and to increase the number of tourism, particularly during the durian season.

2 LITERATURE REVIEW

2.1 Embung Components

The embung building has several components (Kasiro,), including: rainfed area, storage area, embankment, spillway, distribution network/reticulation system (distribution pipe, transmission pipe), (water tubs, cattle tubs, garden water tubs), safety fences (fences surrounding embankments and

143

puddles, gates) and complementary buildings such as measuring rails, bench marks and embung name plates.

2.2 Operation and Maintenance of Embung

In general, the operation and maintenance activities of embung consists of three parts, namely:

1. Implementation of the operation of embung
   Due to the limited volume of water present in the reservoir, prior to operation, an operation plan should be made. This activity begins with the allocation of water distribution for the population, based on the calculation of water requirements.

2. Implementation of monitoring and inspection
   Regular monitoring is necessary to obtain good and accurate data. This is for early drilling and inspection of the characteristics and safety of the embungs. The data to be taken include: (a) rainfall data on the embung area, (b) discharge data on the spillway, (c) raw water supply data on the valve hause, (d) stream embankment, and (e) seepage discharge data on the down stream of the embankment. In addition to these data, it is necessary to inspect the overall condition of the embung building.

3. Maintenance and repair
   In order to maintain the continuity of the function of the embung building, the components and completeness of the embung building need to be maintained on a regular basis. Routine maintenance activities, including:

   (a) Embankment maintenance
       Grasses grown on embankments need watering during the dry season and mowing to see if damage is likely to occur on the embankment. The types of damage can be cracks, landslides, leaks, and so on.

   (b) Storage maintenance
       The flow of water that enters the container column often carries garbage including tree trunks, therefore cleaning needs to be done.

   (c) Spillway maintenance
       Trash and tree trunks carried by runoff water need to be cleaned and prevent hardwoods from growing along the channel or the edge of the canal.

   (d) Maintenance of distribution networks and complementary buildings
       This maintenance is important to prevent damage or leakage that will result in waste of water and also uneven distribution.

2.3 Aspects Reviewed

There are 3 (three) aspects that are very important in relations to embung mangement, namely the physical aspects, aspects of utilization, and aspects of Operation and Maintenance (O & M). Each aspect consists of several variables (Umum, 2018).

1. Physical Aspects

   (a) Embankment, consisting of: Wet area due to seepage through body of embung or foundation causing local landslide due to saturated soil, Wet area extends in body of embung and creates seepage, Cracks across the body of embungs, Cracks extends in the body of the embung at the top (can be straight/curve), shrinkage, cracks are usually short, shallow, narrow, numerous, and irregularly directed, Erosion of grooves in the body of embungs, and plants high in the body of the embung.

   (b) Variables in the overflow consist of: Collapsed in overflow ducts, Erosion grooves in overflow ducts, Local scours in spills, and High plants in the body of the embungs.

   (c) Variables in the storage pool, consisting of: Deposition of mud, Dirt/twigs of deciduous trees on the column, Fence around the pool, Board guess, buoys, and Water availability.

   (d) in the distribution network pipeline, consisting of: Transmission pipes, and Pipe distribution.

   (e) Variables on the tubs, consisting of: Tubs of human need, Tubs of purposes of livestock, and Tubs of purposes garden.

2. Aspect Utilization, consisting of: Water distribution, Feel comfortable with the quality of water embung, and Improvement of quality of life/health.

3. Aspects of Operation and Maintenance, consisting of: Obedience to implement O & P, Availability of facilities and funds O & M, Subsidies, and Activities training and maintenance operation of embung.

3 METHOD

3.1 Research Sites

This research was conducted at Embung Abimanyu location in Ngabeyan hamlet, Ngropoh Village, Kranggan Sub-district, Temanggung Regency, Central Java Province, Indonesia as presented in Figure 1 and Figure 2.

Figure 1: Research sites

Figure 2: Aerial looks over Embung Abimanyu

3.2 Aerial Looks over Embung Abimanyu

The population in this study consists of related SKPD and the community of water users of Ngropoh who are educated elementary school until graduate. Sample in this study was taken randomly with the propotionate stratified random sampling. The technique used when the population have different levels of education. The reason for the use of the above mentioned sample technique is that Embung Abimanyu users have different levels of education ranging from elementary to graduate with a population of 150 people. The total population of each level of education are: elementary school = 55 people, junior high school = 47 people, high school = 40 people, Diploma = 5 people, and Undergraduate = 3 people.

The total number of sample members is determined by Taro Yaname and Slovin formula. This refers to the opinion of (Reduwan, 2007) that the sampling technique uses the formula of Taro Yaname and Slovin when the population is known and more than 100 people. The formula is as follows:

$$n = \frac{N}{N.d^2 + 1} \qquad (1)$$

where n is the number of sample members, N is the population number, and d^2 is precision. Precision set 10%, then:

$$n = \frac{150}{150.(0.1)^2 + 1 = 60} respondent \qquad (2)$$

The number of sample members uses the proportional allocation formula:

$$ni = \frac{Ni}{N}n \qquad (3)$$

where ni is the number of sample members by stratum, n is the total number of sample members, Ni is the number of population members by stratum, and N is the total population number. Thus, the number of sample members based on education level is as follows:

$$Elementary school = \frac{55}{150}.60 = 22,$$
$$junior high school = \frac{47.60}{150} = 18,8 \approx 19,$$
$$senior high school = \frac{40}{150}.60 = 16,$$
$$diploma = \frac{5}{150}.60 = 2,$$
$$and undergraduate = \frac{3}{150}.60$$
$$= 1,2 \approx 1 \quad (4)$$

3.3 Data Collection

Data collection techniques used field observation techniques and questionnaires. The research used descriptive method with quantitative approach and data collection technique. Quantitative research is a study that takes samples from a population and uses questionnaires as a basic data collection tool (Singarimbun and Effendi, 1989).

Observation Technique is a field research technique in order to collect data where the researcher as a participant in the cultural environment of the object studied (Mantju, 1994). Questionnaire technique is a technique of data collection done by giving a set of questions or questions written to the respondent to be answered (Sugiyono, 2011). The questionnaire used in this study is a questionnaire with Likert scale as it was exposed in (Sugiyono, 2011). Likert scale is used to measure attitudes, opinions, and perceptions of a person or group of people about social phenomena. In the Likert scale the variables to be measured are translated into variable indicators. Then the indicator is used as a starting point to arrange the items of the instrument that can be a statement or question. Theanswer of each instrument item using Likert scale has gradation from very positive to negative.

3.4 Data Analysis

The data of the research results were analyzed by assigning specific values to each variable using the Likert scale method. Likert scale is used to measure attitudes, opinions, and perceptions of a person or group of people against a particular fonemena. The phenomenon in question is research variables that have been specified by the researcher. The values on the Likert scale are as follows:

a Strongly Agree/Always/Very Important/Always,rated 5

b Agree/Important/Frequently, rated 4

c Doubt/Quite Important/Almost Never, rated 3

d Less Agree/Less Important/Almost Never, rated 2

e Disagree/Not Important/Never, rated 1

The above values are used to measure the performance of each aspect reviewed. The steps in the data analysis are assessments for each aspect of the same value, in which all variables of each component are considered to have an equal contribution to the management of the Embung Abimanyu. Assessment of the embung performance for each aspect can be seen in Figure 3 below:

Aspects	Score				
	Very good	Good	Moderate	Bad	Very bad
Physical	4.01–5.00	3.51–4.00	2.51–3.50	1.51–2.50	1.00–1.50
Utilization	4.01–5.00	3.51–4.00	2.51–3.50	1.51–2.50	1.00–1.50
Operations and maintenance	4.01–5.00	3.51–4.00	2.51–3.50	1.51–2.50	1.00–1.50

Figure 3: Interpretation Scoring Criteriafor Embung Performance(Source : (Sugiyono, 2011)).

The questionnaire consisted of two types of questions/statements that use positive sentences and negative sentences, aiming for respondents to answer each question more seriously and not mechanistic. Questions/statements that use positive sentences have the following assessment answers:

a Strongly Agree/Very Important/Always 5

b Agree/Important/Often 4

c Doubt/Quite Important/Sometimes 3

d Less Quality/Less Important/Never 2

e Disagree/Not Important/Never 1

Questions/statements that use negative sentences have the following assessment answers:

a Strongly agree/Very Important/Always 1

b Agree/Important/Often 2

c Doubt/Quite Important/Sometimes 3

d Less Quality/Less Important/Never 4

e Disagree/Not Important/Never 5

Each variable consists of several questions/statements that use positive and negative sentences so that for the assessors then the number of answers from positive sentences and negative sentences summed and then distributed with the number of questions from these variables. After getting the value of each variable then the sum of variables to get the average value of each variable. The average value is obtained by using the formula:

$$X = \frac{x_1 + x_2 + ... + x_n}{n} \qquad (5)$$

where X is mean, $x_1 x_2 + ... + x_n$ is variable – n according to Likert scale, and n is variable number.

$$X = \frac{\Sigma f_i x_i}{\Sigma f_i} \qquad (6)$$

where X is mean, f_1 is variable number, and xi is variable value of – n according to Likert scale. Furthermore, to obtain a conclusion that the performance of the management of embung is optimal in accordance with the plan or vice versa not optimal obtained from the average value of the 3 aspects ie physical aspect, utilization aspect, and aspects of O & M (Operational and Maintenance). So the final value of the 3 aspects that have been averaged is the final answer to the problem in this research. The final value is obtained by using the formula:

$$N_{FINAL} = \frac{N_{AF} + N_{AP} + N_{AOP}}{3} \qquad (7)$$

where N_{FINAL} is the final mean score N_{AF} is mean of physical aspect, N_{AP} is mean of utilization, and N_{AOP} is mean of O and P.

4 RESULT AND DISCUSSION

4.1 Respondents Profile

Total respondents: 60
Sex: male = 24 and female = 6
Age: 25 – 30 years old = 1, 31 – 35 years old = 6,
36 – 40 years old = 6, 41 – 45 years old = 8,
46 – 50 years old = 10, 51 – 55 years old = 20,
and 56 – 60 years old = 9
Education: elementary =22, junior high = 19, senior high = 16, Diploma = 2, and under graduate = 1

4.2 Physical Aspect

No	Variable	Score	% Respondents
1	Dike	4.42	19
2	Spillway	4.00	19
3	Pool/pond retention	4.00	19
4	Pipe distribution network	5.00	24
5	Tub/service pond	4.00	19
	Total Score	21.42	100
	Mean	4.28	

Figure 4: Interpretation Scoring Criteriafor Embung Performance.

The Figure 4 above shows that the respondents observation of the embankment is in excellent condition, the spillway is in good condition, the pool is in good condition, the distribution network pipe is in excellent condition, and the tub is in good condition.

The majority of respondents answered very well on the physical aspect and it can be concluded that the 5 (five) physical aspects such as embankment, spillway, catch pond, distribution network pipeline, and tub service on embung Abimanyu belong to very good condition so that the benefits of embung Abhimanyu functioned very well good.

4.3 Utilization Aspect

No	Variable	Score	% Respondents
1	Water distribution	4.15	19
2	Comfortable feeling with water guarantee	4.05	19
3	Improved quality of life of tourist attraction	4.42	19
	Total Score	12.62	12.62
	Mean	4.21	

Figure 5: Value of variable condition in Utilization aspect.

Based on the above table it can be seen that the majority of respondents answered very well on the value of the condition of each variable on the utilization aspect. Respondents stated that the distribution of water in excellent condition did not occur conflict in the seizure of water distribution in Abimanyu embung, respondents feel comfortable with the guarantee of water during the long dry season because the water embung never happened drought, and the existence of quality improvement of life with the existence of tourist attraction during the durian harvest season so as to improve the welfare for Ngropoh and surrounding villagers.

4.4 Operations and Maintenance Aspect

No	Variable	Score	% Respondents
1	Compliance with Operation and Maintenance	3.94	19
2	The availability of Operation and Maintenance funds	4.07	19
3	Subsidy	3.96	19
4	Operation and Maintenance training activities	4.31	24
	Total Score	16.28	100
	Mean	4.07	

Figure 6: Values of variable conditions in the aspects of Operation and Maintenance.

Based on the Figure 6 it can be seen that the majority of respondents answered very well on aspects of operation and maintenance. This indicates that the respondents rated the operational and maintenance training activities very well, the availability of facilities and operational fund maintenance is very good, the subsidy is considered good, and the obedience of operational and maintenance is also considered good

4.5 Utilization Analysis

Based on the results of the analysis and discussion on the physical aspects, aspects of utilization, and aspects of operation and maintenance, the overall analysis of the benefits of Abimanyu embungs are: $N_{AF} = 4.28$, $N_{AP} = 4.21$, and $N_{AOP} = 4.07$.

Abimanyu Utilization Analysis

$$= \frac{N_{AF} + N_{AP} + N_{AOP}}{3} = \frac{4.28 + 4.21 + 4.07}{3} = 4.19 \tag{8}$$

Based on the results of the analysis, overall Abhimanyu embank on very good condition. This value condition is strongly influenced by physical aspect, utilization aspect, and aspect of Operation and Maintenance.

The achievements of each variable can be seen in the graph of the radar diagram below.
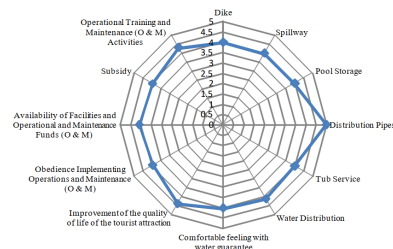
Figure 7: Graph of Radar Diagrams of Research Variables

5 CONCLUSIONS

5.1 Conclusion

Based on the results of the analysis on Embung Abimanyu, it can be concluded as follows:

1 Viewed from the physical aspect of 4.28 means the overall meaning of the embung parts such as embankment, spillway, pond storage, pipeline network, tub service is in very good condition.

2 From the aspect of utilization, yield value of 4.21 means that from the aspect of embung utilization, it has been utilized very well by society.

3 From the aspect of operation and maintenance yields of 4.07 value,operation and maintenance of the embung are in excellent condition.

Based on the aforementioned results, the overall analysis of the benefits of Embung Abimanyu are on very good condition. This means that the Abimanyu Embung can provide excellent benefits to the surrounding community either in terms of physical aspects, aspects of utilization, as well as from aspects of operation and maintenance

5.2 Suggestions

Based on the conclusions as described above, the following suggestions can be given:

1 There is a need to increase the observance of operational and maintenance (O & M) of Embung Abimanyu.

2 There is a need to add operational standard (SOP) in implementing O & P Embung Abimanyu so that local community will have better understanding about operation and maintenance system and also actions that need to be taken in overcoming problem at Embung Abimanyu.

3 There is a need for a rules on village regulations governing the distribution of water ponds.

4 There is a need for an independent maintenance costs from villages that do not rely on the government for the maintenance costs of the embungs.

5 There is a need for care of the physical aspects of parts such as embankments, spillways, storage ponds, pipelines, and service tanks to function better.

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Incorporating Attitude towards Islamic Banking in a Customer Loyalty Model

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Keywords: Customer Loyalty, Switching Costs, Customer Satisfaction, Service Quality, Attitude, And Islamic Banking.

Abstract: The objective of the study is to examine the mediating effect of switching costs between the relationship of customer satisfaction on customer loyalty in islamic banking. 283 respondents were used as samples using purposive sampling. By structural equation model (SEM) the findings show that of the six hypotheses, five hypotheses are supported, one hypothesis is not supported. The results of the study show, customer satisfaction affects customer loyalty both directly and indirectly through switching costs. These results are supported by previous findings, and at the same time, they reveal that switching costs do not fully mediate the influence of customer satisfaction on customer loyalty. The direct influence of customer satisfaction on customer loyalty shows the evidence.

1 INTRODUCTION

(Oliver, 1997) states that loyalty is a strong cause to reorder a product for customers consistently in the future. It is substantially important for the company because it can be an inhibiting factor for competitor, increasing a company's ability to respond to competitive threats to the company, increasing more sales and income, and reducing customer sensitivity to competitors' marketing efforts (Delgado-Ballester and Munuera-Aleman, 2002). In islamic banking, customer attitudes towards Islamic banking can have an influence on improving service quality and customer satisfaction. Attitudes are dispositions to respond favorably or unfavorably to products, people, institutions or events (Ajzen, 2005). Meanwhile, (Berkowitz, 1972) considers attitudes as individu al internal conditions that influence individual choices to display behavior towards objects, people or events. According to (Rizwan et al., 2014) attitudes towards islamic banking include the following: the level of customer preference in choosing Islamic banking; always see the label "Islamic" in choosing banking products; Islamic bank products are important for customers; using Islamic banking products is the customer's own choice; and the closest people to customers also use islamic banking products. Still according to (Rizwan et al., 2014) attitudes towards islamic banking affect customer perpective of service quality and complacency.

In addition to attitudes towards islamic banking affecting customer satisfaction, service quality also affects customer satisfaction. Service quality is a level of excellence to meet consumer expectations (Zeithaml et al., 1990). And service quality is formed by comparison between ideal and perceptions of quality performance (Oliver, 1997). (Scaglione, 1988) states that if consumers get less service quality from the company, they will show signs of leaving the company or reducing their spending. (Hafeez and Muhammad, 2012) revealed that increasing customer satisfaction through improving service quality can maintain customer loyalty.

Customer complacency play cruicial role to create customer loyalty. They are able to give several beneficial factors in creating customer complacency, increasing organization esteem, reducing price elasticity, reducing transaction costs and increasing employee efficiency as well as productivity (Anderson et al., 1993). Besides that, customer satisfaction is also seen as one of the best indicators for future earnings (Hayes and Bloom, 2002). Furthermore, according to (Fornell, 1992), they could increase not only customer operating costs caused by increasing number of customers, and increase advertising effectiveness as well as business reputation.

(Aydin and Özer, 2005), say that the increased switching expense is able to avoid loosing customers. Likewise, (Chadha and Kapoor, 2009) says that high switching costs affect customer loyalty. In other

149

words, the higher the cost of switching, the higher customer loyalty will be. In many cases, the relationship between customer loyalty and customer satisfaction are very strong for customer segments that have high switching costs (Bloemer et al., 1998) And (Jones et al., 2000).

Eventhough attitude and service quality only emerge as important factors of customer satisfactions from most previous studies but they lead to the customer loyality and switching cost. They are known as essential aspects of the profitability determinations. Hence the objective of the study to identify the effect of intervening variable : customer satisafaction in this research framework.

2 LITERATURE REVIEW AND HYPOTHES

2.1 Attitudes towards Islamic banking

The results of (Abou-Youssef et al., 2015) study show that religiosity has an impact on consumer attitudes toward Islamic banking. Nevertheless, the principles of Islamic finance are not the only reason identified in choosing Islamic banks. According to (Rizwan et al., 2014), attitudes towards Islamic banking include: preference for Islamic products; consideration of seeing "Islamic labels"; the importance of Islamic products; Islamic products are the customer's own choice; and the people closest to users of Islamic products. The results of the research by (Rizwan et al., 2014) show that attitudes towards Islamic banking influence consumer perceptions of the quality of Islamic bank services. Based on the description above, a hypothesis can be made as loyalty but also could prevent turnover, reduce price elasticity of customers, the cost of marketing failure, follows:

H1: The higher the attitude towards Islamic banking, the higher the quality of service

The results of the (Erol and El-Bdour, 1989) investigated factors that might contribute to repeat purchases of Islamic bank customers, the results showed that attitudes towards Islamic banking, relative prices, efficient service, convenience, confidentiality, cost/benefit, reputation and the bank's image contributes to customer satisfaction. (Butt and Aftab, 2013) stated that the supply of products offered by conventional banks but in accordance with Islamic principles, it can increase satisfaction for Muslim customers. Moreover, according to (Rizwan et al., 2014) attitudes towards Islamic banking affect consumer perceptions of customer satisfaction in Islamic banks.

Based on the description above, a hypothesis can be made as follows :

H2 : The higher the attitude towards Islamic banking, the higher the customer satisfaction

2.2 Service Quality

Then (Parasuraman et al., 1985) indicates that the satisfied services can be measured by zero customer complaint. Therefore providing qualified services become essential factor in business. (Donald et al., 1998) gave further indications that the quality of services are positively significant on consumer satisfaction. Thus, high service quality will increase customer satisfaction which encourages customer loyalty (Santouridis and Trivellas, 2010). The findings of (Hong and Goo, 2004) indicate a positive relationship between service quality and customer satisfaction. (Beerli et al., 2004) find that service quality is an antecedent that exerts a direct influence on satisfaction and indirect influence on loyalty. Relevant findings are also found in (Hafeez and Muhammad, 2012)(Siddiqi, 2011) (Chadha and Kapoor, 2009) (Salam, 2013) (Aydin and Özer, 2005). Based on the description above, a hypothesis can be made as follows:

H3: The higher the quality of service, the higher the customer satisfaction

2.3 Customer Satisfaction

Beerli et al., (2004) find that satisfaction and switching costs might be found as antecedents of loyalty. While Lee And Cunningh am (2001) mentioned that switching costs as a mediator variable between customer satisfaction and loyalty Aydin et al., (2007) further explain that customers who study product knowledge in avoiding purchasing mistakes will rearrange past buying experiences. In this process, if the customer moves, a comparison will be made between the brand that will be used and the old brand. To reduce cognitive dissonance, customers tend to purchace satisfied products. Analysis of opportunity cost suggests that customer satisfaction has a positive significant influence on switching costs. High customer satisfaction would increases the opportunity cost as they will feel reluctant to try to other service providers. More specifically, Aydin et al., (2007) examined the relationship between consumer satisfaction, trust, switching costs, and loyalty. They found that trustworthiness and consumer satisfaction were not only correlated positively with loyalty, but also with switching costs. These finding show that satisfaction does not only affect loyalty directly but also does indirectly through switching cost. Consistent with the above de-

scription, this study proposes the following hypothesis: H4: The higher customer satisfaction, the higher the rate of switching costs.

Higher customer satisfaction through improving service quality will encourage customer loyalty. Customer satisfaction is directly related to customer loyalty. Significant influence of customer satisfaction on customer loyalty is almost shown by every previous study, such as (Beerli et al., 2004)(Amin et al., 2013) (Aydin and Özer, 2005) (Chadha and Kapoor, 2009) and (Ball et al., 2004) Based on the description above, a hypothesis can be made as follows:

H5: The higher customer satisfaction, the higher the customer loyalty.

2.4 Switching Costs

(Jones et al., 2000) state that switching costs as an important factor influencing customers' decisions to remain with service providers. Switching costs are expected to make it difficult for customers or cause great sacrifices if they want to switch to other service providers. Lee And (Lee and Cunningham, 2001) state that basically switching costs occur when there are two parties (buyers and sellers or consumers and certain product brands) who make transactions so that a relationship is formed between the two. When one party, usually the buyer/consumer, is not too dependent on the other party, then the buyer/consumer does not have an obstacle to make transactions with other parties. In such conditions consumers have low switching costs. The results of (Dick and Basu, 1994) found that customer loyalty is determined not only by satisfaction but also by switching costs. In addition,(Beerli et al., 2004) stated that satisfaction and switching costs provide a positive influence on customer loyalty. In addition, (Aydin and Özer, 2005) found that switching costs were a moderating variable for the influence of satisfaction on customer loyalty and a direct effect on customer loyalty. Switching costs play an important role by making it valuable for moving to other service providers Lee And (Lee and Cunningham, 2001), so that switching costs increase, so customer loyalty will increase as well. In short, the results of (Chadha and Kapoor, 2009) also show that switching costs affect consumer intentions to remain with certain service providers. Based on the description above, a hypothesis can be made as follows:

H6: The higher the cost of switching, the higher the customer loyalty. Based on the hypothesis above, the conceptual framework of this research can be described as follows :
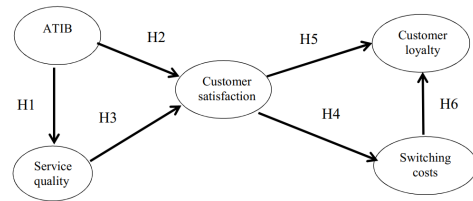
Figure 1: Conceptual Framework Of Research

3 RESEARCH METHODS

The object of this research is Islamic banking, especially Bank Umum Islamic/Islamic Commercial Banks (BUS). The population of this study is Islamic bank customers. Knowing that the study population is very broad, the researchers restricted this research area in Yogyakarta, Jakarta, Bandung and Surabaya. 300 samples are carried out using non probability sampling method. In this study, the sample was taken using purposive sampling method, which is a non probality sampling technique where the researcher determines sampling by specifying specific characteristics/ criteria that are in accordance with the research objectives. The criteria determined in this study are customers who know and use the services of Islamic banks, which have become Islamic bank customers for at least 6 months. From the 300 respondents involved in this study, only 283 were included in the analysis

Variables/Indicators	Corrected Item-Total Correlation	Cronbach Alpha	Status
Attitudes towards islamic banking		0.869	Reliable
1. Favorite choosing Islamic banking products	0.707		
2. Seeing the label "Islamic" when choosing a product	0.807		
3. The importance of Islamic bank products	0.931		Valid
4. Using Islamic banking products is a choice	0.846		
5. The closest person to use Islamic banking	0.802		
Service quality		0.884	Reliable
1. Devotion of employees to assist customers	0.700		
2. Employees are not too busy responding to customers	0.621		
3. Understand customer specific needs	0.778		
4. Transactions are carried out immediately	0.796		
5. Bills, reports and documents without error	0.783		Valid
6. A sense of security in transactions	0.709		
7. Operates at convenient working hours	0.794		
8. Provide clear information guidelines	0.745		
9. Give individual attention	0.635		
Customer satisfaction		0.848	Reliable
1. Never fails to meet customer expectations	0,848		
2. Never disappoint customers	0,801		Valid
3. Choosing this bank is a wise decision	0,806		
4. Overall customers feel satisfied	0,905		
Switching costs		0.893	Reliable
1. Switching to a new bank raises financial costs	0.701		
2. Switching to a new bank causes additional costs	0.749		
3. Switching to a new bank service is not as expected	0.796		
4. It is not certain that the administrative costs of new banks will be cheaper	0.805		
5. Worrying other people who transact with customers, if they move to a new bank	0.604		Valid
6. Turning to a new bank, must learn to use new services	0.781		
7. Switch to a new bank, need to compare all services that will be received	0.596		
8. Comparing banks to each other, requires a lot of energy, time and effort	0.802		
9. Turning to a new bank, the initial adm fee will be high	0.769		
Customer loyalty		0.916	Reliable
1. Don't like moving to another bank	0.905		
2. I am a loyal customer	0.962		Valid
3. Customers will always recommend to others	0.912		

Figure 2: Test Results For Validity And Reliability Of Research Instruments

4 RESEARCH RESULT AND DISCUSSION

As explained earlier that the respondents involved in the study and eligible for further analysis amounted to 283 respondents. Of the respondents involved, the majority (58%) were women and the rest were men. Some of them were between 20 and 30 years old, and the rest over 30 years old. In terms of employment, the majority (48.4%) are private employees, the rest work as students/students, civil servants, lecturers, BUMN employees and others. Furthermore, structural equation modelin g (SEM) and AMOS 8.80 programs were used in analyzing the conceptual framework of this research. Before testing the hypothesis, first test the validity and reliability of the data to be used in the analysis. An indicator is declared valid if the value of t is 96 1.96 and a variable is declared reliable if it has construct reliability $\geq$ 0.50. Based on these requirements, all indicators or question items are declared valid and reliable in measuring the variables. Table 2 presents the results of testing the validity and reliability of the collected data.

Indicator	λ_i	ε_i	tvalue	Contruct Reliability	Minimum Requirement	Note
Attitudes towards Islamic banking				0.87	0.50	Reliable
ATIB1	0.83	0.56	14.72		1.96	
ATIB2	0.62	0.20	17.25		1.96	
ATIB3	0.99	0.34	15.19		1.96	Valid
ATIB4	0.47	0.12	12.32		1.96	
ATIB5	0.92	1.03	11.82		1.96	
Service quality				0.92	0.50	Reliable
SQ1	0.81	0.37	10.52		1.96	
SQ2	0.89	0.29	17.44		1.96	
SQ3	1.00	0.36	17.76		1.96	
SQ4	0.79	0.35	15.57		1.96	
SQ5	0.82	0.54	14.19		1.96	
SQ6	0.97	0.93	13.06		1.96	Valid
SQ7	0.57	0.19	14.71		1.96	
SQ8	0.8	0.42	13.90		1.96	
SQ9	0.86	0.47	14.31		1.96	
Customer satisfaction				0.79	0.50	Reliable
S1	0.63	0.27	8.09		1.96	
S2	0.48	0.12	13.15		1.96	Valid
S3	0.58	0.17	12.54		1.96	
S4	0.59	0.43	9.57		1.96	
Switching costs				0,94	0,50	Reliable
SC1	0.88	0.37	10.35		1.96	
SC2	0.68	0.31	17.36		1.96	
SC3	0.59	0.17	18.07		1.96	
SC4	0.64	0.20	14.54		1.96	
SC5	0.55	0.08	15.88		1.96	Valid
SC6	0.68	0.24	15.21		1.96	
SC7	0.61	0.22	14.84		1.96	
SC8	0.63	0.24	14.29		1.96	
SC9	0.68	0.46	12.00		1.96	
Customer loyalty				0,66	0.5	Reliable
CL1	0.55	0.15	9.02		1.96	
CL2	0.62	0.11	16.50		1.96	Valid
CL3	0.70	0.15	16.43		1.96	

Figure 3: Test Data Validity And Reliability Test Results

urthermore, with valid and reliable data the researchers conducted structural analysis using the AMOS 8.80 program to test the hypotheses of this study. The effect of exogenous variables on endogenous variables and the value of t of each influence appear as in Figure 3. The statistical value of the final structural model shows that the model is very good (fit) in representing this research data. This is proved by the value of X2 of 412.2 with the degree of freedom 393, then Normed X2 = 1.05, which means that the model has a good level of compatibility. This fact

is reinforced by the RMESEA value of 0.02 and the TLI and CFI values of 0.99. Furthermore, the value of the Expected Cross Validation Index (ECVI) of this study model was 3.78. This value is lower than ECVI for the saturated model which is 6.07. It shows that this research model can be replicated in similar samples in the same population. The significance of the influence between variables and testing the hypothesis of this research is shown in Figure 4.

Hypothesis	β or γ (t-value/α level)	Note
H1: Attitude towards islamic banking had a significant positive influence on quality of service.	0.65 (6.53/<0.0%)	Accepted
H2: Attitude towards Islamic banking had a significant positive influence on customer satisfaction	0.19 (1.49/14%)	Not accepted
H3: Service quality had a significant positive influence on customer satisfaction	0.50 (3.83/0,0%)	Accepted
H4: Customer satisfaction had a significant positive influence on switching costs	0.83 (7.43/<0,0%)	Accepted
H5: Customer satisfaction had a significant positive influence on customer loyalty	0.65(4.11/<0.0%	Accepted
H6: Switching costs had a significant positive influence on customer loyalty	0.44(2.96/<0.03)	Accepted

Figure 4: Summary Of Hypothesis Testing

The coefficient of the effect of switching costs to loyalty is 0.44 with a significance level of 0.03% indicating that the sixth hypothesis (H6) of this study is proven. This finding illustrates that when respondents feel high costs when moving to another bank, they tend to continue using the bank that has been used. This is consistent with the opinion of (Ball et al., 2004) which states that consumers tend to be disloyal to certain service providers or brands when they do not feel there are obstacles to moving to other service providers or brands, and vice versa. This finding is consistent with the results of a study by (Aydin and Özer, 2005) and (Chadha and Kapoor, 2009). The regression coefficient of the influence of customer satisfaction on loyalty is 0.65 with a significance level of 0.0% indicating that the fifth hypothesis (H5) of this study is proven. It shows that respondents will be loyal when they feel satisfied. This finding supports previous results stating that customer satisfaction has a positive effect on customer loyalty (Dick and Basu, 1994) And (Chadha and Kapoor, 2009). The proof of H6 and H5 indicates that the loyalty of respondents to Islamic banking is not solely because they are satisfied, but because they face obstacles to moving to another bank.In addition, the results of this study indicate that satisfaction not only directly affects loyalty, but also has an indirect influence through switching costs. The indirect effect of satisfaction with loyalty is 0.83 with a significance level of 0.0%. In other words, this result supports H6 and H5. The proof of this hypothesis illustrates that respondents' satisfaction not only increases their loyalty to Islamic banking but also increases their barriers to moving to other banks. Meanwhile, the results of this study also show that satisfaction is influenced by the quality of service and attitudes towards Islamic banking. The re-

gression coefficient of the influence of service quality on satisfaction is 0.50 with a significance level of 0.0% indicating that the third hypothesis (H3) of this study is proven. This finding indicates that respondents will be satisfied when the quality of service increases. This finding supports previous results stating that service quality has a positive effect on customer satisfaction (Salam, 2013). Meanwhile, the regression coefficient of the influence of attitudes toward Islamic banking on satisfaction is 0.19 with a significance level of 0.14% indicating that the second hypothesis (H2) of this study is not proven. This finding shows that although respondents have a positive attitude towards Islamic banking it does not satisfied. This finding does not support previous research which stated that attitudes towards Islamic banking had a positive effect on customer satisfaction (Rizwan et al., 2014).

5 CONCLUSIONS

This research has several weaknesses that need to be overcome for researchers who are interested in examining customer loyalty, especially with regard to the selection of research subjects. Further researchs need to use islamic credit bank institutions to test the consistency of findings across markets.

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Study for Development of Geotourism Potential in Edi Village Timor Leste

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Keywords: Edi Maubisse, geomorphosite, geosite, geotourism

Abstract: Maubisse is one of the administrative posts of the Ainaro in Timor Leste, which is known to have a very high interest of tourist attractions because of its cold weather and beautiful mountain views. However, those attractive natural phenomena have not been fully used yet as educational attractions (as geotourism). The purpose of this study is to conduct an inventory and interpretation of the geotourism potential in Maubisse, especially in Suco Edi. This research was conducted in three phases: literature study, field research and data analysis of the geotourism potential using quantitative and descriptive methods. The data analysis method used was geosite and geomorphosite assessment based on certain parameters according to (Kubalíková, 2013). The parameters used were scientific and intrinsic values: education, economy, conservation, and added value possessed by a geosite.

1 INTRODUCTION

Geotourism is a scenic spot of natural tourism where the main object is geodiversity through geological tourism attraction to tourists, natural science education and environmental conservation based on geological phenomena. Accordingly, it can attract the attention of tourist to visit the geotourism area and will increase the local community's income economically.

Geotourism was first defined (Hose, 1995) in England. There are two viewpoints of geotourism: Purely geological and geomorphologically focused Sustainable Tourism and Geographically Sustainable Tourism, this emphasizes preservation of the geographical sense of a place in general, beyond simple geological and geomorphological features. The aim of geotourism is to make visitors aware of, and to gain some understanding of, the geological features that surround them. Geotourism itself is a tourist activity that is specifically focused on the panorama and geological aspects (Newsome and Dowling, 2010). At its simplest geotourism is tourism with some connection to geology or geomorphology Development of certain areas into a Geotourism region will certainly give a good impact people's lives in various aspects of life such as economic, social, cultural, and infrastructure. However, in determining an area

as a geotourism area, it needs to be analyzed first. The analysis generally carried out is geosite and geomorphosite analysis. Geosite and Geomorphosite are landscapes that have potential as tourism sites and have a value based on the perspective of human assessment (Kubalíková, 2013). This analysis is intended to provide an assessment of the specific parameters such as the value of a scientific approach, educational value, economic value, conservation value and the value-added (beauty, cultural, geological factors) in certain areas (Kubalíková, 2013).

2 RELATED WORKS

Maubisse (Maubesse, Mau-Bessi, Maobisse, Maubise) is a historic town in the hills 70 km south of Dili. it is one of the administrative posts of the Ainaro, Timor Leste which is known to have a very high interest of tourist attractions because of its cold weather and beautiful mountain views. It's about 3 hours traveling from Dili by motorbike and car and from Maubisse town to Edi Village basically takes about 1 hour by Motor and Car. Elevation and coordinates: Elevation (approx.): 1430m Latitude (Lat): 8°50'17"S Longitude (Lon): 125°35'50"E 50'17"S.

155

The geological map of Timor Leste and the outcrop map of study area are shown in Figure 1 and Figure 2 respectively.

Geotourism is an earth park where its potential is measured based on geodiversity that has unique geological characteristics with the beauty values of natural objects in certain scales and distributions, as well as integrating other forms of natural scenery and cultural existence in regional uniqueness.

The geodiversity that has been identified in the Timor-Leste territory is through regional geological mapping in the Portuguese period (Audley Charles, 1968), regional geology map of Dili sheet (Bachri and Situmorang, 1994) and also regional geology map of Baucau sheet (Audley-Charles, 1986). Therefore, the general potential of geodiversity in Timor-Leste are distributions of complex rocks including the presence of rare fossils in sedimentary rocks, physical geological phenomena (complexity of geological structures) and also variations of geomorphological landscape such as islands, lakes, lagoons, hot springs, spring, waterfalls, beaches, mountains, plateau, plains, rivers and caves.
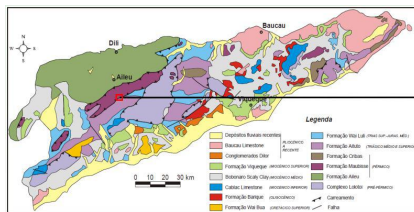

Figure 1: Geological map of Timor Leste (Carvalho and Lisboa, 2003)

Figure 2: Outcrop map of study area (Carvalho and Lisboa, 2003)

Based on the regional geology, the studied area is part of Maubisse and Aitutu Formation with medium corrugated mountain morphology unit to Structural Mountain. The geological structures found in the form of a sliding fault and thrust fault. The Formation of Aituto, dating from the Triassic mid. - upp, corresponds to an alternation of thin slates of limestone, clayey and clayey shales, with predominance of the carbonated component, whereas the Wai Luli

Formation, Triassics up. to the Middle Jurassic, is characterized by an increase of the clayey component. Its potential is linked to the joint occurrence of more or less marly clays and limestone, from which the cement industry is interested.

The potential of the Maubisse Formation, also dating from the Permian, rests on the lower part of the unit, which is about 400 m thick and where very thick stands of massive limestone predominate. The upper part of this Formation consists essentially of rocks of an eruptive nature, about 500m thick. The limestone are very poorly affected by metamorphism and correspond to biocarcasses of separatists cement, very rich in fauna, with enhancement for crinoid remains. They typically have red to pinkish tones, and lighter tones, cream and gray may also occur. Their noblest suitability will be for ornamental purposes, and the use of different aggregates, especially for lime and cement, in terms of light tones, can not be ruled out.

Furthermore, geoconservation is the environmental conservation which consists of the singularity of geological phenomenon that needs to be protected through geotourism programs (Crofts and Gordon, 2015). The geological conservation area of Timor-Leste that has been identified from (Haig and McCartain, 2010) with the topic of "Triassic Organic-Cemented Siliceous Agglutinated Foraminifera from Timor Leste: Conservative Development in Shallow Marine Environments" amounts to four (4) areas are as follows; Area of Tutuala, Area of Iliomar-Aliambata, Area of Manatuto-Pualaca and Area of Ainaro-Maubisse.

According to (Sharples, 2002), general reasons for doing geoconservationare:

1. Geodiversity has a scientific value which is used for human needs and related ecosystems

2. Characteristics of non-renewable geodiversity

3. Many sensitive geodiversity is easily damaged, especially the risks caused by various human activities

4. Providing knowledge information with the fundamental principles of geoconservation

5. Provide information on geological conservation status in Timor-Leste

6. Propose to Conservationists to give advice for decision maker

7. Provide estimation on geoconservation.

Inventory and preliminary identification of geodiversity data as the first phase in collecting and improving the quality of information and also the beginning of a database to make conservation area of

geological diversity. Very important data and a fundamental basis of information for developing a geoconservation area based on four points are as follows (Crofts R, 2014):

a Scientific Value; Characterization of the geodiversity and geoheritage values based on their geological processes and history

b Aesthetic Value; describes the formation of geoheritage phenomena and various attractions of geomorphological landscapes

c Cultural Value; the location of the geoheritage site is always associated with the culture of the local community

d Recreational Value; shows the relationship between geoheritage sites with various tourism activities, such as recreation, sports and adventure.

3 METHODOLOGY

The method that used in this study is descriptive explorative. Explorative descriptive research is research that aims to explore extensively about things or causes that influence the occurrence of something. The main purpose of this type of research is to systematically describe the facts and characteristics of objects or subjects that are precisely examined, related to this research, the situation that will be seen is the potential of geotourism in Suco Edi, Maubisse, Ainaro, Timor Leste.

This study applies two (2) stages approaches i.e. Literature Review and Field Observation. The aim of reviewing existing literatures are to have a prior understanding and accumulation stage of references needed from various sources, especially about geotourism and geology of Timor-Leste while Filed Observation or Field Work is the stage of collecting all pertinent geotourism objects in identifying the general potential of geodiversity. There is one (1) considered method applying in this research. It is qualitative method such as "GIS Survey, Descriptive and Interview to the community". Lastly, this database is used and analyzed using the Kubalikova parameter 2013, to obtain the results of the feasibility of the geotourism percentage.

4 RESULTS AND DISCUSSIONS

We have discovered three types of tourism resources that are potential for geotourism: geological tourism,

geomorphological tourism and river tourism – all located in nine sites (two geomorphosites and seven geosites).

4.1 Pousada Geomorfosite

Pousada is located in Maubisse village in (1302 - m, 08 50' 27,5" 125 36' 07,6") perched on a lookout just off the main road near the bend. It's a Guesthouse set in amazing gardens within old stone walls (Portuguese colonial era), Considering the Hill top location offers expansive views and history behind this beautiful old place, the community, traditional and culture in the surrounding area and based on feasibility study, we consider it as a potential geomorphosite for geotourism (89%).

4.2 Erus Manu Waterfall

It is located in Edi Village (1300 m, 08°51'41"0 S-125°35'50" E). Erus Manu waterfall is the body of Edi Erus rivers, water's steep fall from 4 meters height over a rocky ledge of Limestone that fall downward in to pool below with depth of 2 meters. The type of this waterfall is horsetails. Horsetail is a type waterfall in which water flows over a broad ledge, usually an overhanging one, into a pool by keeping contact with the underlying rock during its descent. In fact, the local people use this place for swimming recreation because the water is clear, clean and fresh. The average geosite potential is 64% for Geotourism.

4.3 Haut Doner Waterfall

Haut Doner is the water's steep fall from 1- meter height over of massive boulders of Limestone and surrounded by red limestone outcrop that descending in to pool below where the water is very clean, clear and fresh with depth about 0.85 meter as the body of Edi Erus river. It's type of FAN waterfall that is a steep angled cascade that fans out from a narrow width at the top to a larger base at the bottom. Most fans are also horsetails in that are maintain contact with undering rock during their descent. It's located in Edi Village (1201 m, 08°51'42"5 S - 125°37'40"8"S) The average geosite potential is 64% for Geotourism.

4.4 Ermanfoli Waterfall

Ermanfoli Waterfall is very clear clean and cold and water's steep fall from 15 meters height over a bedrock of Clastic limestone (Maubisse Formation) that falls downward without making contact with the

underlying rock in to pool below with depth of 2 meters. The waterfall has enough space between the water and the rock that you can walk behind it. This type of waterfall is known as plunge waterfall. The Ermanfoli has a cave behind the waterfall that makes it unique in and has historical story in it, where in the conflicts times the Portuguese colonization and of the Indonesian occupation the local people escape and evacuate into the cave. The average geosite potential is 59% for Geotourism. It is located Edi Village (1197 m, 08°51'42"2 S - 12°37'44"0"S).

4.5 Ersulihatmau Waterfall

It's water steeps fall from 1-meter height over of massive boulders of limestone that descending in to pool below where the water is very clean, clear and fresh with depth about 0.73 meter as the body of Edi Erus river. It's type of fan waterfall that is a steep angle cascaded that fans out from a narrow width at the top to a larger base at the bottom Most fans are also horsetails in that they maintain contact with underlying rock during their descent. It is located in Edi Village (1175m, 08°51'42"5 S-125°37'40"8"S). The average geosite potential is 64% for Geotourism.

4.6 Ermihis Waterfall

Its water steeps fall from 25 meters height over of limestone (Maubisse Formation) that descending in to pool below where the water is very clean, clear and fresh with depth about 0.1 meter. It is type of FAN waterfall that is a steepagled cascade that fans out from a narrow width at the top to a larger base at the bottom maintain contact with bedrock during their fall downward. It's located in Edi village (1165m, 08 51' 45,9"125 37' 57,4"). The average geosite

4.7 Erkuira Waterfall

Erkuira block waterfall is a type of "ledge" waterfall. In a block waterfall, water falls from a wide river or stream, and the fall is typically wider than it is tall. The water drops over the verticalcliff with 5 meters height over a rocky ledge of clastic limestone that fall downward into the pool bellow with depth of 2 meters. It is located in Edi Village (1160 m, 08"51'51,2"- 125"38'03,7"). The average geosite potential is 59%.

4.8 Debu Waterfall

Debu waterfall is located in Edi Village (1160m,08'51'58,5"-125 38' 08,4"). The aver-

age geosite potential is 59% for Geotourism. It is Slide waterfalls can be considered a sub-type of horsetail. The water glides down a relatively low angle slope, maintaining continuous contact with bedrock of layered clastic limestone. However, is that contact is constant because of the shallow slope of the rock in slide waterfalls.(Height 11m, depth 2m).

4.9 Edi Simerah Geomorfosite

This geomorphosite is located in Edi Simerah Village (2002m 08 51' 31,3"125 37' 43,5"). The geomorphosite of Edi Simerah shows landforms that have acquired a scientific, cultural or historical, aesthetic and/or social/economic. In the hill of Edi Simerah there are complete component for a geomorphosite. Raimerah Waterfall (Fan waterfall), Traditional house of Edi Raimerah, small chapel made of woods and Hill top location offers expansive views of structural mountain landscape with average potential to be develop for geotouristic destination makes up to 69%.

A geotouristic tracking route map has been designed. It is start from Pousada to Edi Village. It normally takes about 1 hour by motorbike and car. The road to Edi village is adventurous and the surrounding view is amazing and in the middle of the trip it's better to take a stop in Ule Lefa strawberry garden. Ule Lefa is well known as a ecotourism site for strawberry farming (1411m, 08 50'30,3' S—125'37' 14,5").

5 CONCLUSIONS

Edi Village has significant potential to be developed as one of the geotourism destination in Maubisse, Ainaro, Timor-Leste. The geotourism potential of Suco Edi, we have discovered three types of tourism resources: geological tourism, geomorphological tourism and river tourism all located in nine sites (two geomorphosites and seven geosites). The average results of the feasibility study of the geotourism potential in each of these sites are: Pousada Geomorphosite 89%; Erus Manu Waterfall 64%; Haut Doner Waterfall 64%; Ermanfoli Waterfall 59%; Er Sulihat Mau waterfall 64%; Er Mihis Waterfall 64%; Er Kuira Waterfall 59%; Debu Waterfall 59%; and Edi Simerah Geomorphosite 69%. Considering all the aspects above, which were based on the quantification and comparison of the various wonders between nature and geological processes that turns possible the implementation of geotourism object, it shows that Suco Edi has tourism resources that are suitable to be developed into geotourism sites with an overall average feasibility value of 65.66%. Recognizing that Edi

is a rural village, the development of geotourism in the area would even be beneficial for a local and sustainable economic development. Hence, infrastructure development would be required as well as legislative protection in order to use the geotourism resources of the area to improve the living conditions of the local community and to promote this village (and, thus, Timor-Leste) in a wider scale. Community and local leaders of Edi Village need protect those sites and develop as much as possible and propose it to the government for the further study and support geotourism development in the potential area. Further survey research is needed which is more focusing in to the detailed on the geological condition and process of the area. This place is recommended for geologist students for the field study due to the existence of geological essential features such as beautiful and complex structures and unique lithology that is Permian Maubisse formation. Highly recommended to adventurer, traveler and nature lover to explore this hidden beautiful remote Village of Edi Maubisse.

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Vital Strengthening of SMES through E-Commerce Adoption Purposeful

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Keywords: Strategy, SMEs Empowerment, Competitiveness, Adoption of E-Commerce.

Abstract: Within the time of globalization and quick advancement of information innovation, companies got to make changes to internet-based commerce. These consider assesses the components that lead small to medium-sized enterprises (SMEs) to embrace e-commerce. This investigate proposes an e-commerce adoption model utilizing structural equation modeling that explore the impacts of Technological, Organizational, Environmental, and Individual variables on the SME's e-commerce adoption purposeful. The population of the study was SMEs producing snacks, such as roasted peanuts, banana chips, cassava chips, crackers, and so on in Keranggan, Setu, Tangerang Selatan. The method of sampling was simple random sampling with 100 SMEs as samples. The study utilized Structural Equation Modeling (SEM) with SmartPLS Program 3.0 for data examination. Technological, Organizational, Environmental, and Individual variables were found to impact e-commerce adoption purposeful significantly and positively. In the Technological Aspect the biggest indicator value was Relative Advantage which is increasing sales and profits. Relative Advantage was also the biggest indicator compared to indicators from other aspects.

1 INTRODUCTION

Small and Medium Enterprises (SMEs) have a vital and key part of national financial improvement. Other than playing a part in financial development and business, SMEs moreover play a part in conveying improvement results. In the present, many people access the internet, but there are still a few SMEs who use it and are less aware of the importance of mastering information technology (IT) can open wider opportunities in business.

The Ministry of Cooperatives and Small and Medium Enterprises (Kemenkop UKM) states that as numerous as 3.79 million SMEs have utilized online stages to advertise their items. This amount is around 8 percent of the overall SME owners in Indonesia, which is 59.2 million (Service of Communication and Data, 2019). The number of ecommerce players has not however come to the target of the UKM Kemenkop program and the Service of Communication and Data (Kemkominfo) titled 8 Million MSMEs Go Online. In expansion, concurring to Deputy Access Capital of the Creative Economy Agency (Bekraf) Fadjar Hutomo said that computerized media plays a critical part in all aspects of people's lives nowadays,

counting within the trade division of SMEs.

To extend the competitiveness of SMEs as well as to urge export opportunities and other commerce openings can be done by utilizing the improvement of information technology, particularly e-commerce, not as it was utilizing the internet as a device to advance or look for trade openings, but also must be balanced with great authoritative administration through the use of the correct program. Site and ecommerce improvement has to be done as a implies for advancement and promoting of commerce items, so that it will increment deals volume and increment income. This increment in income will, in the long run, develop the SMEs. This increase in income will eventually develop the SMEs.

Keranggan village is located on the outskirts of the Cisadane River, precisely in Setu District, South Tangerang City. The extent the area of the Keranggan SMEs community is around ± 50 hectares. Keranggan village is a village where most of its citizens work as snacks entrepreneurs, such as roasted peanuts, banana chips, cassava chips, crackers, and so on. The production of the SME has been delivered out of the Greater Jakarta area andsome have even been delivered to the outer islands. The activity of the commu-

nity business activities in Keranggan Village is a food production business activity that is spread in most RT 12 and RT 13 and RT 11 areas. The total number of SMEs in Keranggan is $\pm$ 150 SMEs. Most of the activities carried out by the SMEs are still traditional, ranging from processing raw materials, cooking, packing, and distributing manually.

The reasons for choosing the research unit are: (1) The superior product contribution to the most significant per capita regional income; (2) Market orientation of superior products is abroad; (3) Optimizing the use of local raw materials and (4) Empowering local labor. For these reasons, the comes about of the study will deliver a representation of the status of SMEs within the ecommerce adoption process so it can be utilized as a reference and thought for partners (neighborhood governments) to empower prospect change of prevalent items as a column of the neighborhood economy.

The retail industry is no exception and most of them embrace computerized impression to boost their sales and revenue. Let alone meeting the targets, but the brand outreach is one great takeaway from this work out. The reason for this study is to distinguish a comprehensive set of potential variables affecting the adoption of e-commerce in SMEs. More particularly, the consider builds a model of e-commerce adoption and gives a better understanding of the appropriation of e-commerce by SMEs.

The results will improve the understanding of SME proprietors around the potential benefits of ecommerce and optimize the adoption of e-commerce model by SME proprietors. A more prominent understanding around this will increment their likelihood to distribute a few assets towards receiving e-commerce. The study will donate experimental prove of variables impacting the deliberate of receiving e-commerce in SMEs.

2 LITERATURE REVIEW

Purposeful to adopt is broadly utilized as a dependent variable in adopting different technologies (Zhu et al., 2003) (Alamro and Tarawneh, 2011). Santhanamery and Ramayah, 2013 define continuous intention as "the intention of users to continue to use or long-term use of technological intentions to ensure that technology is better than the previous one." The intention of ebusiness adoption has been developed by (Drazin, 1991) (Grover, 1993)(Crook and Kumar, 1998) (Zhu et al., 2002) (Nelson and Shaw, 2003) implement online sales, online order raw materials to suppliers, aggressively doing internet advertising, applications,

technology for information exchange. From a number of references from several researchers, we adjust ourselves in the context of SMEs in Keranggan Village. Figure 1 describes the conceptual model.
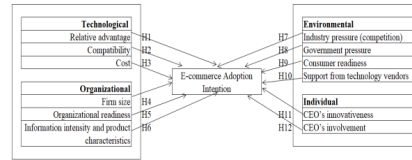

Figure 1: Conceptual Model.

H1: Relative advantage has positive and noteworthy impact to the adoption of ecommerce within SMEs, H2: Compatibility has positive and noteworthy impact to the adoption of e-commerce within SMEs, H3: Cost has positive and noteworthy impact to the adoption of e-commerce within SMEs, H4: Firm size has positive and noteworthy impact to the adoption of e-commerce within SMEs, H5: Organizational readiness has positive and noteworthy impact to the adoption of e-commerce within SMEs, H6: Information intensity and product characteristics has positive and noteworthy impact to the adoption of e-commerce within SMEs, H7: Industry pressure has positive and noteworthy impact to the adoption of e-commerce within SMEs, H8: Government pressure has positive and noteworthy impact to the adoption of e-commerce within SMEs, H9: Consumer readiness has positive and noteworthy impact to the adoption of e-commerce within SMEs, H10: Support from technology vendors has positive and noteworthy impact to the adoption of e-commerce within SMEs, H11: CEO innovativeness has positive and noteworthy impact to the adoption of e-commerce within SMEs, and H12: CEOs involvement has positive and noteworthy impact to the adoption of e-commerce within SMEs.

Technological factors consist of several indicators, such as perceived benefits, suitability, and costs that affect e-commerce innovation adoption. The perceived advantage is the level of acknowledgment of benefits to be obtained for the company (Oliveira and Martins, 2011). Direct perceived benefits as discussed in the section earlier and expectation of indirect benefits (customer service, productivity increase), also influence the degree to which organizations receive e-commerce advances (Crook and Kumar, 1998) (Premkumar and Roberts, 1999).

(Alamro and Tarawneh, 2011) states that perceived benefits refer to the acquisition or improvement of existing business operational transaction methods with e-commerce applications, including increased profit and the creation of positive relationships of trade partners, satisfaction and commitment between partners. (Kowtha and Choon, 2001) (Zhu

et al., 2003) (Hong and Zhu, 2006) contend it is vital to understand the supporting and hindering components of companies in receiving e-business.

Some researchers identify technology as a crucial factor and the key to achieving successful adoption of information systems, (Kuan and Chau, 2001) (Kowtha and Choon, 2001) (Delone and McLean, 2003) (Nelson and Shaw, 2003) (Hong and Zhu, 2006) report a positive relationship between enterprise technology infrastructure and e-business diffusion. Learning variables such as mastery in specialized and innovative management have a noteworthy effect on advancement adoption (Kindström et al., 2013) (Wang and Cheung, 2004)

Expansive companies are individuals who generally receive innovation since they have more assets (Crook and Kumar, 1998) (Kowtha and Choon, 2001) (Thong, 2001)(Hwang et al., 2004). Organizational readiness using the business dimension and size of the company's business as a dimension of organizational aspects and was elaborated with indicators of organizational readiness, among others: the range of markets served, the reach of distribution channels, the ability of alliances with suppliers, customer relations (Zhu et al., 2002). Organizational readiness is a measurement of whether the company's attributes are sufficient to adopt e-commerce (Chong et al., 2012).

Indicators of the company's external environment that can influence the company's intention in the ebusiness adoption processincluding customer readiness, business partner readiness and the level of industrial competition (Zhu et al., 2002) (Gibbs and Kraemer, 2004). The concentrated of ICT exercises within the industry in which the company works, alluding to the degree to which corporate accomplices, clients, and providers embrace innovation in their commerce operations and processes (Simatupang and Sridharan, 2002) (Ranganathan et al., 2004). The impacts of government approaches appear to coordinate and backhanded incitement of data stream that empowers quicker spread of innovation (Bagale, 2014). Government e-readiness as an evaluation of the organization of the planning of a nation and its commitment to energize, bolster, encourage, and organize e-commerce and its needs (Molla and Licker, 2005).

CEOs can influence IT adoption based on innovation and their interest in change. Because of the CEO's overwhelming part in small businesses, this perspective is exceptionally imperative in executing IT. The willingness of CEOs to innovate mainly determines IT adoption (Thong, 1999) (Zhu et al., 2003). The CEO's part as a item winner is discussed in (Grover, 1993). In small businesses, the CEO is ordinarily the sole proprietor and decision producer and

advancement and CEO inclusion contribute to the victory of the IT appropriation process (Poon and Swatman, 1999). Inventive CEOs are willing to require risks and incline toward arrangements that have not been attempted before (Thong, 2001). Directors with a positive state of mind towards e-business as a instrument that gives companies with key esteem can reinforce the inclination to embrace e-business in companies (Grandon and Mykytyn Jr, 2004). The challenges of e-commerce as individuals and organizational issues, counting getting senior administration bolster (Kuzic et al., 2002).

3 MATERIALS AND METHODS

A descriptive-associative approach was connected in this study where the survey was created to test the hypothetical system and theories created. The population of the ponder was SMEs producing snacks, such as roasted peanuts, banana chips, cassava chips, crackers, and so on in Keranggan, Setu, Tangerang Selatan. This study collected data in cross sectional range of time, from in depth interviews and a questionnaire. The basis for embracing this approach is that a study conducted through the utilize of a planned survey can donate a list of questions to respondents in arrange to get reactions. Upon extraction, it is additionally easier for elucidation because it includes standard collected information subjected to thorough quantitative examination (Sekaran, 2003). Probability sampling with simple random sampling was utilized to choose the respondents. With a total number of 150 populations, this study targeted 100 SMEs respondents in Keranggan Village, Setu, Tangerang Selatan. This study employed Structural Equation Modeling (SEM) with SmartPLS Software 3.0 for data analysis. Partial least squares (PLS) analysis is an alternative to OLS regression, canonical correlation, or covariance-based structural equation modeling (SEM) of systems of independent and response variables. Structural Equation Modeling (SEM) is a second-generation multivariate data analysis method that is often used in marketing research because it can test theoretically supported linear and additive causal models.

4 RESULTS AND DISCUSSIONS

4.1 Structural Model Analysis

The Technological aspect (X1) consists of 3 dimensions: Relative Advantage, Compatibility, and Cost.

Organizational aspect (X2) consists of 3 dimensions: Firm Size, Organizational Readiness, and Information Intensity. Environmental aspect (X3) consists of 4 dimensions: Industry Pressure, Government Pressure, Consumer Readiness, and Support from Technology Vendors. Individual Aspects (X4) consist of two dimensions: CEO's Innovativeness and CEO's Involvement. Ecommerce Adoption Intention (Y) in this ponder measures the degree to which the crave of SMEs to implement online sales, online ordering raw materials to suppliers, aggressively conducting advertising via the internet, and applying technology to exchange information.The number of p-values in each dimension shows a value of P ¡0.05, where fulfilling the minimum requirements must be less than 0.05. From these results it can be concluded that Relative advantage, Compatility, Cost, Firm size, Organizational readiness, Information intensity and product characteristics, Industry pressure, Government pressure, Consumer readiness, Support from technology vendors, CEO innovativeness, and CEOs involvement includes a noteworthy impact on Adoption Intention Ecommerce. Table 1 describes Cronbach's Alpha, Composite Reliability, Average Variance Extracted (AVE), Original Sample (O), P Values, f-squared effect size of the full SEM model.

Table 1: Cronbach's Alpha, Composite Reliability, Average Variance Extracted (AVE), Original Sample (O), P Values, f-squared effect size.

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)	Original Sample (O)	P Values	f-square effect size
Relative advantage	0.8684	0.8935	0.5128	0.3998	0.0127	0.0451
Compatility	0.6769	0.7340	0.5801	0.1261	0.0321	0.0149
Cost	0.6071	0.7125	0.5827	0.1172	0.0461	0.0015
Firm size	0.7786	0.7811	0.5462	0.1603	0.0463	0.0040
Organizational readiness	0.8474	0.8756	0.5047	0.1990	0.0371	0.0115
Information intensity and product characteristics	0.6541	0.8524	0.7428	0.1557	0.0267	0.0124
Industry pressure	0.7330	0.8280	0.5466	0.1514	0.0279	0.0241
Government pressure	0.6621	0.8204	0.6954	0.1405	0.0283	0.0304
Consumer readiness	0.6841	0.8019	0.5032	0.2993	0.0156	0.0215
Support from technology vendors	0.6402	0.8327	0.7164	0.1671	0.0420	0.0050

CEOs innovativeness	0.6535	0.7258	0.5713	0.1358	0.0473	0.0012
CEOs involvement	0.6633	0.7242	0.5405	0.1594	0.0474	0.0039

Figure 2. describes the full SEM model as the results of the research showing the parameter values of each observed variable (indicator) and exogenous latent variables and endogenous latent variables.

Technological (X1), Organizational (X2), Environmental (X3), and Individual (X4) aspects have a positive and noteworthy impact on Ecommerce Adoption Intention (Y). Technological (X1), Organizational (X2), Environmental (X3), and Individual (X4) aspects have a determinant coefficient of 0.8807 on E-commerce Adoption Intention (Y), meaning that E-commerce Adoption Intention (Y) variables can be explained by Technological (X1), Organizational (X2), Environmental (X3), and Individual (X4) aspect variables are 88.07%, the rest are explained by other factors.
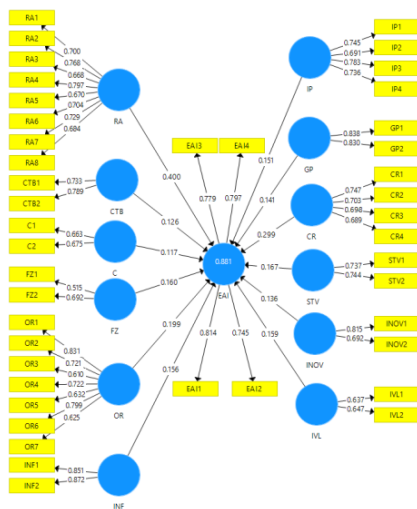

Figure 2: SEM Model.

Relative Advantage has the most elevated impact on e-commerce appropriation eagerly in Technological angles. Respondents considered ecommerce appropriation would increment deals and benefits. The higher the entrepreneur's understanding of the relative benefits of e-commerce selection, the more noteworthy the probability of companies distributing assets such as administrative assets, monetary assets, and innovative assets, to embracing e-commerce innovation (Ghobakhloo et al., 2011).

The comes about of this study approve past studies which found that relative benefits are critical

forecasters for E-commerce execution (MacGregor and Vrazalic, 2008) (Alamro and Tarawneh, 2011) (Wanyoike et al., 2012). This study watches that CEOs who execute e-commerce selection altogether accept that e-commerce is not only able to extend deals, but moreover extend advertise share, decrease costs, and exploit new trade prospects.

The results of the study show that Cost has the lowest influence on the intention of e-commerce adoption in the Technological aspects. Based on the results of interviews with SME business people in Keranggan Village, SME organizations have limited capital so their ability to buy information technology equipment is also limited. In addition, several SMEs have doubts about investing in using the technology and the limited human resources to apply it. Each indicator has a different influence. The biggest indicator values in each dimension are shown in Table 2.

Table 2: Calculation Results Loading Factor.

Indikator		Outer Loadings
Aspek Technological (X1)		
Relative	Advantage - RA4 Increase sales and profits.	0.7966
Compatibility-CTB2	Knowledge of employees in using the technologies they have.	0.7889
Cost - C2	Financial resources are important as funds are available for installation, promotion, purchasing, shipping, and sustainability costs during the use of e-commerce.	0.6753
Aspek Organizational (X2)		
Firm Size - FZ2	The size of the company makes it possible to adopt e-commerce technology.	0.6922
Organizational Readiness-OR1	The market reach served by the business scope is increasingly widespread.	0.8313

Information Intensity- INF2	The extent to which information related to a particular product or service will be reflected in the intensity of customer information.	0.8723
Aspek Environmental (X3)		
Industry Pressure- IP3	Encouragement to increase work effectiveness.	0.7830
Government Pressure- GP1	The role of the government in facilitating the development of regional infrastructure to improve service and management of regional infrastructure.	0.8379
Consumer Readiness- CR1	Consumer's positive perception of online shopping.	0.7469
Support from Technology Vendors - STV2	Partner capabilities in investments that support compatible systems.	0.7435
Aspek Individual (X4)		
CEO's Innovativeness- INOV1	The desire of business owners to obtain relevant information and skills faster than others in a social context.	0.8151
CEO's Involvement- IVL2	Full involvement of business owners in implementing the new system.	0.6473
E-commerce Adoption Intention (Y)		
EAI1	Implement online sales	0.8140

Information Intensity concurring to the respondent's appraisal will contribute to the victory of the organizational perspectives of e-commerce selection in case the information related to a specific item or benefit is reflected within the escalated of customer information. Information about SME items has to be expanded so that customers know the items sold by SMEs. So, e-commerce is very effective in the sense that consumers get information about the products they need and transact in a fast and inexpensive way. Physically safe, consumers do not need to go to the store where the company sells goods and this allows consumers to transact safely, because in certain areas it may be very dangerous to drive and carry large amounts of cash. Flexible, consumers can make transactions from various locations, both from home, office, internet cafe, or other places. Consumers also don't need to dress neatly. But often it causes disappointment. What is seen on a computer monitor screen is sometimes different from what is seen by naked eye.

Though Firm Size, which is the estimate of the company permits planning the assets required, has the least impact on the deliberate of e-commerce appropriation within the Organizational aspect. The fetched of interfacing to the web, satisfactory hardware/software costs, setup, and maintenance costs may be troublesome for a few SMEs since the starting speculation for the selection of unused innovation is relatively heavier for smaller companies than expansive companies. Financial availability affects the level of e-commerce adoption, these financial resources are important as funds are available for installation, promotion, purchase, delivery, and sustainability costs during the use of e-commerce (Nelson and Shaw, 2003). Expansive companies frequently have adequate trade, human and innovative assets to contribute to e-commerce. The size of the company in question is a small business size. The business that adopts ecommerce is the majority of small businesses because micro or small businesses must find ways to survive in an easy way and not cost a lot. The way that can be used in promoting it simply and easily is by adopting e-commerce (Savrul et al., 2014).

Government Pressure with the government's role in facilitating the development of regional infrastructure to improve service and management of regional infrastructure contributed to the success of environmental aspects in encouraging e-commerce adoption. The South Tangerang City Government was asked to help promote the Keranggan Village, KecSetan, Tangsel as a tourist village for micro and small-scale industries. Promotion is very much needed so that the area will increasingly develop into a micro and small-scale industrial center because so far it has been popular as a home industry center that produces snacks. In expansion to instructive assistance, facilitation of innovative framework and lawful systems, the climate that will energize commercial application engineers to supply item highlights that bolster different e-commerce advances that will contribute to the accomplishment of SMEs. To create an environment that supports ecommerce, the government can help solve problems, increase awareness, and provide the right infrastructure, marketing local content according to language and culture in the local environment

(Mirchandani and Motwani, 2001).

The appropriation of e-commerce requires government bolster within the frame of arrangements that bolster e-commerce development issued, it is not clear whether control of information technology frameworks, particularly the web, is one of the spines of e-commerce advancement, change of the customs framework and deregulation of export-import products. Infrastructure development is slow. One of the main obstacles is still the lack of infrastructure that exists and has not been evenly distributed throughout the Indonesian archipelago. Government's seriousness is needed to gradually build good and programmed infrastructure, Indonesian people can be introduced to the internet as one of the results of developing information technology at a cheap and affordable cost.

Adoption of e-commerce requires readiness of human resources both technically and nontechnically such as the banking system, trade traffic to the applicable legal system. There is a need for the accessibility of information and education centers for the advancement of e-commerce specialists. The adoption of e-commerce moreover requires bank and protections support, a great 'electronic banking' framework is required, other than that Indonesian banks are also still troublesome to form exchanges utilizing other monetary forms, particularly in small sums and the nonattendance of third parties as online exchange underwriter truly in Indonesia.

Consumer readiness, which is the comfort of customers for internet access, has the least impact on the deliberate of e-commerce appropriation within the environmental perspectives. The emergence of fraud through e-business and there are no guarantees for transactions carried out, thereby reducing the level of customer trust. With the emergence of various cases that occur, a solution is needed to increase customer trust to make transactions through online marketing. The e-marketplace model allows shared accounts and guarantees from third parties for successful transactions. Concerns about fraud and non-delivery of goods from consumers will be eliminated. Whereas from the merchant's side, the trust will be paid for the items sent will be higher due to account facilities.

This implies that CEO's Innovativeness concurring to respondents' judgment will decide the personal viewpoints of e-commerce appropriation on the off chance that there is a desire of commerce proprietors to get important information and abilities faster than others in social settings. CEOs can impact IT appropriation based on advancement and their intrigued in alter. Since the CEO's prevailing part in little businesses, this perspective is exceptionally vital in executing IT. The readiness of CEOs to improve basically decides IT appropriation (Thong and Yap, 1995). Past writing found CEO innovativeness to significantly and positively impact IT adoption (Thong, 1999) (Mirchandani and Motwani, 2001)(Thong, 2001).

In small businesses, the CEO is ordinarily the sole proprietor and choice creator and advancement and CEO association contribute to the victory of the IT appropriation process (Poon and Swatman, 1999). Innovative CEOs are willing to require dangers and favor arrangements that have not been attempted before (Thong, 1999). The development of information technology can be used to help market products to consumers. There are several main capabilities of information technology, namely (Turban et al., 2006): a. Perform fast numeric computing, and large volume capacity; b. Deliver communication that is quick, precise, and reasonable inside and between organizations; c. Large storage capacity in media that is increasingly small and easily accessible; d. Increasing the effectiveness of team/group performance that is spread/different locations; e. Enables access to lots of information quickly and cheaply, globally; f. Automation of business processes; g. Typing and editing speed; h. The above capabilities are carried out cheaply compared to manual methods.

CEO's Involvement, to be specific commerce proprietors, have encounter and capabilities related to information technology having the littlest parameter gauges. A CEO with more IT information can evaluate the benefits of unused innovation and be more likely to embrace development. Lack of IT information makes instability and as it were mindfulness through the information that gives certainty to unused developments that encourage adoption (Thong, 2001). CEOs in small organizations need essential information on IT and have lacking mindfulness of the potential benefits of IT adoption (Gable and Raman, 1992). CEOs without IT knowledge tend not to be committed to IT appropriation assets. In connection to small businesses, Mirchandani and Motwani, 2001 show that beat administration bolster is a critical calculate in recognizing adopters and not adopters of ecommerce.

5 CONCLUSIONS

The discoveries of this study contribute to the body of writing in a number of ways. This study gives an understanding of the appropriation of e-commerce by SMEs. Innovation encompasses a noteworthy impact on e-commerce selection eagerly. Organizations have a significant impact on ecommerce appropriation

eagerly. Environment includes a significant impact on e-commerce selection eagerly. Individual contains a significant impact on e-commerce selection eagerly. Innovation, organization, environment, and people at the same time have a significant impact on e-commerce selection eagerly.

The government must increment its endeavors by advancing viable programs and activities to empower the level of e-commerce appropriation bySMEs. Proprietors and supervisors of SMEs have an important part in empowering the development of advancement since they are recognizable with the organizational framework and the characteristics of SMEs. Managers must realize that they can have a positive impact on the appropriation of technology by preparing their representatives, conjointly believe technologies focal points. SMEs actors need to develop creative and innovative elements so that their business have better performance. It is vital for SMEs to extend representative information in utilizing the innovation they have in arrange to grow the run of markets served and be able to outlive within the period of worldwide competition. SMEs have an important role in global economic and it is the reason why government policy needs to improve human and technology capability, give information about market opportunity, improve internet accessibility, facilitate funding access, and facilitate information system among SMEs. This result might enhance the understanding of SME proprietors with respect to the potential benefits of e-commerce. A more prominent understanding of the issue will increment their likelihood to apportion a few assets towards receiving e-commerce. SMEs got to plan the assets such as innovation and organization in ecommerce appropriation by considering Technological, Organizational, Environmental, and Individual components.

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System Entities Approach for First Step to Design System That Connecting Small and Medium Enterprises (SMEs) and Researchers

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Keywords: system planning, entity system, requirement modelling, SMEs, system requirement.

Abstract: The purpose of this study is to analyse the system planning and attributes in an entity system for the first step to design systems that are involved in the entity system for the research marketplace that will be developed. For the first, by using SWOT analysis as tool for strategic planning the opportunity to develop a research marketplace is needed especially for the purpose that researchers and SMEs can interact with each other. Then entity system is part of requirement modelling. During requirements modelling, systems developers must identify and describe all system requirements. System requirements fall into five general categories: outputs, inputs, processes, performance, and controls. Based on SWOT analysis for strategic planning, the opportunity to develop a research marketplace is very large. From strategies formed, the results of the SWOT analysis and the mission that want to achieve are directly proportional to goals and objectives. This is a strong reason why research markets can be formed. The last stages of modelling requirements with the entity system approach are the inputs, processes, outputs desired by SMEs and their respective researchers have been grouped.

1 INTRODUCTION

Small and Medium Enterprises (SMEs) are the main player in domestic activity in Indonesia. They faced many problems while running their business. The research conducted by researchers in Indonesia has not been fully integrated with SMEs. The research result (both from Universities and research institutions) has unfortunately not yet fully adopted by the community, especially the SMEs. The problems in SMEs are solved by discussing with other SMEs or searching on Google with a similar case. Many researchers in Indonesia but the research results and technology developed are not appropriate with the users, such as industry, government, and society. (Febriani and Dewobroto, 2018) Commercialization of research results is important when seen from an economic standpoint to provide benefits for the country and also create jobs. From the other side, it can provide a forum for researchers to introduce their work that has the potential for change in the scientific world. One of the main factors influencing the commercialization of research results in Indonesia is the mismatch of research results with consumer needs.

So far, researchers and SMEs moved respectively. SMEs solve their problems and researchers look for research ideas without knowing where will be ap-plied. The difficulty for researchers looking for a place to do research so more research using secondary data or dummy data to resemble characters required data or using data from previous studies. This is due to the difficulty to get data from a company because of the lack of cooperation between companies and researchers. During this time The Community Service program has been assessed as the basis for interacting with SMEs where they can work together with researchers to conduct research. This program is the implementation of the practice of science, technology, and cultural arts directly to the community institutionally through scientific methodology as a responsibility in an effort to develop community capabilities, so as to accelerate the pace of growth in achieving national development goals. The problems in SMEs for community service program are usually simple. But the problems in SMEs found in that program can be the basis for continuing into the real research. In addition, the research conducted was not sustainable or not integrated from the previous year because it was difficult to get partners for cooperation.

To bring together researchers and SMEs in order to help SMEs in solving their problems it takes a place that can bring together all. This place adopts the marketplace concept. For this research, it can be called a Research Marketplace. Marketplace knew

that has succeeded in bringing together many online sellers and consumers both in the fields of hospitality, finance, beauty, health, food, consumer goods, construction and so on. The research marketplace that wants to develop is based online where each SMEs can communicate with researchers without limited in time and distance. The research has been started since 2017, starting from the analysis of the quality of information for SMEs to the adoption of the results of research by understanding what kind of information is required and desired by SME (Febriani et al., 2017), it is expected that in the future, the research result may be fully adopted by SMEs. Then analyse the problems faced by SMEs and conduct a needs analysis using PIECES diagrams(Febriani and Dewobroto, 2018).

Requirement analysis still needs to be done to find out the input, process, and output (entity system in requirement modelling). It will be the first step before the move to the design system. Based on these problems, the purpose of this study is to analyse the system planning and attributes in an entity system for the first step to design systems that are involved in the entity system for the research marketplace that will be developed.

2 METHODOLOGY

Data is collected by interviewing researchers (30 researchers from universities and research department) and SME owners (150 owners) who produce products and services.

2.1 Strategy Planning

There is no standard approach to strategic planning but strategic planning can be starts with SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis. SWOT analysis is one of strategic planning tools usually used to many situations that need a decision (Hay and Castilla, 2006).

2.2 System Entities

An entity is something that can describe data. Entities can also be interpreted as an individual that represents something tangible and can be distinguished by something else. In a real world model each Entity represents a group or family of uniquely identifiable person places, things, concepts or events of interest to the firm and about which the firm wants or must collect data or keep records. The data or records about each entity describe what they are, what they look like, how they are used, what purpose they serve, what actions

they take or what actions are taken with or against them (Modell, 2007). In this entity system, inputs, processes, outputs, roles, rules, and stakeholders will be seen to be involved in this research marketplace. Entities have an important role in the database system because if there is no set of entity database systems are not formed. The entity system approach is also part of requirement modelling.

3 THE RESULTS

Strategic planning begins with conducting the SWOT analysis. SWOT is an acronym for Strengths, Weaknesses, Opportunities and Threats. SWOT Analysis is a tool used for strategic planning and strategic management in organizations. It can be used effectively to build organizational strategy and competitive strategy (Gürel and Tat, 2017).

SWOT Analysis is a strategic planning framework used in evaluation of an organization, a plan, a project or a business activity. SWOT Analysis is therefore a significant tool for situation analysis that helps the managers to identify organizational and environmental factors. SWOT Analysis has two dimensions: internal and external. The Internal dimension includes organizational factors, also strengths and weaknesses, external dimension includes environmental factors, also opportunities and threats (Gürel and Tat, 2017). SWOT analysis for strategic planning defined based on the following criteria (Jyothi et al., 2008):

a Strengths are internal attributes of the organization that are helpful to the achievement of the objective.

b Weaknesses are internal attributes of the organization that are harmful to the achievement of the objective.

c Opportunities are external conditions that are helpful to the achievement of the objective.

d Threats are external conditions that are harmful to the achievement of the objective.

STRENGTHS	WEAKNESS
SMEs increasingly grow up and problems are getting more complicated.	SMEs and researchers are not fully connected.
The wishes and needs of researchers so that research results can be applied or can be commercialized.	It is difficult for researchers to work with big companies so that sometimes they use dummy data.
The research results can be used as a support for decision making.	SMEs do not know researchers who are experts (according to their fields) who can solve the problem at hand.
SMEs do not need a deeper theory because SMEs only need the final results that can help solve the problem.	The output of research has been scientific journals and rarely used directly by the public.
OPPORTUNITIES	**THREATS**
The development of a forum that can connect researchers and SMEs to interact with each other.	For the next, it will be the research marketplace from a competitor.
The existence of a research marketplace has a great opportunity for the research result that can be applied and the development of SMEs will increase.	The possibility of copyright infringement will happen if security is not organized well and the right strategy is not applied to the research results.
Communication is tied with all SMEs and researchers in all around Indonesia.	

Figure 1: SWOT analysis both SMEs and researchers.

Based on the results of the SWOT analysis, the opportunity to develop a research marketplace is needed

especially for the purpose that researchers and SMEs can interact with each other. This can also be supported by the results of the PIECES framework where in terms of performance, information, economic, efficiency, and service are far better by forming a research marketplace.

There is no standard approach to strategic planning. Beside swot analysis, a firm's mission statement should contain an inspirational message to its stakeholders. The majority of analyst view the strategic planning process as a dynamic interaction similar in Figure 1 that show where the mission statement reflects a long-term horizon, but sets forth goals that are achievable and consistent with realworld conditions (Shelly and Rosenblatt, 2012).

A mission statement is just the starting point. Next, identifies a set of goals that will accomplish the mission. To achieve those goals, then develops a list of shorter-term objective. Objectives also might include tactical plans. Finally, the objectives translate into day-to-day business operations, supported by IT and other corporate resources. The outcome is a set of business results that affect company stakeholders.

Figure 2: Strategic planning is a dynamic process that identifies specific goals and objectives that support the mission

The mission of this study is of course that the problems of SMEs can be overcome and the research results can be fully utilized by not only being a scientific journal. The goal for this research is for SMEs and researchers to interact with each other so that the problems of SMEs can be resolved and research results can be fully utilized. To achieve this goal, so the objective is to create a meeting place between SMEs and researchers in the form of a research marketplace. In general terms, a system is described as an entity (unit) where there is input that enters the system and processes it, so it comes out as output.
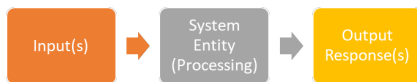

Figure 3: System entity

The picture above is the basis of a system entity. This picture is not yet clearly explained the importance of elements a system. The entity construction should clearly describe what the system and the element in it. Not only input and output, but in a system should also be stakeholders involved, mission and objectives, opportunities, threats, and control. The Mission, objectives, and opportunities, in general, have been explained in system planning.

Entity system is part of requirement modelling. During requirements modelling, systems developers must identify and describe all system requirements. A system requirement is a characteristic or feature that must be included in an information system to satisfy business requirements and be acceptable to users. System requirements serve as benchmarks to measure the overall acceptability of the finished system. System requirements fall into five general categories: outputs, inputs, processes, performance, and controls.

The Outputs:	The Inputs:
1. Research marketplace must be able to show research results which show information past and present (of course with good policy and security to avoid plagiarism and copyright of researchers). 2. Information from research results must be up to date and show the information needed. 3. The information can present in detail (charts or graphics), detail analysis, and detail alternative decisions. 4. The system must show the profile details of both SMEs and researchers. 5. The system must show the satisfaction of cooperation between SMEs and researchers (can be with stars). 6. Show a research time schedule from the beginning until the research estimation is complete.	1. The SMEs and researchers must provide details of each profile. Such as for researchers must provide their expertise, research track record, and others. SMEs must provide the business type, length of business, problems often faced and others. 2. SMEs must input detailed problems and detailed data, such as product defect data, over time data and others. 3. The researcher must provide the research results in detail including the results of the analysis that will enter into the data center. 4. Data entry screens must be uniform, except for background color, which can be changed by the user. 5. Providing satisfaction assessment of good cooperation between researchers and SMEs
The Process:	The Performance:
1. Calculate the average satisfaction of cooperation between SMEs and researchers. 2. Update information on research results needed by SMEs. 3. Show the pictures or charts as a research results analysis. 4. Calculate the time schedule of research starting from the beginning to completion of the study.	1. The system must support many users online simultaneously. 2. Response time must not exceed four seconds. 3. The system must be operational seven days a week, 365 days a year. 4. The research results that have been completed can be seen at any time.
The control and Security:	The Stakeholder:
1. The system must provide logon security at the operating system level and at the application level. 2. The research results can be accessed in detail only for SMEs who have problems and researchers who work together to solve them. 3. There is a cooperation agreement that must be agreed upon by SMEs and researchers. 4. The system must create an error log file that includes the error type, description, and time.	1. SMEs 2. Researchers

Figure 4: System entity as part of system requirement.

The future of this research is to establish a framework for the development of research markets. Based on the system development life cycle, the next step is system design where it starts designing object-based with UML until it reaches program implementation. The limitation of this study is a large number of fields of SMEs and researchers so that it is not biased to classify researchers according to their fields and SMEs according to the type of product produced.

4 CONCLUSIONS

Based on SWOT analysis for strategic planning, the opportunity to develop a research marketplace is very large. From strategies formed, the results of the SWOT analysis and the mission that want to achieve are directly proportional to goals and objectives. This is a strong reason why research markets can be formed. The last stages of modelling requirements with the entity system approach are the inputs, processes, outputs desired by SMEs and their respective researchers have been grouped.

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Prediction and Analysis of the Factors That Influence Volume of Air Passenger at Banyuwangi Airport using Econometric

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Keywords: Econometric, Passenger Prediction, Airport Masterplan.

Abstract: The volume of passengers at the airport in the future needs to be predicted. From several air passenger prediction methods, one of them is the econometric method. This method has the excellence of long-term predictions and gaining knowledge of economic factors that affect the volume of air passengers. In this study, several economic factors, such as hotel occupancy, population, rupiah exchange rate, tourism visitor, inflation, and the Banyuwangi Consumer Price Index (CPI), were analyzed. Pre-analysis data needed before building the model, including data selection, data description, data pattern recognition, and data completeness. The best econometric model is obtained from the results of the combination test of each variable. The best econometric model is used to predict the volume of air passengers in Banyuwangi airport for the next 20 years. From the results, three factors significantly effect the volume of air passengers, that is, hotel occupancy affect 0.301%, population affect 0.132%, and the rupiah exchange rate affect -0.481%. To evaluate the accuracy of predictions using the Mean Absolute Percentage Error (MAPE) with a value of 15,208 %.

1 INTRODUCTION

Indonesia Civil Avition Law No.1 2009, it is stated that the airport, one of the transportation network nodes. It encourages and supports industrial and trade activities. It encourages and supports industrial and trade activities. The economic stability of Banyuwangi Regency has an impact on the growth of human and goods mobilization from origin to destination through air transportation modes. Referring to the Banyuwangi Airport Master Plan, phase II is estimated to serve aircraft passengers around 272,500 passengers per year, but in 2017 volume of air passengers at Banyuwangi Airport is 188,949 thousand, and by the end of 2018 air passengers volume is 366,155 people. There is a significant difference between the master plan projections and existing passenger. Banyuwangi Airport has the potential to experience density and result in a decrease in the quality of services for users of air transportation services. In this condition, there is a high need to evaluate and projections air volume passengers in the future.

The purpose of this study is to predict the volume of air passengers for the next 20 years and analyze the factors that effect the volume of passengers at Banyuwangi Airport. According result of analysis, it was obtaining knowledge about the factors that in-

fluence the volume of air passengers at Banyuwangi Airport. The study result can be used as a reference for policy development.

2 LITERATURE REVIEW

Economic factors affect the volume of passengers at certain airports, regions or cities. The most common economic indicators are Gross Domestic Product (GDP), Per capita GDP, Population (Pop), Income, and Per Capita Income (Guo and Zhong, 2017). There are many studies that discuss the relationship between air passenger volume and economic variables.

Figure 1. Provides insight into several economic indicators that have been used to estimate the volume of air passenger.

Author	Methods	Variable
R. GUO, ZW ZHONG, MATTER: in 2017	Econometric models	of China's GDP exchange rate of SGD to CNY Indian CPI GDP Purchase Rate Community tourism
Bilqis Amaliah, Azizha Zeinita, Erma Suryani: 2016	Dynamics Simulation Econometric models	GDP Population Terminal
Vassilios A. Profillidis Population, George N. Botzoris, (2006)	General to Specific Approach, Econometric models,	GDP, index of car ownership, car usage fees, fuel costs of railway trainsLowest competitive Rates Travel time
Adetayo Olaniyi Adeniran 2017 ,, Adedayo Ayomide	regression analysis of Ordinary Least Squares	naira currency exchange rate GDP, CPI

Figure 1: Literature Review.

3 METHODOLOGY

To solve the problem, the process is carried out referring to the methodology illustrated in Figure 2.
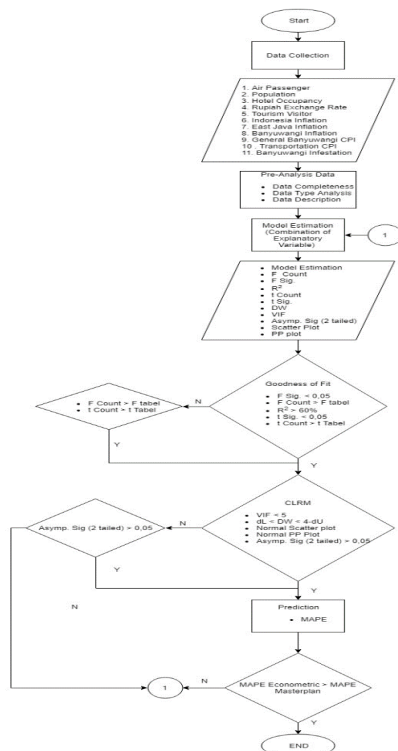
Figure 2: Methodology flow chart

3.1 Data Collection

Data in this study was collected from agencies, and website agencies, as shown in Figure 3.

No	Variable Year	Source	Num. of Sample
	Dependent Variable		
1	Air Passenger 2012-2017	Banyuwangi Airport	72
	Explanatory Variable		
1	Population 2012-2017	Dinas Kependudukan dan Catatan Sipil Kabupaten Banyuwangi	72
2	Hotel Occupancy 2012-2017	Dinas Kebudayaan dan Pariwisata Kabupaten Banyuwangi	72
3	Rupiah exchange rate 2012-2017	https://www.bi.go.id/	72
4	Tourism visitor 2013-2017	Dinas Kebudayaan dan Pariwisata Kabupaten Banyuwangi	60
5	National Inflation 2013-2017	https://www.bi.go.id/	60
6	East Java Inflation 2013-2017	https://jatim.bps.go.id/	60
7	Banyuwangi Inflation 2013-2017	BPS Banyuwangi	60
8	General Banyuwangi CPI and Transportation CPI 2013-2017	https://banyuwangikab.bps.go.id/	60
9	Banyuwangi Infestation 2012-2017	Dinas penanaman modal dan pelayanan terpadu satu pintu Banyuwangi	6

Figure 3: Dependent Variable and Explanatory Variable.

3.2 Pre-analysis Data

Pre-analysis of data consists of :

3.2.1 Data Completeness

Completeness of data includes independent variables, explanatory variables, number of data, and year, shown in Figure 3.

3.2.2 Data Type Analysis

Data type in this research:

- Data Type : Quantitative data
- Data Classified : secondary data
- Measurement : Interval – Ratio

3.2.3 Description of Data Graphically

To simplify data analysis, detect trends, seasonal and data patterns, the data is presented using a line chart graph, where the X axis for time (month), and the Yaxis for volume.

Example of graphically shown in Figure 4.

Figure 4: Description of data graphically

There are several data that have the potential to be included in the model, comprise:

- Investment data of Banyuwangi in 2012-2017, the data has annual intervals so that it requires interpolation of monthly intervals. And it is feared that it will cause inaccuracies in the model.
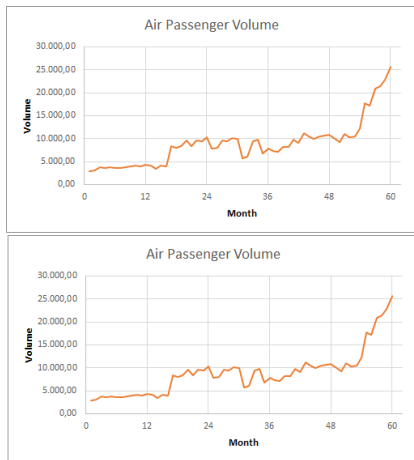
- Banyuwangi Inflation, there are similarities between Banyuwangi inflation data and East Java inflation, In this study used East Java inflation.

3.2.4 Data Description Numerically

Data description numerically is shown in Figure 5. to get the mean, standard deviation, and Number of Sample (N).

	Mean	Std. Deviation	N
Air Passenger	7413,0833	4797,915	72
Hotel Occupancy	48696,6667	7487,596	72
Rupiah exchange rate	12003,5458	1649,372	72
Population	1652723,3056	25432,931	72
Tourism visitor	202333,1167	143462,576	60
National Inflation	5,4715	1,926	60
East Java Inflation	0,4112	0,592	60
General CPI	117,0058	6,384	60
Transportation CPI	115,4777	7,850	60

Figure 5: Descriptive Statistic Table.

3.3 Model Estimation

Regression analysis, implemented in equation (1), is needed to measure the strength and direction of passenger relationships and explanatory variables. To determine constants, using the Ordinary Least Squares (OLS) method. In linear regression analysis with OLS, it is necessary to pass the test of the classical linear regression model (CLRM).

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_n x_n \qquad (1)$$

Y = Dependent Variable β_0 = Constants $\beta_1, \beta_2...\beta_n$ = Estimated regression coefficient $x_1, x_2, . . . x_n$ = Explanatory Variable

Coefficients table is shown in Figure 6 produces values of : $\beta_0, \beta_1, \beta_2...\beta_n$, t count, t Sig., Variance Inflation Factor (VIF) value.

Model	Unstandardized Coefficients		t	Sig.	Collinearity Statistics
	β	Std.Error			VIF
(Constant)	-220300,605	26797,541	-8,221	0,00 0	
Hotel Occupation	0,301	0,037	8,15 0	0,00 0	1,784
Rupiah exchange rate	-0,481	0,268	-1,79 7	0,07 7	4,545
Population	0,132	0,018	7,32 8	0,00 0	4,918

Figure 6: Coefficients table.

Anova table is shown Figure 7 produces values of : Degree of Freedom (df), F count, and F Sig

Model	Sum of Square	df	Mean Squre	F	Sig.
Regression	1427150815,231	3	475716938,410	156,072	0,00 0
Residual	207268348,269	68	3048063,945		
Total	1634419163,500	71			

Figure 7: Anova Table.

Model Summary is sown in Figure 8 .produces values of: R , R2 , Durbin Watson (DW)

Model	R	R²	Std. Error of the Estimate	df 1	df 2	Durbin Watson
1	0,934	,873	1745,871	3	68	1,611

Figure 8: Model Summary Table.

3.4 Goodness of Fit / Model Feasibility Test

The accuracy of the regression model obtained in estimating the actual value can be measured by a simultaneous regression coefficient test (F-Test), coefficient of determination (R2), and test individual coefficients test (t-Test).

3.4.1 F-test

The F-test is used to determine whether the Explanatory variable $X_1, x_2,...x_n$ has a significant influence on the dependent variable Y simultaneously.

- Compare the F Sig to significance level
  - if value of F Sig. < 0.05, explanatory variables have a significant effect simultaneously on dependent variable.

– if value of F Sig. > 0.05, explanatory variables have no significant effect simultaneously on dependent variable, or compare F count to t table value.

- Compare t count to t table value

  – if F count > F table value, Explanatory variables have a significant effect simultaneously on dependent variable.

  – if F count < F table value, Explanatory variables have no significant effect simultaneously on dependent variable.

3.4.2 Coefficient of Determination (R^2)

Coefficient of Determination using to measure how far the ability of the model explains the dependent variable (Kuncoro, 2001). Implemented in the equation (2).

$$Coefficient of Determination = (R)^2.100\% \quad (2)$$

3.4.3 Individual Coefficients Test (t-Test)

The t-test is used to find out how far the explanatory variables effect the dependent variables individually (Kuncoro, 2001) If t Sig. < Significance level (α), the model estimation is declared feasible (Kuncoro, 2001).

- Compare the t Sig to significance level (Siregar, 2013).

  – if value of t Sig. < 0.05, explanatory variables have a significant effect individually on dependent variable.

  – if the value of t Sig. > 0.05, explanatory variables have no significant effect individually on dependent variable. or Compare t count and t table value.

- Compare t count to t Table value (Siregar, 2013).

  – if t count ≥ t table value, explanatory variables have a significant effect individually on dependent variable.

  – If -t table value ≤ t count ≤ t table value explanatory variables have a significant effect individually on dependent variable.

3.5 Classical Linear Regression Models (CLRM)

The model must pass the CLRM, comprise:

3.5.1 Multicollinearity

Multicollinearity is a state of high intercorrelations among the explanatory variables. The model is declared free from multicollinearity if the VIF value < 5 . Using VIF value.

- if VIF value < 5, there are no symptoms of Multicollinearity.

- if VIF value > 5, there are symptoms of Multicollinearity.

3.5.2 Autocorrelation / Independence of Observations

In time series data, autocorrelation is defined the error for one time period t is correlated with the error for a subsequent time period t-1. To measure of autocorrelation uses durbin watson test. Compare the DW value with the value of dL and dU on the DW table level. The value of dL and dU are shown in Figure 9.

1. dU < DW< 4-dU item If DW value fall in inconclusive area, uses Run test to measure of autocorrelation (Profillidis and Botzoris, 2006) Figure 10.

T	K	dL	dU
72	2	1.58949	1.64571
72	3	1.56112	1.64571
72	4	1.53226	1.70539
72	5	1.50293	1.73664

Figure 9: DW Table Level.

T : Number of samples K : Number of variables dL: Lower limit of Durbin Watson dU: Upper limit of Durbin Watson
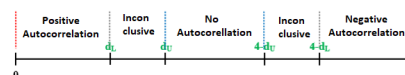
Figure 10: Description of Autocorrelation Using DW

3.5.3 Run Test

Run test is an alternative test to test the autocorrelation if the DW value fall in conculsion area. The test applied by run the randomization test (Profillidis and Botzoris, 2006). Decision in run test, if Asymp. Sig. (2-tailed) > 0,05 , there are no symptoms of autocorrelation.

3.5.4 Heteroscedasticity

The Heteroscedasticity test is a test that assesses whether there is an inequality of variance from the residual for all observations in the linear regression model (Kuncoro, 2001). Heteroscedasticity test analyzes the Scatter plot. The Scatter Plot Graph as seen

as Figure 11 created with y and x axis,where x axis is Studentized Residual (SRESID) and y axis is Standardized Predicted Value (ZPRED)".
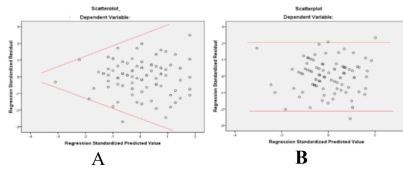
Figure 11: A There are symptoms of heteroskedasticity, B No Symptoms of Heteroskedasticity

3.5.5 Normality

The results of the normality test by observing the distribution of Probability Plots (PP Plots). If the distribution of these points approaches or is in a straight line (diagonal), then it is said that (residual data) is normally distributed, but if the distribution of these points is far from the line, then the skewed distribution as seen as Figure 12.

Figure 12: A PP plot with skewed distribution, B Normal PP Plot

3.6 Predictions

Prediction is the process of systematically estimating something that is most likely to occur in the future based on past and present information.

- Winter additive exponential methode Three components winter additive exponential smoothing implemented in equation (3), (4), (5), and (6) (In, 2017):

1. Prediction

$$Y_{t+m} = S_t + mb_t + l_{t-L+m} \qquad (3)$$
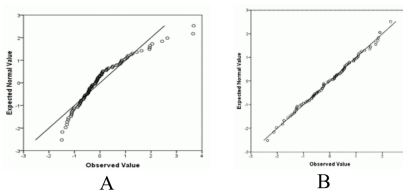
2. Overall Smoothing

$$S_t = a(X_t - l_{t-1}) + (1-a)(S_t + b_{t-1}) \qquad (4)$$

3. Smoothing trend

$$b_t = \beta(S_t - S_{t-1}) + (1-\beta)b_t - 1 \qquad (5)$$

4. Seasonal Refinement

$$l_t = Y(X_t - S_t) + (1-Y)l_{t-1} \qquad (6)$$

Where :

S_t = Smoothing value for t period.
X_t = Actual value in the final period t
b_t = Value of trend smoothing
α = Smoothing parameters for data ($0 < \alpha < 1$)
Y = Seasonal smoothing parameters ($0 < y < 1$)
β = Smoothing parameters for trends ($0 < \beta < 1$)
l_t = Seasonal adjustment factors
L = Seasonal length
$Y_t + m$ = Forcasting for m periode from t
m = Number of periods to forecast

3.7 Evaluation of Predictions

The prediction model is validated using Mean Absolute Percentage Error (MAPE) (7).

$$MAPE = \frac{\sum \frac{|ei|}{X_i 100}\%}{n} = \frac{\sum \frac{|X_i - F_i|}{X_i 100}\%}{n} \qquad (7)$$

4 RESULTS AND DISCUSSION

From the regression analysis procedure performed, three estimations of the econometric model were built. Each model results from a combination of explanatory variables.

4.1 Model 1

Model 1 is built using eight explanatory variables, with 95% Significance level (α), and number of samples (N) 60, the details as shown in Figure 13.

Refer to Figure 13, the R2 = 85,9%, meaning the explanatory variable can explain the dependent variables well and has a strong relationship. Explanatory variables have a significant effect simultaneously on dependent variable referring to F.Sig. (0,000) < Significance level (0,05). t Sig of x1, x2, x3 and , x4 < 0,05 it means they have a significant effect individually on dependent variabel. t Sig. of x5, x6, x7 and , x8 > t Significance level, so it need to compare t count to t table. t count of x5, x6, x7 and , x8 < 1,675. It declare , the explanatory variables have no significant effect individually on dependent variable.

According the result of t-test, model 1 not pass feasibility test.

| Model 1 α = 95% N = 60 Y =1 x = 8 Hotels occupancy($x1$) Rupiah exchange rate. ($x2$) Population. ($x3$) Tourism Visits. ($x4$) Indonesia Infl. ($x5$) East Java Ifl. ($x6$) General CPI. ($x7$) Transport CPI ($x8$) | Regression analysis Results Y= -2.50617,39 +0.315 $x1$ + (-1,411 $x2$) + 0,137 $x3$ + (-0,007 $x4$) + 188,805 $x5$ + (-269,417 $x6$) + 239,97 $x7$ + 558,43 $x8$ R^2 = 85,9 F Sig = 0,000 t table = 1.675 F Value = 38.832 F table = 2.13 DW = 1.402 dL = 1.51442 dU = 1.65184 |

	t count	t Sig	VIF
$x1$:	7,662	0,000	1,610
$x2$	-2,608	0,012	8,474
$x3$:	3,707	0,001	10,749
$x4$:	-2,574	0,013	2,400
$x5$:	0,999	0,322	2,396
$x6$:	-0,597	0,553	1,288
$x7$:	1,108	0,273	34,553
$x6$:	0,474	0,637	15,423

Figure 13: Model 1 Information Table

4.2 Model 2

Model 2 is Built with four explanatory variables, with 95%Significance level (α), and number of sample (N) 60, the details as shown in Figure 14 .

| Model 2 α = 95% N = 60 Y =1 x = 4 Hotels occupancy($x1$) Rupiah exchange rate. ($x2$) Population. ($x3$) Tourism Visits. ($x4$) | Regression analysis Results Y= -2.71781,663 +0.324 $x1$ + (-0,526 $x2$) + 0,164 $x3$ + (-0,005 $x4$) R2 = 84,7 F Sig = 0,000 t table = 1.674 F Value = 75,931 F table = 2.54 DW = 1.402 dL = 1.51442 dU = 1.65184 |

	t count	t Sig	VIF
$x1$:	8,097	0,000	1,499
$x2$	-1,718	0,091	2,688
$x3$:	7,213	0,000	4,041
$x4$:	-2,249	0,029	2,102

Figure 14: Model 2 Information Table

Refer to Figure 14, the R2 = 84,7%, meaning the explanatory variable can explain the dependent variables well and has a strong relationship. Explanatory variables have a significant effect simultaneously on dependent variable referring to F.Sig. (0,000) < Significance level (0,05). t Sig of x1, x3and ,x4 < 0,05 it means they have a significant effect individually on dependent, but t Sig of x3> Significance level, so it need to compare t count to t table. t count of x3(7.213) > 1.674. It declare all explanatory variables have significant effect individually on dependent variable. Model 2 pass the Multicollinearity test. According to all VIF value < 5. For autocorrelation test, DW value < dL, it means model 2 have a positive autocorrelation. According the result of autocorrelation test, model 2 not pass CLRM test.

4.3 Model 3

Model 3 was Built with three explanatory variables, with 95% Significance level (α), and number of sample (N) 72, the details as shown in Figure 15.

| Model 3 α = 95% N = 72 Y =1 x = 3 Hotels occupancy($x1$) Rupiah exchange rate. ($x2$) Population. ($x3$) | Regression analysis Results Y= -2,27346,580 +0.301 $x1$ + (-0,481 $x2$) + 0,132 $x3$ R^2 = 87,3 F Sig = 0,000 t table = 1,670 F Value = 75.931 F table = 2.54 DW = 1.611 dL = 1.53226 dU = 1.70539 |

	t count	t Sig	VIF
$x1$:	8,150	0,000	1,784
$x2$	-1,797	0,077	4,545
$x3$:	7,328	0,000	4,918

Figure 15: Model 3 Information Table

Refer to Figure 8, the R2 = 87,3, meaning the explanatory can explain the dependent variables well and has a strong relationship. Explanatory variables have a significant effect simultaneously on dependent variable referring to F.Sig. (0,000) < Significance level (0,05). t Sig. of x1,and x2 < 0,05 it means they have a significant effect individually on dependent, but t Sig. of x3> t Significance level, so it need to compare t count to t table. t count of x3(-1.797) < - 1.670. It declare all explanatory variables have significant effect individually on dependent variable. Model 3 pass the Multicollinearity test according to all VIF value < 5. For autocorrelation test, DW value < dU, DW value fall in inconclusive area, to solved this condition we uses a Run test. Result of Run test as shown in Figure 16.

Refer to Figure 16, value of Asymp. Sig(2-tailed) 0,476 > 0,05, it means model 3 no autocorrelation. From Figure 12 shows that the point distribution does not form a particular pattern / path, so it can be concluded no heteroscedasticity. Distribution of points from Figure 17 normal P-P Plot.

The above plot is relatively close to a straight line, so it can be concluded that the data residuals are distributed normally.

Unstandardized	Residual
Test Value	9,55233
Cases < Test Value	36
Cases ≥ Test Value	36
Total Cases	72
Number of Runs	34
Z	-0,712
Asymp. Sig. (2-tailed)	0,476

Figure 16: Run test result.
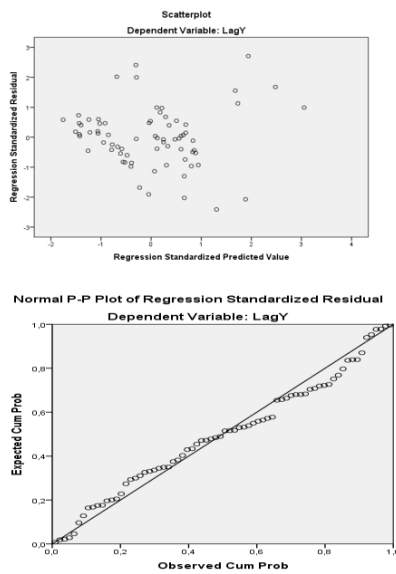
Figure 17: PP Plot

4.4 Predictions for the Next 20 Years

After getting the model, we predict each explanatory variable. From the observations of the data on each variable, with the presence of seasonal trends and patterns, the use of predictions suitable for each variable is as follows:

1. Population Winter Additives
2. Hotel Occupancy Winter Additives
3. Currency Exchange Winter Additives

Based on the econometric model 3, the volume of air passengers in Banyuwangi is predicted for the next 20 years. Predictions from 2017 to 2037. Prediction results are shown in Figure 19.

4.5 Prediction Validation

Figure 18 shows comparation MAPE value for econometric prediction and Masterplan prediction.

	MAPE	Explanation
Masterplan	22,786 %	The error percentage is 22,768 %
Econometric	15,208 %	The error percentage is 15,208 %

Figure 18: Comparation MAPE Value.
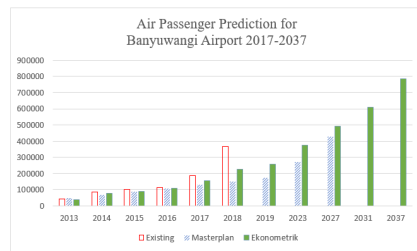
Figure 19: Results of model econometric predictions

5 CONCLUSIONS

The results of the analysis; the variables that significantly influence the volume of air passengers at Banyuwangi airport are Hotels Occupancy, Rupiah exchange rates, and Population, with coefficients of value 0, 301, -0.481, and 0.132. A negative sign on the rupiah exchange rate shows an inverse relationship. With the MAPE value of 15,208 %, the prediction of passengers at Banyuwangi Airport using econometrics is declared feasible. Therefore, it is concluded that the economic model provides a good estimate of the volume of air passengers at Banyuwangi Airport.

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Juridical Analysis of "Safeguards" on Protection of State Industrial Law

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Keywords: Safeguard, Regulation, Legal Protection

Abstract: Safeguard is one of the legal instruments to protect domestic industries from increasing imported goods that occur in normal trade but harming domestic industries. To avoid this, the WTO and the Government of Indonesia issued a protection regulation. The purpose of the study is to find out 1).Protection of domestic industrial law against safeguards in WTO provisions and regulations in Indonesia. 2).Adjustment of a substance in Indonesia to safeguard provisions. This legal research is normative juridical by using a statue approach, analyzed in a continuous manner. The results of the study:1).There are still some weaknesses in the safeguard rules in Indonesia because there are no specific rules regarding safeguards because they are still regulated in the Customs Law, while each WTO rule is regulated in each different Article, there is no explanation that absolute and relative in terms of imposition of safeguards. 2).In implementing safeguards there are still differences found in the form of safeguard provisions in WTO rules and regulations in Indonesia.

1   INTRODUCTION

International trade is one part of business activities that have recently experienced very rapid progress. This can be seen from the increasingly expanding circulation of goods, services, capital and labour between countries. This activity can occur through export, import, investment, service trade, license and franchise, intellectual property rights and technology experts, which in turn have an influence on other economic activities, such as banking, insurance, taxation and so on (Indraswari and Sudiarta, a).

It is realized that it is not easy to implement the WTO agreement in accordance with the stipulated provisions so that there may be deviations in the process of trade liberalization that urges the position of the domestic industry, so it is necessary to take safeguards so that mutually beneficial international trade activities can be realized. Many cases of security measures implemented by several countries such as Argentina that implement security measures against the footwear industry in their countries without harmonizing the WTO provisions, resulting in losses suffered by these countries.(Alfaqiih, 2012)

Trade relations between countries known as international trade experience rapid development from time to time. The dynamics of international trade are followed by a variety of complex problems as a consequence of a fair trade relationship occurring in the

business world. A distinctive feature of international trade is the existence of trade relations carried out between cross-border countries carried out by business actors by following a specific and specific system. In international trade, the existence of a system is a patron that forms and directs trade activities into certain desired goals (Barutu, 2007). Indonesia officially became a member of the WTO in 1995 by ratifying all WTO agreements, through Law No. 7 of 1994 concerning the Ratification of the Agreement Establishing the World Trade Organization.

Open international market conditions, for Indonesia, offers a great opportunity for domestic products to be exported, however in accordance with the principle of causality Indonesia is also required to open a domestic market for imported products to enter and circulate (Lestari, 2010). This certainly can bring intense competition from imported products, especially if the number of imported products floods the domestic market. Thus, this can lead to the formation of an unfair business competition in the domestic market. If these conditions occur, then as a member of the WTO, Indonesia can implement legal measures in the form of safeguards. Safeguard is one of the legal instruments to protect domestic industries from increasing imported goods that occur in normal trade but harming domestic industries.

A safeguard mechanism for an international trade agreement is the core element to secure market ac-

cess commitments in trade negotiations and effectively sustain trade liberalization despite domestic resistance from comparatively disadvantaged economic sectors. A safeguard system is not only essential to provide safety nets for overly excessive importation within such a short period of time, but also critical to facilitate structural adjustment induced by import competition. (Ahn, 2006)

WTO data show that Indonesia is the second largest country that actively applies safeguard measures. This can be proven since Indonesia joined the WTO from 01/01/1995 until 31/12/2015.

In Indonesia, the institution authorized to conduct the investigation is the Indonesian Trade Safeguard Committee (KPPI) which was established in 2003 through the Decree of the Minister of Industry and Trade No.84/MPP/Kep/2/2003 dated February 17, 2003. This decree is a follow-up to Presidential Decree No. 84 of 2002 dated December 16, 2002 concerning Measures for Safeguarding Domestic Industries from the Effects of a surge in Imports. This KPPI has the task of handling problems related to efforts to recover serious losses or prevent the threat of serious losses suffered by domestic industries as a result of a surge in the number of imported goods (Indonesia, a).

Safeguard is regulated in the WTO, GATT (General Agreement on Tariff and Trade) Article XIX and in several national regulations, namely Law No. 7 of 1994 concerning Ratification of the Agreement Establishing The World Trade Organization; UU no. 17 of 2006 concerning Amendments to Law No. 10 of 1995 concerning Customs; Government Regulation No. 34 of 2011 concerning Antidumping Measures, Reward Measures and Trade Safeguard Measures and Decree of the Minister of Industry and Trade of the Republic of Indonesia No. 85/MPP/Kep/2003 concerning Procedures and Requirements for Requests for Investigation of Safeguarding Domestic Industries from the Effects of a Surge in Imports.

Some previous study research on safeguards, for example:

1. Protection of Domestic Industry through Safeguard Actions of the World Trade Organization. That safeguard regulation refers to Article XIX GAAT (Emergency Action on Imports of Particular Product) as perfected by the 1994 agreement on safeguard. Safeguard measures are also regulated in the Indonesian legal system with Presidential Decree Number 84 of 2002 concerning measures to safeguard domestic industries from the consequences import policy (Indraswari and Sudiarta, b).

2. Harmonization of Regulations and Effectiveness

of Safeguard Institutions in Indonesia , Analysis of the Interest of Indonesia's Special Safeguard Mechanism in Agricultural Negotiations in the World Trade Organization (WTO), which addresses the issue of protecting domestic producers from import surges through the Special Protection Mechanism (SSM) scheme (Lubis et al., 2010).

3. Likewise for the nuclear field, as the study conducted by Ign. Djoko Irianto in the Title: The Role of Safeguards Technology and Physical Protection for the Protection of Nuclear Materials.

4. Safeguard Mechanism and ATIGA (ASEAN Trade in Goods Agreement): Case Study of Sugar Trade in Indonesia and Fruit Trade in Vietnam, which explains among others the emergence of new problems in trade that exist between ASEAN member countries, is due to non-cultural negotiations their confrontation and informal cooperation adopted by member countries in solving trade problems.

5. Anita Kamilah's research entitled: Law Protection for Domestic Industries Due To Dumping Practice. Basically, this research focuses on: (1) What factors cause a corporation to practice dumping, and (2) How is the legal protection of a country due to dumping practices. Factors causing dumping, to gain profit by setting lower prices on the import market and monopoly on the market of the importing country. The form of protection for countries suffering from losses due to dumping practices is to be able to impose "Antidumping Import Duty", as a sanction for exporting countries(Kamilah, 2015).

6. Subsequent research on safeguards by Dukgeun Ahr, a Professor from Korea (Professor of International Trade Law and Policy, Graduate School of International Studies, Seoul National University, Korea). With the title of his research "Restructuring the WTO Safeguard System" in his journal entitled "The WTO Trade Remedy System: East Asian Perspectives". In this study discussed some of the problems that are more basic, procedural and substantive. Also explained a little about the establishment of better protection mechanisms in the future(Ahn, 2006)

Meanwhile, in my research entitled Juridical Analysis of "Safeguards" On Protection of State Industrial Law, by raising the issue as set out in the legal issue below.

Based on the description above, several problems arise. The objectivities of the study in this study are:

1. How about safeguards against the protection of-

domestic industrial law according to WTO Provisions and Regulations in Indonesia?

2. is safeguards in Indonesia in accordance with the safeguard provisions stipulated by the WTO?

2 METHOD

This research is juridical normative by using a statue approach, and a conceptual approach. This research is normative juridical with a literature approach that is by studying journals, books, legislation and other documents related to this research.

This approach views the law as identical with written norms created and promulgated by authorized institutions or officials.

In this study there are 3 legal materials: primary, secondary and tertiary. Primary legal materials which are provisions relating to Safeguards based on WTO regulations and national regulations consisting of: a. General Agreement on Tariffs and Trade (GATT) 1947; agreement on Safeguard: c. Law No. 7 of 1994 concerning Ratification of the Agreement Establishing The World Trade Organization d. UU no. 17 of 2006 concerning Amendments to Law No. 10 of 1995 concerning Customs; Government Regulation No. 34 of 2011 concerning Antidumping Actions, Reward Actions, and Trade Safeguard Measures; Secondary legal material that is all publications about law that are not official documents (books, dictionaries, journals, comments on court decisions).Tertiary legal materials namely: a large Indonesian dictionary, Law dictionary, encyclopaedia, and others.

Legal Material Collection Techniques with the model of library research (Ibrahim, 2006).

The technique of analysing legal material is carried out in a descriptive qualitative manner, namely the selection of theories, principles, norms, doctrines and articles in the law. Legal materials obtained are then subjected to discussion, examination and grouping into certain parts to be processed into information data (Asshiddiqie, 1997).

3 SAFEGUARDS (TRADE SECURITY MEASURES) AGAINST THE PROTECTION OF DOMESTIC INDUSTRIAL LAW ACCORDING TO WTO PROVISIONS AND REGULATIONS IN INDONESIA

It is not easy to establish a WTO agreement in accordance with the provisions applied so that a safety valve may be needed so that mutually beneficial international trade activities can be realised. This has been done since the entry into force of the 1947 GATT agreement, one of which is safeguard action (Barutu, 2007). Safeguard actions are intended to avoid situations in which WTO members face a dilemma between allowing domestic markets that are severely disturbed by imported goods and withdrawing themselves from the agreement. If the second one is chosen by many countries, it means that the agreement is ineffective.

GATT 1947 has special conditions in emergency actions stipulated in Article XIX regarding this Emergency Action on Imports of Particular Products, and the provisions in the condition of how safeguard actions can be implemented, specifically Article 1 (a) concerning unforeseen developments are stipulated (Indonesia, b). Safeguard actions can be carried out if there are elements of unexpected developments, the obligations of the parties to the agreement include: concessions on tariffs which consequently increase the number of imported goods into the area, causing a serious threat to similar products so that the countries that make the agreement are given the authority to take preventative action against the more severe losses that will be experienced by the domestic industry. Preventive and corrective actions can be in the form of delaying concessions, withdrawing or changing concessions.

In Article XIX GATT, a country is allowed to: modify agreed concessions, impose import restrictions for a temporary time if it can be proven that an increase in certain imported products results in considerable losses for domestic producers, and continues to impose import restrictions during the time needed to overcome corrected losses. In its development, the provisions on safeguards were rewritten in a formulation that was somewhat different from what was stated in the Agreement on Safeguard Agreement which was one part of the WTO agreement.

There is a difference regarding the identification of the increase in imports between Article XIX GATT 1994 and Article 2.1 Agreement on Safeguard where

Article 2.1 Agreement on Safeguard identification of imports is further clarified by the inclusion of elements of difference between absolute and relative increases, where this is not mentioned in Article XIX GATT 1994.

Law Number 10 of 1995 concerning Customs which originally only regulates the issue of AntiDumping Import Duty and Subsidized Import Duty, then Law Number 17 of 2006 concerningamendments to Law number 10 of 1995 concerning customs, extends actions trade safeguards by including two new provisions, namely Safeguard Measures Import Duty and Revitalization Import Duty in addition to Anti-Dumping Import Duty and Rewards Import Duty (Barutu, 2007).

In the opinion of the author, Indonesia, which has ratified Law Number 7 of 1994 in protecting domestic industries for safeguards, has not been able to provide preventive safeguards optimally. This can be proven by the absence of regulations regarding safeguards stipulated in more specific laws. Safeguard in Law Number 17 of 2006 concerning changes to Law number 10 of 1995 concerning customs is only inserted. Whereas in the WTO regulations both are regulated in different Articles, safeguards are regulated in Article XIX GATT while Customs is regulated in Article VII GATT.

In Government Regulation No. 34 of 2011 concerning Antidumping Measures, Reward Measures, and Trade Safeguard Measures more specifically regulates the safeguard actions themselves both in terms of their understanding and procedures. The shortcomings do not explain who the parties are interested in.

3.1 Safeguards Provisions in Indonesia Viewed from WTO Safeguard Provisions

In principle, open international trade demands uniformity of rules that apply at the international level with rules made at the national level. This uniformity of rules is commonly referred to as a harmony between international rules and national rules. In harmonizing this law, the most important thing is the existence of a meeting point on fundamental principles between the two, so that the conflict of law is avoided (Alfaqiih, 2012).

The inconsistency in the substance of the arrangement and its application will have an impact on the demands through the WTO Dispute Settlement Body.

A question is whether the safeguard provisions made by the Indonesian government are in accordance with the provisions that apply internationally, the fundamental principles of the GATT and national legislation need to be compared. These fundamental principles are examined through 2 categories, namely the safeguard imposition requirements and the safeguard forms that can be imposed.

Rules regarding safeguards in Indonesia are regulated more fully in Government Regulation No. 34 of 2011 concerning Antidumping Measures, Reward Measures and Trade Safeguard Measures, while at the international level, the safeguard provisions contained in the GATT are further elaborated in the Agreement on Safeguard.

First, the conditions for imposing safeguards. In this government regulation, safeguard requirements can be found in the definition of safeguards, namely actions taken by the government to restore Serious Loss or prevent the Threat of Serious Loss suffered by the Domestic Industry as a result of a surge in the number of imported goods in absolute or relative to the Similar Goods or Directly Competing Goods. Provisions regarding safeguard requirements are in line with the provisions contained in the Agreement on Safeguard. It can be said that Indonesia has adjusted the substance to the WTO safeguard regarding the requirements for imposing safeguards because there is no difference between the safeguard imposition requirements. There should be a harmony between international rules and national rules so that there is no conflict of law.(ULFA, 2017)

Second, the form of safeguards in regulations in Indonesia can be found in article 70 paragraph 2 of Government Regulation Number 34 of 2011 in which safeguards can be imposed in the form of import duties or quotas. If the form of safeguard chosen is import duty, then the one who determines it is the Minister of Finance, while the safeguard in the form of a quota is determined by the Minister of Industry and Trade (Indonesia, a).

PP No. 34 of 2011 divides safeguards into temporary safeguards and permanent safeguards. Temporary safeguards stipulated in article 80, article 81, article 82, where temporary safeguards can be applied in the event of recovery of domestic industry losses are difficult due to delay in imposing security measures, during the investigation period KPPI can recommend to the Minister to impose temporary security measures.

Safeguard on Agreement has temporary safeguards and permanent safeguards. Temporary safeguards are carried out if there is initial evidence of an increase in imports that results in serious losses or the threat of serious concern for domestic industries, temporary safeguard measures (Article 6 Agreement on Safeguard), are needed if domestic industry conditions are in "critical condition". That is, if no imme-

diate action is taken, an increasingly difficult situation will be created to make repairs and recovery (Indonesia and Indonesia,).

For safeguards, it can still be determined in 3 forms, namely an increase in import duties, a stipulated import quota, and a combination of both forms. If safeguard measures are set in the form of quotas, the number of quota may not be smaller than the average import data in the last three years. In otherwords, for the case of imposing a number of quotas that are different from the import average in the last 3 years, there is a need for evidence/justification specifically (Barutu, 2007). As stated in Article 5.1 Agreement on Safeguard.

The arrangement of safeguard forms in this Government Regulation is the same as the arrangement in the Agreement on Safeguard. Even if there is a difference, it is only in the form of temporary safeguards, in the Agreement on Safeguard Article 6 it is mentioned that it should be imposed in the form of import duty and not quota, while in PP Number 34 of 2011 article 80 paragraph 1 is mentioned only in the form of import duty temporary security measures and not as a choice.

4 CONCLUSIONS

4.1 Conclusion

4.1 Safeguards (trade security measures) against the protection of domestic industrial law according to WTO Provisions and Regulations in Indonesia, it turns out there are still some disadvantages, namely:

a). Safeguard arrangements in Indonesia have not been maximized in providing legal protection to domestic industries'). Protection of domestic industrial law regarding safeguards in Indonesia can be realized through preventive legal protection provided by the Government, namely by making more appropriate regulations regarding safeguards, providing socialization for business actors, and conducting an assessment of the import mechanism. While repressive legal protection is carried out by the government by giving import duties and quotas or both so that the domestic industry does not suffer losses due to a surge in imports.

4.2 In the safeguard provisions in Indonesia, judging from the WTO safeguard provisions both from the safeguard imposition requirements and viewed from the form of safeguards in Indonesia, they are quite consistent in their provisions. However, there are still differences found in the form of temporary safeguards, in the Agreement on Safeguard Article 6

Agreement of Safeguard: it should be imposed in the form of an import duty tariff (and not a quota), while PP No. 34 of 2011 article 80 paragraph 1 is mentioned only imposed in the form of import duty for temporary security measures and not as an option. In implementing a rule, there should be uniformity of rules that apply at the international level with rules made at the national level so that later it can avoid the occurrence of a conflict of law.

4.2 Suggestion

B.1. For the government, especially the Indonesian Trade Security Committee (KPPI), to be more massive in providing services and outreach to the public, especially the domestic industrial parties, so that the economy and trade flows run in accordance with what is stated. Seeing the increasingly dynamic development of the trading business world, it can be made a concern for the government in the future so that the domestic industry does not suffer losses for the welfare of the country's economy. In protecting the domestic industry against a surge in imports, it is necessary to have legal protection through the establishment of regulations specifically discussing safeguards. Because until now there is no specific regulation governing safeguards. Safeguard regulation is still an insert in the Customs Law and there needs to be an additional in substance regulating in more detail who are the parties interested in this government regulation and the intent of absolute or relative.

B.2. For the domestic industry parties to take an active role in providing reports to the KPPI so that the KPPI can directly follow up with the imposition of import duties on temporary safeguards decided by the finance minister in order to prevent greater losses. Because KPPI is not the only one that has an important role in protecting its domestic industry, the public, especially domestic industries, also has an important role in achieving economic welfare goals in Indonesia.

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Forecasting Medicine Purchase Budget using Multiple Linear Regression Method: Case Study - For Ende Regency Health Office

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Abstract: In planning and budgeting for medicine purchases for the Ende regency health office, the pattern used is the pattern of medicine consumption and epidemiological patterns, which are supported by the existing budget and based on the medicine needs plan. This research focuses on forecasting the medicine budget based on the real use of medicines in 24 Ende regency public health centers. The use of multiple linear regression methods has a significant impact because there are other variables that also influence the budget. The 24 public health centers are divided into 3 categories namely for public health center city category, the results of the correlation R, R square and Adjusted R Square are 0.941, 0.886 and 0.871, MAD is 2560360, MSE is 10157921086788, MAPE is 5.73%, public health center outside the city and mountainous regions category, the results of the correlation R, R square and Adjusted R Square values are 0.793, 0.630 and 0.582, MAD is 5756562, MSE is 54447250606455, MAPE is 6.84% and public health center outside the city and coastal areas categories, the results of the correlation R, R square and Adjusted R Square values are 0.873, 0.762 and 0.731, MAD is 5315655, MSE is 61576610175327, MAPE is 9.16%.

1 INTRODUCTION

The existence of health facilities is one of the determinants of the health status of a country. Health care facilities are one of the tools and / or places that are used to carry out health service efforts either promotive, preventive, curative or rehabilitation carried out by the central government, regional government and / or the community. The Public health center is a health service facility that organizes the first level of Public Health and Health Efforts, prioritizing promotive and preventive efforts to achieve the highest degree of public health in its working area in order to support the realization of healthy districts. One of the main programs at the Public health center is a treatment or curative program. In fulfilling the health status of the people served by the public health center, medicines are one of the irreplaceable components. Access to medicines, especially essential medicines, is one of the human rights. The availability of medicines in the health services unit greatly affects the quality of health services. Therefore it is necessary to have good medicine management that aims to ensure the continuity and affordability of medicine services that are efficient, effective and rational. The

process of medicine management consists of several stages, namely the planning stage, the procurement phase, the distribution phase and the use phase

Discussion of existing papers that are the references of scientific writing : Analysis of medicine needs in the Medicine Requirement Plan based on the Use Report and Medicine Request Sheet , budget. The result can reduce the average medicine supply to 93%(Rumbay, 2015) as well as representative and accountable studies (Anumerta and Mahendrawati, 2013).

The method for estimating the medicine needs is the consumption method and epidemiological method, based on the data sheet for the procurement of medicines (Safriantini et al., 2011) and uses SDLC systems development method (System Development Live Cycle)(Rahmawatie and Santosa, 2015). This study uses independent variables of research, namely doctors, pharmacists and patients. The value sought is the availability of medicines. By using linear regression. R2 and F Test results are 0.971 and 293,447(Prabowo and Satibi, 2016). A combination of artificial neural networks and multivariable linear regression analysis can show reasonable predictive accuracy for accurate electricity consumption

and minimum costs for electricity generation in Indonesia(Jaisumroum and Teeravaraprug, 2017).This paper writes about utilizing a multi-variable linear regression analysis method to evaluate the level of use of IoT based on evaluating the quality of IoT experiences with 90% accuracy(Li et al., 2015). This paper describes the use of a multi-variable regression liner method to analyze the use of electric loads for 24 hours (a day) in the dry and rainy season in South Sulawesi, this analysis reaches the MAPE analysis, with the MAPE in the dry season which is 3, 52%, the MAPE in the rainy season is 4.34% by displaying each curve.(Amral et al., 2007). This paper explains the important points in estimating gold prices with multiple linear regression methods, This research was continued by obtaining a predictive value with RMSE of 53,583, using a confidence level of 95% or $\alpha = 0,05$(Sekar et al., 2017). This paper describes the use of a multiple linear regression method to build a QSAR linear peptide model with leave-one-out crossing validation. The result of the discussion is the multiple correlation coefficient (R2) which is 0.991 and RMSE value for the estimated error is 0.062(Yin, 2011).

Therefore, in this paper discusses medicine budget forecasting using multiple linear regression methods with new features namely prescription, type medicine, total medicine, population density with a high accuracy of 95% or 5% error, which are divided into three categories of public health center in Ende regency : 1. City public health center category, 2. Public health centers outside the city and mountainous regions category, and 3. Public health centers outside the city and coastal areas categories. This research uses data mining for 24 public health center, 54 auxiliary public health center (pustu), 73 village health posts (poskesdes) and 75 village delivery posts (polindes). The prescription describes patients who get health services in the form of medicines from pharmacies, the type of medicine describes the average medicine used in the three categories of health centers. Total medicine usage describes the overall medicine used and population density is obtained from the average total population divided by the area in the three categories. The number of residents is related to the budget for medicine per person and the area in relation to the range of services available. By getting a correlation between the four independent variables and other statistical tests, it can be determined the predicted value of medicine purchases for the ende regency health office.

2 FUNDAMENTAL THEORY

Ende Regency has 21 districts and 24 public health centers, of which those 24 Public health centers are divided into three (3) categories, namely the city category, outside the city and mountainous regions and outside the city and coastal areas :

City public health center category : It is located in the regency capital area with a high average population and population density, heterogeneous in all aspects (education, economic, religious level), with coverage to adequate health facilities. They are ende city, kotaratu, onekore, rewarangga and rukunlima. Public health centers outside the city and mountainous regions category : It is located in areas outside the city and on mountains with a population which is not too much and the reach to health facilities is very limited, public health centers are near the market, the average height is 500 -1500 meters above sea level and temperature on average is 10 °C - 20 °C. They are located in detusoko, kelimutu, kotabaru, ndetundora, peibenga, riaraja, roga, saga, watuneso, watunggere, welamosa, wolojita and wolowaru. Public health centers outside the city and coastal areas categories: It is in areas outside the city and coastal areas and lowlands with a population that is not too much and the reach to health facilities is very limited, public health centers are near the market, the average height is 0 - 500 meters above sea level and the average temperature is 22 °C - 30 °C. Those are included in this category are ahmad yani, maubasa, maukaro, maurole, nangapanda and ngalupolo.

Based on the initial data mining used for dependent variables and independent variables namely : Y value : public health center medicine budget : a total of medicine data based on medicine use and medicine prices, X1: prescription: the total prescription data originating from the concerned pharmacy clinic, X2: total average type of medicine used, X3: total cumulative value of medicine use, X4: population density data,

The initial data mining for the category of city public health center in the city category can be seen in Figure 1.

No	The budget (Y)	Prescription (X1)	Type medicine (X2)	Total medicine (X3)	Population density (X4)
1	48219060	7555	81	269134	2635.28
2	40529814	7427	81	252128	2647.33
3	48279843	7569	83	280303	2660.08
4	55050795	8093	81	240920	2673.57
5	45061654	7820	85	247864	2687.84
6	-	-	-	-	-
32	71321115	9524	70	259451	2605.94
33	64433170	8720	71	218594	2600.04
34	49523075	7854	65	201929	2594.22
35	61184250	8877	68	208327	2588.47
36	50205824	8283	68	190435	2577.2

Figure 1: City area data correlation variables.

3 METHODOLOGY

The discussion in chapter 3 is divided into two (2) important parts, namely the flow of research and the formulation of multiple linear regression.

3.1 Flow of Research

This study was divided into several stages, namely data retrieval, preprocessing, weighting, classification, evaluation and representation in the form of real data on medicine use, prescriptions, types of medicines, medicine prices per usage, and population density, which formed the variables used in multiple linear regression. The research methodological flow chart can be seen in Figure 2.
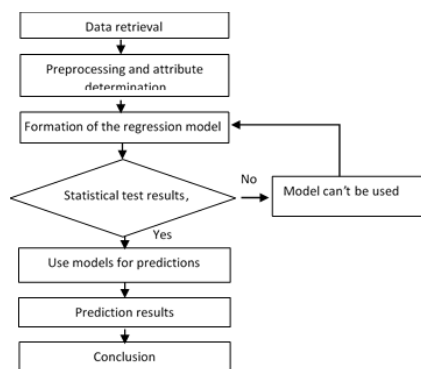
Figure 2: Research flow.

- Data retrieval stage. Retrieving raw data for medicines and prescriptions on 24 Public health centers in the Ende regency.

- Preprocessing and attribute determination stage..

- Formation of the regression model stage.

- Statistical test results and analysis stage. Stages are carried out in accordance with statistical rules with a confidence level of 95% or $\alpha = 0.05$ correlation test, T test, F test, correlation coefficient test, multi collinearity test (VIF), autocorrelation test (Durbin-Watson test), make the best equation for multiple linear regression.

- Use models for predictions. Perform R test, R Square, Adjusted R Square, MAPE

3.2 Multiple Linear Regression

Multiple linear regression is a regression analysis that explains the relationship between dependent variables and factors that affect more than one independent variable (free). The purpose of multiple linear regression analysis is to measure the intensity of the relationship between two or more variables, contain predictions of the value of Y based on the value of X.

Stages in multiple linear regression :

a The form of the regression equation, can be seen in equations (1) to look for projection or predictive values according to the coefficients that refer to equations (2).

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n X_n + \varepsilon \quad (1)$$

matrix form y = x β

$$Y^- = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_n X_n \quad (2)$$

b Correlation coefficient
Correlation is a term used to measure the strength of relationships between variables, the equation can be seen in equation (3)

$$R = \sqrt{\frac{\beta 1 \Sigma x1y + \beta 2 \Sigma x2y}{\Sigma y2}} \quad (3)$$

c Coefficient of Determination
Multiple regression testing which includes more than two variables to find out the proportion of total diversity in the independent variable Y can be explained by dependents (X) which are in multiple regression equation models together and can be seen in the equation (4).

$$R^2 = \frac{\beta 1 \Sigma x1y + \beta 2 \Sigma x2y}{\Sigma y2} \quad (4)$$

d Partially and Multiple Regression Test
The t test is used to partially test each variable. The t test refers to equation (5)

$$T = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \quad (5)$$

The f test multiple regression needs to be done to find out whether a group of independent variables simultaneously have an influence on dependent variables. f statistics is used and can be seen in equation (6).

$$F = \frac{r^2(n-m-1)}{m(1-r^2)} \quad (6)$$

e Multycollenirity and autocorrelation test.
Multicollinearity test and autocorrelation test can be seen in the equation (7) and (8).

$$VIF = \frac{1}{1-R_i^2} \quad (7)$$

$$D = \frac{\Sigma_{t=2}^{n}(e_t - e_{(t-1)})^2}{\Sigma_{t=1}^{n} et^2} \quad (8)$$

f Performance criteria
Mean Absolute Deviation (MAD), Mean Square Error (MSE), Mean Absolute Percentage Error (MAPE), in comparing the optimal performance of a prediction can be calculated based on equation (9), (10),(11),

$$MAD = \frac{\Sigma_{k=1}^{n}(yr - yf)^2}{n} \quad (9)$$

$$MSE = \frac{1}{n}\Sigma_{k=1}^{n}(yr - yf)^2 \quad (10)$$

$$MAPE = 100x\frac{\Sigma_{k=1}^{n}\left|\frac{yr-yf}{yr}\right|}{n} \quad (11)$$

Where : y,y1,y2,yn are dependent variables. β_0 , β_1, β_n, β_m are the intercept parameter and the independent variable regression coefficient. X1 , X2, Xn are dependent variables.

ε is an error variable. Y^-, $Y1^-$, $Y2^-$, Yn^- are the predicted value of the dependent variables sought. n, k are amount of data, m is number of variables, yr is experiment value, yf is predictive value.

4 RESULT AND DISCUSSION

By using the forecasting method using multiple linear regression, OLS (Ordinary Least Square) enter with the Simple Seasonal, Winters' Additive, Arima the model that meets the statistical requirements is obtained.:

4.1 Public Health Center City Category

- Value R, R Square, adjusted R Square, Durbin Watson. Correlation (R) simultaneously (together) between prescription variables (X1), medicine types (X2), medicine use (X3) and population density (X4) on medicine budget (Y) of 0.941 and correlation coefficient (R square) amounting to 88.6 % and free autocorrelation test because the value of Dubin Watson 2.040 meets the existing conditions, where D > dl and 4-D > du, dl = 1.2953. du = 1.65387, then 2,040 > 1.2953 and 1.96 > 1.65387, can be seen in the Figure 3.

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.941ᵃ	.886	.871	3434573.548	2.040
a. Predictors: , population density, prescriptions, medicine use, medicine types				
b. Dependent Variable: Budget				

Figure 3: Value of simultan correlation.

- The value of the regression constant, the standard error, the value of t > t table (2.04), the sig value < 0.05, fulfills some of the existing equations and the collinearity / VIP test is fulfilled because the VIF value is < 10, it can be seen in Figure 4.

Model	Coefficients B	t	Sig.	VIF
(Constant)	-62490876.102	-2.094	.045	
Prescriptionsᵃ	12199.096	11.625	.000	1.681
medicine typesᵃ	-223782.776	-2.533	.017	1.288
medicine useᵃ	62.783	3.200	.003	1.397
population densityᵃ	6625.336	.668	.509	1.602
a. Predictors: population density, recipes, medicine use, medicine types				
b. Dependent Variable: Budget				

Figure 4: Value of partial correlation.

- Test the value of Value f is fulfilled because the value of f results > f table (60.159 > 2.67), the value of sig is fulfilled with a value of 0.000. There can be seen in Figure 5.

Model	Sum of Squares	F	Sig.
Regression	2838611171883511.	60.159	.000ᵇ
Residual	3656851591219912.25		
Total	3204296331005423.0		
a. Predictors: population density, prescriptions, medicine use, medicine types			
b. Dependent Variable: Budget			

Figure 5: Value of performance criteria.

- The regression equation can be seen in equation (12), based on the value B in Figure 4.

$$Y = -62490876.102 + 12199.096.X1 - 223782.776.X2 + 62.783.X3 + 6625.336.X4 \quad (12)$$

189

- The results of values on forecasting meet the existing standard equations : MAD is 2560360, MSE is 10157921086788 and MAPE is 5.73%. They based on the calculation of the comparison formula of real values and predictive values. Ideal error value is a small error value or close to zero. The existing MAD, MSE and MAPE values indicate that the predictive value for the multiple linear regression equation are ideal, can be seen in the Figure 6.

No	Nilai real	Nilai prediksi Y	MAD |error|	MAPE
1	48219060	45903544.7	2315515.302	4.80%
2	40529814	43354208.01	2824394.011	6.97%
6	-	-	-	-
35	61184250	60812147.84	372102.1611	0.61%
36	50205824	52367903.84	2162079.842	4.31%
			92172977.38	2.064 125068
		MAD	2560360	MAPE
		MSE	1015792 1086788	5.73%

Figure 6: Model fit statistics.

- Graphs of observation (y value, budget) and fit values (predictive value) based on the value of MAPE 5.73 % for time series data can be seen in the Figure 7.
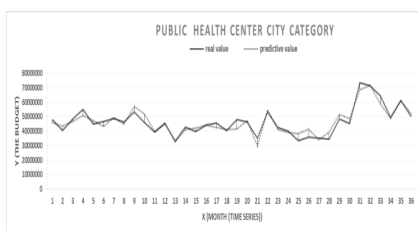
Figure 7: Graph of real data real and prediction data

4.2 Public Health Center Outside the City and Mountainous Regions Category

- Value R, R Square, adjusted R Square, Durbin Watson.
  Correlation (R) simultaneously (together) between prescription variables (X1), medicine types (X2), medicine use (X3) and population density (X4) on medicine budget (Y) of 0.793 and correlation coefficient (R square) amounting to 63% and free autocorrelation test because the value of Dubin Watson 1.136 meets the existing conditions where D > dl and 4-D > du, dl = 1.2953. du = 1.65387, then 1.136 < 1.2953 and 2.864 > 1.65387,

can be seen in the Figure 8.

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.793[a]	.630	.582	7951670.593	1.136

a. Predictors: , population density, prescriptions, medicine use, medicine types
b. Dependent Variable: Budget

Figure 8: Value of simultan correlation.

- The value of the regression constant, the standard error, the value of t > t table (2.04), the sig value < 0.05, fulfills some of the existing equations and the collinearity / VIP test is fulfilled because the VIF value is < 10, it can be seen in Figure 9.

Model	Coefficients B	t	Sig.	VIF
(Constant)	375176606.262	1.907	.066	
Prescriptions[a]	7305.106	4.265	.000	1.198
medicine types[a]	235143.306	1.210	.235	1.650
medicine use[a]	120.541	3.262	.003	1.634
population density[a]	-3598451.153	-1.994	.055	1.651

a. Predictors: population density, prescriptions, medicine use, medicine types
b. Dependent Variable: Budget

Figure 9: Value of partial correlation.

- Test the value of Value f is fulfilled because the value of f results > f table (13.174 > 2.67), the value of sig is fulfilled with a value of 0.000. There can be seen in 10.

Model	Sum of Squares	F	Sig.
Regression	3331914110480461.0	13.174	.000[b]
Residual	1960101021832358.8		
Total	5292015132312820.0		

a. Predictors: population density, prescription, medicine use, medicine types
b. Dependent Variable: Budget

Figure 10: Value of performance criteria.

- The regression equation can be seen in equation (13), based on the value B in Figure 9.

$$Y = 375176606.262 + 7305.106.X1 + 235143.306.X2 + 120.541.X3 - 3598451.153.X4 \quad (13)$$

- The results of values on forecasting meet the existing standard equations : MAD is 5756562, MSE is 54447250606455 and MAPE is 6.84%. They based on the calculation of the comparison formula of real values and predictive values. Ideal error value is a small error value or close to zero.

The existing MAD, MSE and MAPE values indicate that the predictive value for the multiple linear regression equation are ideal, can be seen in the Figure 11.

No	Nilai real	Nilai prediksi Y	MAD |error|	MAPE
1	103940176	93980650.89	9959525.113	9.58%
2	107572946	91571616.23	16001329.77	14.87%
6	-	-	-	-
35	81955727	78760497.88	3195229.123	3.90%
36	79632725	75201763.53	4430961.468	5.56%
			207236232.9	2.4619 01597
		MAD	5756562	MAPE
		MSE	5444725 0606455	6.84%

Figure 11: Model fit statistics.

- Graphs of observation (y value, budget) and fit values (calculation results /predictive value) based on the value of MAPE 6.84 % for time series data can be seen in the Figure 12.
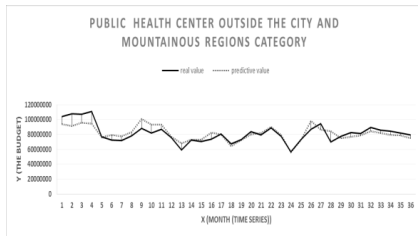
Figure 12: Graph of real data real and prediction data

4.3 Public Health Center Outside the City and Coastal Areas Categories

- Value R, R Square, adjusted R Square, Durbin Watson.
  Correlation (R) simultaneously (together) between prescription variables (X1), medicine types (X2), medicine use (X3) and population density (X4) on medicine budget (Y) of 0.873 and correlation coefficient (R square) amounting to 76.2 % and free autocorrelation test because the value of Dubin Watson 1.591 meets the existing conditions, where D > dl and 4-D > du, dl = 1.2953. du = 1.65387, then 1.591 > 1.2953 and 2.409 > 1.65387, can be seen in the Figure 13.

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.873ª	.762	.731	8456259.309	1.591
a. Predictors:, population density, prescriptions, medicine use, medicine types				
b. Dependent Variable: Budget				

Figure 13: Value of simultan correlation.

- The value of the regression constant, the standard error, the value of t > t table (2.04), the sig value < 0.05, fulfills some of the existing equations and

the collinearity / VIP test is fulfilled because the VIF value is< 10, can be seen in Figure 14.

Model	Coefficients B	T	Sig.	VIF
(Constant)	30930866.822	.374	.711	
Prescriptionsª	7706.693	6.766	.000	1.189
medicine typesª	-103285.543	-.794	.433	1.200
medicine useª	110.412	4.451	.000	1.270
population densityª	-153373.230	-.441	.663	1.048
a. Predictors: population density, prescriptions, medicine use, medicine types				
b. Dependent Variable: Budget				

Figure 14: Value of partial correlation.

- Test the value of Value f is fulfilled because the value of f results > f table (24.823 > 2.67), the value of sig is fulfilled with a value of 0.000. There can be seen in Figure 15.

Model	Sum of Squares	F	Sig.
Regression	7100224620778033.0	24.823	.000ᵇ
Residual	2216757966311770.5		
Total	9316982587089804.0		
a. Predictors:, population density, prescriptions, medicine use, medicine types			
b. Dependent Variable: Budget			

Figure 15: Value of performance criteria.

- The regression equation can be seen in equation (14), based on the value B in Figure 14.

$$Y = 30930866.822 + 7706.693.X1 - 103285.543.X2 + 110.412.X3 - 153373.230.X4 \quad (14)$$

- The results of values on forecasting meet the existing standard equations : MAD is 5315655, MSE is 61576610175327 and MAPE is 9.16%. They based on the calculation of the comparison formula of real values and predictive values. Ideal error value is a small error value or close to zero. The existing MAD, MSE and MAPE values indicate that the predictive value for the multiple linear regression equation are ideal, can be seen in the Figure 16.

No	Nilai real	Nilai prediksi Y	MAD |error|	MAPE
1	50830899	53763555.59	2932656.588	5.77%
2	49159310	54613811.56	5454501.558	11.10%
6	-	-	-	-
35	47159436	43116116.96	4043319.043	8.57%
36	47598659	41653257.54	5945401.465	12.49%
			191363578.5	3.2963 21777
		MAD	5315655	MAPE
		MSE	6157661 0175327	9.16%

Figure 16: Model fit statistics.

- Graphs of observation (y value, budget) and fit values (results / predictive value) based on the value of MAPE 9.16 % for time series
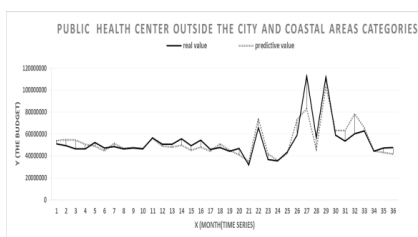
data can be seen in the Figure 17.

Figure 17: Graph of real data real and prediction data

4.4 Forecasting Results for the Public Health Center Category

- Example forecasting value of x1, x2, x3, x4 public health city center category can be seen in Table 14, with forecasting value for 5 months in 2020, based on the MAPE value in Figure 2, Figure 12, Figure 17, and on equation (12),(13) and (14).

Data (month)	$\bar{X1}$	$\bar{X2}$	$\bar{X3}$	$\bar{X4}$
Jan-20	7756	47	132981	2540.01
Feb-20	8093	53	135296	2539.99
Mar-20	7888	52	154604	2539.99
Apr-20	8234	50	144206	2539.98
May-20	8395	52	156980	2539.97

Figure 18: Forecasting values.

- Forecasting budget values for each category can be seen in Table 15 based on equation (12),(13) and (14).

Data (month)	Category I (a)	Category II (b)	Category III (c)
Jan-20	46784888	78839641	68261698
Feb-20	49698497	88062123	79821642
Mar-20	48633679	85247973	82282978
Apr-20	52649248	86693786	70182338
May-20	54967660	76188429	88279115

Figure 19: Budget forecasting values.

Where : a. Category I is forecasting of medicine use budget for public health city center category b. Category II is forecasting of medicine use budget for public health center outside the city and mountainous regions category c. Category III is forecasting of medicine use budget for public health center outside the city and coastal areas categories

5 CONCLUSIONS

Forecasting the medicine purchase budget with four variabel independent : X1: prescription, X2: total average type of medicine used, X3: total cumulative value of medicine use, X4: population density data for public health center city category, the results of the correlation R, R square and Adjusted R Square are 0.941, 0.886 and 0.871, MAD is 2560360, MSE is 10157921086788, MAPE is 5.73%, public health center outside the city and mountainous regions category, the results of the correlation R, R square and Adjusted R Square values are 0.793, 0.630 and 0.582, MAD is 5756562, MSE is 54447250606455, MAPE is 6.84% and public health center outside the city and coastal areas categories, the results of the correlation R, R square and Adjusted R Square values are 0.873, 0.762 and 0.731, MAD is 5315655, MSE is 61576610175327, MAPE is 9.16%.

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Is Random Regret Minimization More Suitable in Predicting Mode Choice Decision for Indonesian Context than Random Utility Maximization?

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Keywords: Travel Mode Choice, Multinomial Logit Model, Stated Preference Survey, Elasticity, The Value of Travel Time Saving.

Abstract: Since often encountered the missing prediction by using the concept of random utility maximization (RUM) for Indonesian context, this study proposed a theory of random regret minimization (RRM) aiming to more precisely predict the chosen mode and to increase the model fit. Three variances of RRM were implemented: Classical RRM, μRRM, and PRRM. Yogyakarta and Palembang were chosen as a case of the study by involving 708 respondents. A stated preference survey was carried out by offering six scenarios to the respondents. We apply the value of final log-likelihood, rho-square, Akaike and Bayesian Information Criterion, and hit rate to compare the model fit. We also calculate the value of travel time saving, and the time and cost elasticity. The result shows that by excluding the rho square, RRM outperforms RUM in both cities. The μRRM produces the best model fit in a case of travel mode choice in Yogyakarta, while there is a tendency that PRRM produces a better model fit than μRRM in Palembang. We also found that RRM tends to generate a higher VTSS, time and cost elasticity than RUM. Travellers in both cities also tend to be more sensitive to change in travel time than travel cost.

1 INTRODUCTION

To date, numerous studies worldwide concerning the choice decision use random utility maximization (RUM)-based discrete choice model in predicting the choice of several offered alternatives. This modelling approach assumes that people choose one of several options which have the highest utility (McFadden et al., 1973). In transportation studies, a logit model is the most widely used method in the discrete choice model (Ding et al., 2017) (Dong et al., 2018). The RUM based discrete choice model also applied in many studies of travel mode choice in Indonesia. (Irawan et al., 2017) applied RUM-based binary logit model to analyze the potential demand of bus mode for egress trip from railway stations in Yogyakarta, which is motivated by a situation that train passengers prefer to opt to park their owned motorcycle at destination railway station compared to they have to use bus mode for their egress trip. (Bastarianto et al., 2019) used RUM-based multinomial logit model, nested logit model, and cross-nested logit model in understanding the joint choice of travel modes and tour types for commuters from Bekasi

to Jakarta, Indonesia. (Irawan et al., 2018) applied RUM-based ordered logit model in predicting the demand of hybrid car in Indonesia. Meanwhile, (Rezika et al., 2018) used bivariate ordered probit model in estimating the urban railway demand in Yogyakarta.

Regarding the choice between public transport and motorcycle mode in Indonesia, we assume that the RUM-based discrete choice model might not be appropriate. This is due to many travellers prefer to use motorcycle mode to avoid the intolerable service of public transport (PT). It is evident that even though the Indonesian government has reformed the public transport service in some cities in Indonesia, private vehicle users especially motorcyclists still reluctant to shift to public transport mode (Ilahi et al., 2015). In Yogyakarta, people who decide to use public transport must depart much earlier to minimize the lateness at the destination point, such as workplace and school (Irawan and Sumi, 2011).

It also should be noted that even though motorcycle give the high utility caused by itsflexibility (Irawan and Sumi, 2012; Irawan, 2019), the motorcycle is a transport means that is the most often involved of a traffic accident . (Soehodho, 2017) showed that

193

motorcycle acts as an aggravating factor on the severity level of a traffic accident. By considering the factor of traffic death and injuries, the motorcycle could not provide the highest utility compared to public transport mode. However, Indonesian travellers are also reluctant to use public transport caused by poor service provided (Joewono et al., 2016).

As mentioned above, since we assume that RUM might not be appropriate for public transport versus motorcyclist case, we consider utilizing an alternative modelling approach to utility maximization. This alternative modelling approach contrary to RUM tries to minimize disutility. Recently, some researches have also used the disutility minimization model called Random Regret Minimization or RRM in predicting mode choice decision (Chorus, 2010) (BELGIAWAN et al., 2017). In RRM, travellers choose a specific travel mode in an attempt to minimize a disutility obtained from the other alternative travel modes (Chorus et al., 2008).

With the introduction of RRM, many studies have proven that RRM outperforms RUM in terms of model fit, prediction accuracy as well as the value of travel time savings (VTTS) and elasticities (Leong and Hensher, 2015) (Hensher et al., 2013). For the Indonesian context, previous research has compared RUM and RRM for mode choice decision in Bali (Belgiawan et al., 2017) and Jakarta (Belgiawan et al., 2019). However, their studies do not specifically study motorcycle and PT as alternative choices. Therefore, this paper aims to compare the use of utility maximization (RUM) and disutility minimization (RRM) approach in mode choice decision for Indonesian context. The mode choice alternatives that we discuss is between PT which includes Bus and Light Rail Transit (LRT), and motorcycles.

2 LITERATURE REVIEW

RRM was first introduced by (Chorus et al., 2008). It assumes that a traveller chooses a specific mode of transport to minimize anticipated regret. Since then, there are some variants of RRM. The first is the Classical RRM which is an improvement of the original RRM. By re-analysing ten datasets used to compare RUM and Classical RRM, (van Cranenburgh et al., 2015) proposed μRRM and Pure RRM (PRRM) model to improve the model fit of Classical RRM. Recently, the use of RRM is not only for mode choice decision but also for park-and-ride lot choice (Sharma et al., 2019), route choice (Mai et al., 2017) (Li and Huang, 2017), driver choice of crash avoidance maneuvers (Kaplan and Prato, 2012), freight transport

(Boeri and Masiero, 2014), activity start time and duration (Golshani et al., 2018), and automobile fuel choice (Hensher et al., 2013). (Chorus et al., 2014) showed that out of 43 empirical studies, 15 studies found that RRM's performance is better than RUM, while 13 studies show that the model fit differences between RUM and RRM are generally small.

This study attempts to implement the various kinds of RRM for Indonesia context. The first study was begun by comparing Classical RRM and RUM model in term of travel mode choice decision (i.e., bus rapid transit, feeder bus, motorcycle, and car) in Denpasar Greater Area, Bali (Belgiawan et al., 2017). By considering the value of Akaike Criterion (AIC), Bayesian Criterion (BIC), rho square, and final log-likelihood, the result shows that the RUM model outperforms Classical RRM. However, both model result in the low model fit. We predict that the poor service of public transport in Bali might result in the bias data because of the difficulties experienced by the respondents when facing the stated preference survey. We also predict that comparing the mode choice between car and motorcycle regarding travel time and trip cost becomes less precise because of the respondents' characteristics of socioeconomics inherently more cause it.

To fill the research gap of the previous studies, Yogyakarta and Palembang were chosen as case studies because of the satisfying service of existing public transport (Irawan et al., 2017) (Budi and ZUSMAN, 2015). Our respondents also focus on motorcycle users since we attempt to understand the main reason of choosing motorcycle mode is more caused by the utility offered by motorcycle (RUM model) or unacceptable disutility when using bus mode (RRM model). Because the RRM could be implemented with a minimum of three alternative modes (Chorus, 2010), we added a light rapid transit mode as a choice instead of motorcycle and bus mode. In this study, we also compare the value of travel time saving, travel cost and travel time elasticities between RUM and RRM. Previous studies showed that the value of RRM-based elasticity is higher than RUM based elasticity (Belgiawan et al., 2017) (Thiene et al., 2012).

3 THEORETICAL BACKGROUND

3.1 Regret Function

In the CRRM framework, (Chorus, 2010) defined that the regret associated with an alternative m for person n is determined by:

$$RR_{mn}^{CRRM} = a_m + R_{mn}^{CRRM} + \varepsilon_{mn} = a_m +$$
$$\Sigma_{z \neq m} \Sigma_q ln(1 + exp[\beta_q(X_{qzn} - X_{qmn})]) + \varepsilon_{mn} \quad (1)$$

Where R_{mn} is random regret for an alternative m for person n, R_{mn} is systematic regret for alternative m for person n, ε_{mn} is unobserved regret for alternative m for person n, a_m is alternative specific constant, β_q is the estimated parameter associated with the generic attribute X_q, X_{qzn} and X_{gft} are values associated with generic attribute Xq_q for, respectively, person n choosing alternative z and m.

Meanwhile, the formula to calculate the regret function for μRRM introduced by (van Cranenburgh et al., 2015) was modified by dividing the coefficient of β_q with μ. Furthermore, they also found that the formula for systematic regret of the P-RRM model is as follows.

$$RR_{mn}^{PRRM} = a_m + \Sigma_q \beta_q X_{qzmn}^{PRRM} \quad (2)$$

where:

$$X_{qzmn}^{PRRM} = \{ \begin{matrix} \Sigma_{z \neq m} max(0, X_{qzn} - X_{qmn}) \, if \, \beta_q \geq 0 \\ \Sigma_{z \neq m} min(0, X_{qzn} - X_{qmn}) \, if \, \beta_q < 0 \end{matrix} \quad (3)$$

3.2 Probability Function

There is no difference in determining the probability of utility function (RUM) and regret function (RRM). The probability function of CRRM and PRRM is written as:

$$P_{mn}^{CRRM-PRRM} = exp(-Rmn)/\Sigma_{m \varepsilon Zz=1}^z exp(-R_{zn}) \quad (4)$$

Since the μRRM includes a scale parameter μ) as an additional degree of freedom to allows the flexibility of the regret function level attribute, the probability function of μRRM is calculated by multiplying μ with the regret value (R).

4 DATA DESCRIPTION

A household-based face-to-face interview survey was carried out from March to April 2017 and from June to July 2017 in Palembang and Yogyakarta respectively. The selected respondents were travellers whose origin and destination points are located within a radius of 500 meters from the LRT station in Palembang, while the respondents were randomly selected in Yogyakarta. The location selection purpose in Palembang was to reduce the bias data in the model

since we only considered the variable of travel time and trip cost. We did not take into account several influenced variables related to the access and egress trip. We also defined the selected respondents are travellers who work and make a daily trip with a minimum distance of 5 km from home to work. It is due to the consideration that LRT can be an opt of travel mode choice and also exclude the motorcycle captive users as the respondents.

There are 401 and 307 respondents involved in Yogyakarta and Palembang respectively. The interview survey was conducted in all existing and planned train stations, and it was proportionally distributed based on population in each sub-district where the rail station is located. With the aim to obtain a better validity level of data, the questionnaire form was designed as simple as possible. We were hoping that the respondents are able to completely answer all of the questions asked by a surveyor within ten minutes interval of time. The questionnaire form was categorized into two items. The first is the characteristic of respondents (gender, age, and income), and the second is the stated preference (SP) survey. The SP questionnaire can be seen in Figure 1.

5 RESULTS AND DISCUSSION

5.1 Estimation Result

The result of the RUM and RRM based MNL model is presented in Table 1. We use PythonBiogeme (Bierlaire, 2016) in estimating the value of coefficient and calculating its model fit. The result shows that the parameter of travel time and cost are 1% significant with a negative value (as expected) for RUM, CRRM, and μRRM in both cities. However, in the case of Yogyakarta, the value of μ is significant at 10%. On the other hand, PRRM shows the insignificant coefficient regarding travel time.

Scenario 1		
	Motorcycle	Bus	LRT
Time	30 min.	45 min.	45 min.
Cost	10,000	10,000	5,000
Choice			
Scenario 2		
	Motorcycle	Bus	LRT
Time	45 min.	30 min.	60 min.
Cost	10,000	5,000	5,000
Choice			
Scenario 3		
	Motorcycle	Bus	LRT
Time	60 min.	45 min.	60 min.
Cost	5,000	5,000	10,000
Choice			
Scenario 4		
	Motorcycle	Bus	LRT
Time	30 min.	45 min.	45 min.
Cost	5,000	5,000	10,000
Choice			
Scenario 5		
	Motorcycle	Bus	LRT
Time	45 min.	30 min.	45 min.
Cost	5,000	10,000	5,000
Choice			
Scenario 6		
	Motorcycle	Bus	LRT
Time	60 min.	60 min.	45 min.
Cost	5,000	10,000	10,000
Choice			

Figure 1: The questionnaire form of SP survey.

Taking into account the model fit, we present the model fit consists of Final Log-likelihood (Final LL), Rho-square, Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and hit rate. The result shows that μRRM produces the smallest final log likelihood in both cities. For Yogyakarta, the value of AIC and BIC for μRRM also indicates the best fit compared to RUM and other RRMs. However, rho-square for RUM in Yogyakarta is better than the all variances of RRM. Meanwhile, for Palembang, PRRM is the best model fit for the value of AIC, BIC, and rho-square. Looking into the hit-rate model fit, the model result for Yogyakarta produces a similar value of hit-rate by 38.53%, while μRRM and PRRM show the highest hit-rate in Palembang by 41.04%.

Due to this, we found that RRM performs better than RUM, in which in a case of travel mode choice in Yogyakarta, μRRM is the best model among the other RRM models. Meanwhile, it is not yet clearly detected whether μRRM or PRRM producing the best model fit in Palembang, in which μRRM produces the best model fit of final log-likelihood, whereas PRRM produces the best model fit AIC, BIC, and rho-square.

5.2 Value of Travel Time Saving

The value of travel time savings (VTTS) is used to measures the willingness to pay for a traveller due to a travel time reduction. For CRRM, the VTTS can be measured by (Leong and Hensher, 2015):

$$VTTS_{mn}^{CRRM} = 60x\frac{\delta R_{mn}^{CRRM}/\delta TT_{mn}}{\delta R_{mn}^{CRRM}/\delta TC_{mn}}$$

$$60x\frac{\Sigma_{z\neq m}-\beta_{TT}/(exp[-\beta_{TT}(TT_{zn}-TT_{mn})]+1)}{\Sigma_{z\neq m}-\beta_{TC}/(exp[-\beta_{TC}(TC_{zn}-TC_{mn})]+1)}$$

$$(5)$$

Where TT_{zn} and TC_{zn} represent travel time and travel cost of person n choosing mode z as the competitor of mode m, respectively. Meanwhile, the VTTS for the μRRM model is obtained by modifying the coefficient of β with β/μ in Eq. (5). Moreover, the VTTS for PRRM can be calculated by (van Cranenburgh et al., 2015).

$$VTTS_{mn}^{PRRM} = 60x\frac{\delta R_{mn}^{PRRM}/\delta TT_{mn}}{\delta R_{mn}^{PRRM}/\delta TC_{mn}}$$

$$60x\frac{-\beta TT\Sigma_{z\neq m TT_{zn}<TT_{mn}}}{-\beta TC\Sigma_{z\neq m TT_{zn}<TT_{mn}}}$$

$$(6)$$

Table 2 presents the value of travel time saving for both RUM and RRM. However, in contrast to RRM, it should be noted that the performance of the

other modes does not influence the VTTS of a specific mode produced by RUM. In RRM, the VTTS measures will increase or decrease conditionally on both the number of available alternatives in the choice set and the changes in the influenced variables of chosen alternative and nonchosen alternatives. From Table 2, it can be seen that in all variance of RRM in both cities, the VTTS for LRT mode is the highest and the VTTS for bus mode is the lowest. It means that travellers in Palembang and Yogyakarta are willing to pay much more expensive when using LRT mode if there is a reduction in the travel time unit. This condition makes sense since the travellers believe that LRT is a travel mode promising timeliness of travel. However, the opposite situation occurs in bus mode representing that travellers are not willing to pay more due to the reduction of travel time. The VTSS for bus mode produced by μRRM and PRRM in both cities is approximately half of the VTSS for LRT mode. Looking into a situation that the VTTS for motorcycle mode tends to higher than bus mode in all variance of RRM, it represents that it will be challenging to shift motorcyclists to use bus mode in their daily trip as it now happens.

Variable	RUM		CRRM		μRRM		PRRM	
	Est.	t-test	Est.	t-test	Est.	t-test	Est.	t-test
Yogyakarta								
Travel time	-0.419	-4.62*	-0.283	-4.72*	-0.267	-4.78*	-0.071	-1
Travel cost	-0.203	-8.82*	-1.43	-8.74*	-0.185	-9.96*	-0.187	-9.51*
μ					0.044	1.64***		
Final LL		-2602.998		-2601.56		-2592.489		-2603.622
Rho-square		0.403		0.062		0.018		0.014
AIC		5209.99		5207.12		5190.98		5211.24
BIC		5221.57		5218.70		5208.34		5222.82
Hit rate		38.53%		38.53%		38.53%		38.53%
Palembang								
Travel time	-0.865	-8.02*	-0.575	-8.19*	-0.535	-8.1*	-0.081	-1.05
Travel cost	-0.283	-10.94*	-2.02	-10.79*	-0.238	-12.14*	-0.243	-10.73*
μ					0.147	7.94*		
Final LL		-1948.93		-1946.58		-1939.56		-1960.01
Rho-square		0.008		0.036		0.04		0.228
AIC		3901.85		3897.17		3885.12		3124.02
BIC		3912.89		3908.21		3901.67		3135.06
Hit rate		37.46%		38.06%		41.04%		41.04%

Note: *1% significant, ** 5% significant, *** 10% significant

Figure 2: Estimation result.

	Yogyakarta			Palembang		
	Motorcycle	Bus	LRT	Motorcycle	Bus	LRT
RUM		12,384			18,339	
CRRM	13,303	11,085	13,674	20,860	15,039	22,682
μRRM	17,862	6,668	20,666	15,445	9,852	20,005
PRRM	22,836	15,187	26,352	13,333	9,395	17,849

Figure 3: Value of travel time saving (IDR per hour).

Comparing the VTTS produced by RUM and RRM in a case of Yogyakarta, all variances of RRM produces the higher VTTS than RUM except in bus mode. Meanwhile, by excluding the bus mode in Palembang, the VTTS for CRRM is higher than RUM, and the VTTS for PRRM is lower than RUM. However, since we have not the VTTS of each respondent either from the questionnaire survey or secondary data, we cannot check what the best model between RUM and RRM which could precisely estimate the VTTS is.

5.3 Demand Elasticity

Elasticity is used to measure the percentage change of probability value caused by the change of correlated attributes. (Ben-Akiva et al., 1985) showed the equation used to calculate the direct elasticities of RUM model is as follows.

$$E_{mn.X_{qmn}}^{RUM} = \frac{\delta P_{mn}}{\delta X_{qmn}} x \frac{\delta X_{qmn}}{P_{mn}} = (1 - P_{mn})\beta_q X_{qmn} \quad (7)$$

Where $E_{mn.X_{qmn}}^{RUM}$ is RUM-based elasticity for traveller n on mode m which is related to variable $X_q.X_{qmn}$ and β_q are specific attribute x for traveller n by mode m and estimated the parameter of attribute x. p_{mn} is the probability of traveller n chooses mode m. For RRM based elasticity value, the formula for PRRM and μRRM is similar as follows (van Cranenburgh et al., 2015).

$$E_{mn.x_{qmn}}^{PRRM-\mu RRM} =$$
$$\left(-\frac{\delta R^{PRRM-\mu RRM}}{\delta X_{qmn}} + \Sigma_{m\in Zz\neq mz=1}^p P_{pn} \frac{\delta R_{zn}^{PRRM-\mu RRM}}{\delta X_{qmn}} \right) \quad (8)$$

Meanwhile, the equation to calculate the elasticity for CRRM is as follow (Hensher et al., 2013).

$$E_{mn.X_{qmn}}^{CRRM} =$$
$$\left(-\frac{\delta R_{mn}^{CRRM}}{\delta X_{qmn}} + \Sigma_{m\in Zz\neq mz=1}^p P_{pn} \frac{\delta R_{zn}^{CRRM}}{\delta X_{qmn}} \right)$$
$$.X_{qmn} \quad (9)$$

Figure 4 presents the measurement of cost and travel time elasticities. As we expected, the sign of all the travel time and cost elasticities produced by RUM and RRM in both cities are negative, means that a reduction of travel time and cost of an alternative mode will increase the percentage of probability in choosing of that alternative mode. However, it should be noted that the value of elasticity of costs and travel time cannot provide an idea of whether RUM is better than RRM or vice versa. These findings will be more useful related to policy implementation. For example: as the policymakers, they hope that the resulted elasticity value is large enough to ease them to make decisions to increase the demand for public transport.

Looking into the cost elasticity, both RUM and RRM produce the lowest cost elasticity for motorcycle modes in both cities. It means that with the change in travel costs, the motorcycle users will be the most reluctant travellers to switch to bus and LRT modes. For example: in the case of μRRM in Palembang City, a 10% increase in out of pocket would only cause a

10% decrease in the probability of using a motorcycle, while for bus and LRT modes could decrease the probability of modal usage by 12% and 14% respectively.

Meanwhile, the highest travel cost elasticity is for LRT mode for the RUM, CRRM, and μRRM models, and the bus mode for the PRRM model showing that those mentioned travel mode will be easy to leave by its passengers if there is a slight increase in ticket costs. From Table 3, it also can be found that people living in Palembang are more elastic in changing travel mode caused by a variable of the trip cost compared to people living in Yogyakarta.

On the travel time elasticity, the value produced by the variances of RRM is not consistently higher than RUM. Even though μRRM results in the highest travel time elasticity in Yogyakarta, both RUM and CRRM produces a higher value than μRRM and PRRM in Palembang. Different from the cost elasticity, bus mode has the lowest travel time elasticity in both cities meaning that with the change in travel time, bus users are the most resistant travellers to use the current mode. It is reasonable because people use motorcycle or LRT mode is more caused by travel time saving so that if there is a small increase of travel time, motorcyclists and LRT passengers are the most vulnerable travellers from the additional travel time. Similar to the previous finding in cost elasticity, the change in travel time is felt more significant for people living in Palembang than people in Yogyakarta.

Comparing between the elasticity of cost and travel time, the travel time elasticity generated by RUM and all variances of RRM is higher than the cost elasticity, except for motorcycle and bus mode in Yogyakarta produced by the μRRM model. This situation represents that the change in the travel time factor makes the traveller more sensitive to switch to other modes compared to the shift in travel cost that must be spent. Meanwhile, in a case where the elasticity of cost is higher than the travel time, the authors cannot find the reason why did it happen. Therefore, in further research, a more in-depth analyzis is needed to reveal the phenomena that occur.

Finally, comparing among the elasticity values produced by the RUM and RRM model, all variances of RRM produces a higher elasticity than RUM. In a more specific case, μRRM and CRRM result in the highest elasticity value in a case of travel mode choice in Yogyakarta and Palembang respectively.

		RUM	CRRM	μRRM	PRRM
Yogyakarta	Motorcycle	-0.09 (-1.28)	-0.96 (-1.20)	-2.76 (2.71)	-0.17 (-0.45)
	Bus	-0.10 (-1.14)	-1.16 (-1.19)	-3.34 (2.43)	-0.24 (-0.36)
	LRT	-0.11 (-1.53)	-1.28 (-1.62)	-3.63 (-3.71)	-0.22 (0.63)
Palembang	Motorcycle	-0.12 (-2.76)	-1.34 (-2.43)	-1.04 (-1.63)	-0.22 (-0.51)
	Bus	-0.13 (-2.27)	-1.65 (2.41)	-1.20 (-1.43)	-0.31 (-0.41)
	LRT	-0.16 (-3.38)	-1.88 (-3.53)	-1.39 (-2.32)	-0.30 (-0.72)

Note: Value in parenthesis is an elasticity value of travel time

Figure 4: Value of travel time saving (IDR per hour).

6 CONCLUSIONS

This study implements all variances of RRM consisting of CRRM, μRRM, and PRRM. To compare which results are better between RUM and RRM, we use the statistic tests of Final Loglikelihood, Rho-square, Akaike and Bayesian Information Criterion, and Hit Rate. Our modelling result indicates that RRM outperforms RUM. Even though RUM still produce the better rho square, RRM could produce the lower of Final Loglikelihood and Akaike and Bayesian Information Criterion. The probability of choice generated by RRM could estimate more precisely shown by the value of hit rate and the average probability value for chosen mode and non-chosen mode. Among all variances of RRM, it can be generally concluded that μRRM could produce the best model fit although there is a propensity that PRRM delivers a better model fit than μRRM in a case of travel mode choice in Palembang.

The value of travel time saving produced by RUM and RRM shows that RRM tends to provide a higher VTTS than RUM. The highest VTTS in both cities generated by RRM is on LRT mode indicating that people are willing to pay more when using LRT if there is a reduction in the travel time unit. Meanwhile, the demand elasticity shows that the travel time elasticity generated by RUM and all variances of RRM (except μRRM in Yogyakarta) is higher than the cost elasticity showing that travellers are more concerned with the travel time than travel cost in deciding what kind of transport means that they use. Both RUM and RRM produce the lowest cost elasticity for motorcycle mode and lowest travel time elasticity for bus mode, saying that motorcyclists and bus users are the most unwilling travellers to shift to other modes due to the change of travel cost and travel time respectively.

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Indicators Institutional Performance in Educational Field in the Province of According to the Value-added Approach: An Analytical Study in the Public Schools in Muscat Governorate

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Keywords: Institutional performance, added value.

Abstract: This quantitative study researched the performance indicators of educational institutes through added vale approach. Schools that are under the supervision of the ministry of education are evaluating their performance through several forms. This system suffers from flaws such as inaccuracies or missing objectivity in filling the forms in addition to its ill timing as the forms are filled at the same period of teachers entering the results of semester exams. The study aimed at researching the most important indicators that affect the educational system through the added vale approach in the educational directorate in Muscat governorate, and highlighting the challenges that face the educational institutes with their performance indicators. The researcher used a descriptive and analytical methods in his investigation. The study sample consisted of 130 in government schools in the Muscat.The researcher designed two questionnaires. performance of the educational institutes,others was on the added value approach. The study concluded; Improvement in performance of the educational institutes was apparent in the areas of positive interactions between the schools and local communities. Taking on board feedback and improving, increasing the level of the teacher's awareness of the subject objectives and empowering him to achieve them. This is achieved through the care of schools to call for periodic meetings to discuss the updates in the educational process, and setting up evaluation tests for the students. In the added value approach, the study was able to increase the level of school's performance in the areas of value construction and positive directions, and diversification of the teaching strategies to improve the schools institutional performance.

1 INTRODUCTION

The management of educational institutions is one of the most important humanitarian activities in societies at different stages, because it directly affects the lives of peoples and nations socially, economically and politically. through the application of modern educational management theories, which enhance the standing of educational institutions, preserve them, promote them and overcome all the challenges they face.(Hussey, 1982).The process of improving institutional performance involves four main themes: internal processes, organizational structures, human resources and technology. Because of the importance of these themes, it became important in the field of educational institutions. In addition, global challenges made educational institutions consider modern administrative and economic methods and approaches to planning for upgrading the efficiency of those in-

stitutions in a way that achieves their objectives

1.1 Problem of the Study

The time has come for educational institutions to adopt the concept of Added Value as an approach and indicator of the effectiveness of institutional performance on the educational process in all its aspects. The researcher chose to study in government schools in the governorate of Muscat, where these schools are subject to monitoring, follow-up, and direct supervision by the Ministry of Education in Oman, which has a system of evaluating institutional performance in schools through a set of forms and surveys targeting administrators, teachers and students, as well as parents. Then are analyzed electronically through synthesized and detailed reports to identify strengths and weaknesses. Theschool must develop the necessary plans to enhance the strengths and avoid or reduce the

weaknesses through integration with the competent authority in every aspect. However, the application of this system is flawed by inaccuracies in the objectivity in filling those surveys and the timing at which the evaluation is available, namely, the period of the input the results of the semester. In addition to the difficulty of access to the website that period because of synchronization with the network pressure in that period, according to the researcher and the official correspondence. Valueadded evaluation can improve performance by increasing the efficiency of educational leaders and making them capable of making fair judgments about the effectiveness of educational institutions. It also can draw decision makers on detailed, time-series data that improve educational programs to contribute to spreading a culture of excellence in our educational institutions

1.2 Importance of the Study

A) Theoretical importance: The importance of the study is illustrated by the fact that it contributes to the disclosure of institutional performance indicators, and its role in giving a true and honest picture of the reality of the educational system within educational institutions, which helps to modify existing policies or adopt new ones; to improve and develop the educational system in educational institutions

B) Prominent importance: This study is - within the knowledge of the researcher - the first study that seeks to link the performance indicators of the school and the educational level using the Added Value approach. The study could be a real addition to libraries, enriching this area and making future use of it by researchers. This study will undoubtedly serve as a model for researchers to conduct similar studies in light of the input used

C) Systematic importance: This study, within the confines of the researcher's science, is the first study that seeks to link school performance indicators to the level of the educational aspect using the Added Value Approach. The study could represent a real addition to libraries, enriching this area and benefiting researchers in the future. This study will undoubtedly serve as a model for researchers to conduct similar studies in light of the input used

2 TERMINOLOGY OF STUDY

-Indicator: The indicator is defined as data, information and reference points for measuring countries'

comparison and measuring educational progress.

Performance: It is intended to carry out an action or task or something that has been accomplished as defined as the outputs or objectives that the system seeks to achieve. Efficiently and produce outputs consistent with its objectives and suitable for its users Institution: In the term, it is a consciously coordinated social entity, with clearly defined boundaries, working on a permanent basis to achieve a specific goal or set of specific goals. As for institutional performance, the researcher defines it as:

The ability and efficiency of the educational institution in implementing its strategic objectives according to the Added Value approach

Institutional performance indicators: Performance indicators are a set of criteria resulting from the experience of the organization, formulated at specific points to be used in the performance evaluation process, which vary according to the environment in which the organization operates, and the prevailing organizational culture.

The educational aspect : is the organized process practiced by the teacher in order to transfer the knowledge and skills to the students and develop their attitudes toward them. Learning is the real outcome of the educational aspect.

Added value: A method for assessing the teacher and measuring the contributions of that teacher to a year by comparing the student test scores in the current school year to those of the previous school year, as well as those of other students in the same grade.

Comments on previous studies Previous studies are the pillars of scientific research that guide the researcher to the method of research and methodology of work, through their findings, to integrate and build on efforts, and to benefit from the results, tools and type of curriculum used. To achieve maximum benefit, as shown below:

First, it is clear from the studies of Saleh Abdel Karim (2010), Abu Hagel (2012) Suhail Sultan (2009), Brayson (2008), Macmillian, H. (2010), that agreed on a relationship between strategic management and institutional performance in universities, and the importance of activating institutional performance within universities. There is also a relationship between institutional performance and both "internal and external" environmental changes, performance and competitive development, and achievement of educational goals within educational institutions. The studies also emphasized the effectiveness of the management of excellence and its contribution to the development of theinstitutional performance of higher education. They also emphasized the importance of institutional reform of the first cycle of basic educa-

tion, in light of effective institutional performance requirements through quality and Added Value. Several aspect were emphasized, the importance of analyzing recent efforts to measure sustainability and institutional assessment tools, identifying normative indicators for institutional leaders and best practices, and sharing experiences to strengthen the concept of sustainability and institutional performance within educational institutions.

Second: studies of Brayson (2008), Choon (2010), Janan, Iman (2010), Al Isawi (2017), Tariq (2016), Hanaa (2010) mentioned the importance of the evaluation of institutional performance and quality according to the Added Value and quality approach. In addition, the need for a methodology to define quality and Added Value concepts in higher education, a weakness in the financial and administrative point of view requiring radical change, both at the institutional and organizational levels. These studies emphasized the impact of this on institutional performance in education, the identification of performance measurement methods, and the impact on the effectiveness of educational institutions' performance by balancing quantifiable factors. They also shed light on the importance of assessing the institutional performance of the faculties of education using a balanced measurement card. Such evaluation reaches a proposed framework for developing the institutional performance of universities in the light of the criteria for TQ and Added Value management, and the existence of weaknesses in the institutional performance of the schools of the first cycle of basic education

Third, the studies of Abdurrahman Mustafa (2012), Laurie (2008), ensure the importance of the control of planning processes, the importance of the implementation of self-evaluation and institutional performance and some measures to improve the educational aspect of schools in all stages and types. They also ensure that appropriate evaluation criteria exist to improve institutional performance within institutions of higher education. There is also a lack of Institutional performance assessment, teaching and learning strategies, and follow-up of academic program learning outcomes at the educational system and school level. Moreover, studies emphasized the importance of regular evaluation reports to ensure the activities of strategic planning programs at universities; and that internal evaluation is not enough to cover all issues and issues related to trends and management patterns within educational institutions; and important institutional differences in policy variables, places, cultures and structures.

Fourth: Studies of Hammoudi and Iman (2010), Hana Hagazi (2010), utilize various techniques, pro-

cedures and tools that benefit the researcher during the preparation of current study tools. Some of these tools are: the Institutional Performance Survey, the Management of Excellence for Education Institutions Survey, the Resolution of Corporate Performance Assessment, the Evaluation of the Administrative Authority for Educational Institutions Performance, and the Measurement of Quality of Institutional Performance. The researcher also benefits from the theoretical and practical orientations to which these studies have been exposed.

Fifth: The various measures of the variables of studies were examined to benefit from them in designing the current study standards.

Sixth: None of the previous studies have discussed the subject of the present study. These are the indicators of institutional performance on the educational side in Oman according to the Added Value approach. Which confirms the existence of the gap and the urgent need for conducting this study.

3 RESEARCH METHOD

The researcher used descriptive analytical method. Study population. The study population consists of all, 169 of the principals and 493 of the senior teachers. according to the official statistics

3.1 The Study Sample

Job title	Males	Females	Total	Percent
Director	15	20	35	20.7%
senior teachers	40	55	95	19.2%
Total	55	75	130	19.6%

Table (1) : study sample

Figure 1: is explain it.

3.2 Study Tools

The researcher developed a questionnaire to measure the institutional performance. Also built a questionnaire for added value and subjected it to the validity and reliability on the following detail:

Tool	Number	Axis	Items	coefficient factor
Added Value	1	Education and Learning	12	0.89
questionnaire	2	Student Environment	10	0.91
	3	School and Community	7	0.90
	4	Leadership and Management	13	0.94
The tool as a whole			42	0.96

Figure 2: validity and reliability coefficient.

Validation of the tool: The researcher relied on the report of the validity of the tool on what is known as Face Validity where the questionnaire of the institutional performance and the identification of added value were presented to the group of arbitrators from the academic professors in the various related institutions.

Reliability of the tool: The internal consistency coefficient was calculated according to the Cronbach alpha formula for each area of the tool. The internal consistency coefficient of the instrument as a whole was 0.93, where the reliability of the first axis was the efficiency of available resources (0.91) (0.93), while the reliability of the quality axis (0.93) is shown in Figure 3. All reliability coefficients for the study axes are high and suitable for the study purposes.

4 RESULTS AND DISCUSSION OF RESULTS

4.1 Results for the First Question

The question: "Are there statistically significant differences between the averages of the level of institutional performance indicators due to the degree of Added Value in a sample of the members (administrative and teaching staff) in some public schools"?

To answer this question, the researcher first applied the one-sample sample test to all the sample members.

This test helps to determine whether there are statistically significant differences as laboratory tests that can compare two or more ; The results were as follows:

Fields	Test value = (0)				
	t	df	Sig.	Top change In value	Mean confidence in differences
					Low er	top
Institutional performance	1.58 2	9 6	.21 1	3.760	3.37	4.1 0
Added Value	.074		.92 8	4.177	3.96	4.2 3

Figure 3: (One-Sample Test) The first hypothesis for all the sample.

In Figure 3 above, the probability value of Sig is greater than the level of significance (α = 0.05) for both variables (institutional performance and Added Value). This negates the hypothesis of the study and accepts the null hypothesis. There are no statistically significant differences between the averages of the level of institutional performance indicators due to the (Added Value) value of a sample of the members (administrative and teaching staff) in some public schools.

To verify the validity of the above conclusion, the researcher conducted a T-Test according to the functional level variable, so that differences between the total of managers and teachers could be verified at the level of each field separately and at all levels for the variables of institutional performance and Added Value; The results are as follows inFigure 4:

/*Axis	field		averages		value	Probability
			Senior teachers	managers	the test (t)	(Sig.)
Institutional performance	The first axis	Efficiency of school resources management	4.34	3.98	2.073	0.068
		Efficiency of equipment	3.51	3.93	1.167	0.255
		Efficiency of Digital Techniques	3.51	3.86	1.828	0.076
		School Finance Efficiency	3.50	3.90	1.427	0.123
	The second axis	is the level of educational product in light of work Teachers	4.12	3.72	1.782	*0.096
		Product level of education in the light of employment Technology	4.10	3.95	1.123	*0.055
		The level of product education in the light curriculum Education	4.00	3.66	1.548	0.251
		Product level education in management light And leadership	4.33	4.16	1.726	0.107
	The 3rd axis	Level of quality	4.00	3.79	2.012	0.444
Added Value		Teaching and Learning Area	4.23	4.14	1.111	0.042
		Student environment	3.88	3.67	1.142	0.113
		School and Community Area	4.00	3.81	1.512	0.088
		Leadership and management area	3.97	4.19	2.091	0.153
All			3.96	3.90	1.580	1.144

Figure 4: The Sample Measurement of Three Tourist Destination.

(*) The differences between the averages are statistically significant at the level of significance (0.05 α)

As shown in the figure above, the probability values (Sig.) for all domains in both variables (institutional performance and Added Value) were greater than the significance (α = 0.05) level. Thus, it can

be concluded that there are no statistically significant differences between the average estimates of the sample study on these areas and the areas combined attributable to the variable level of the function. There are no differences between the views of the senior teachers and the managers, and their opinions are all convergent, which leads to the invalid hypothesis - that the hypothesis of the study is incorrect, and therefore must accept the zero hypothesis.

The researcher concluded that there are no statistically significant differences between the average level of institutional performance indicators due to the Added Value of a sample of members (the administrative and training board) in, of course, government schools. According to the researcher, this finding can be attributed to the existence of a large agreement between teachers and managers to approve what is expressed by the paragraphs of the two questionnaires, especially as the rates of rejection came almost non-existent, with low degrees of neutrality, and all of them are approaching approval. Because the results of the two tests match, the researcher finds no reason to repeat a T-Test (T) test to verify these differences in the light of other variables: gender, scientific qualification.. etc. Results related to the second question:

The second question is: "Are there statistically significant differences between the average level of the educational aspect due to the Added Value of a sample of the members (administrative and teaching) in some governmental schools?

The researcher first applied (One-Sample Test) for all respondents. The results were discards the hypothesis of the study, and accepts the opposite null hypothesis, which denies the existence of any differences of statistical significance in this regard. This indicates that there are no differences of statistical significance between the average level of the educational aspect is due to the score of added value of a sample of the members of the staff (administrative and teaching) in some public schools.

To make sure the previous result is more accurate, the T-Test is applied according to the type; the results were as follows:

DOMAINS		AVERAGES		V(T)	(SIG.)
		females	males		
INSTITUTIONAL PERFORMANCE: LEVEL OF THE EDUCATIONAL ASPECT	Teacher 's Work	4.05	3.53	1.901	0.196
	Technology	3.99	3.72	1.123	0.164
	Curriculum	3.77	3.66	1.548	0.454
	Management and Leadership	3.73	3.61	1.726	0.265
ADDED VALUE		3.74	3.82	1.10	0.194
ALL DOMAINS		3.87	3.67	1.481	0.254

Figure 5: Test (T-Test) for the second hypothesis: differences by type variable.

The above table shows that females have achieved the highest averages in all The four institutional performance questionnaire axes comparable to males,

with a simple difference of (0.52) (0.27) (0.11) (0.12) In contrast to the averages shown in the resolution of Added Value, the difference was small (0.08) for males. As previously indicated, the majority of the sample was female, with 57.7% opposed to 42.3% for males, and the variable of gender can be a factor in detecting differences between the averages for the views of all respondents on the second hypothesis. However, the results that Figure 4above shows indicates that all probability values (Sig.) in all fields are greater than the level of significance ($\alpha = 0.05$), which in turn leads to the conclusion that also discards the hypothesis of the study, and acceptance of the zero hypothesis.

The researcher concluded that there are no statistically significant differences between the average level of the education side due to the Added Value of a sample of members (the administrative and teaching) in the following government schools due to the gender variable.

As a result, there are no statistically significant differences between the educational level averages due to the degree of Added Value in a sample of members (administrative and teaching staff) in some public schools is due to the variable career level. The researcher finds that this result indicates the consensus of the senior teachers and principals regarding the statements made by the two questionnaires, especially the areas related to the educational aspect of the areas of institutional performance related to the educational aspect, in the light of the Added Value approach. This confirms the validity of the results of the statistical analysis, which showed that most of the averages of the second axis of the institutional performance questionnaire expressed a high degree of approval by all the respondents of the four areas of the questionnaire, making the second axis occupy the first rank for the rest of the other institutional performance.

The researcher concludes that the validity of the alternative hypothesis of the study is not proven and confirms the validity of the null hypothesis, which indicates that there are no statistically significant differences between the educational level averages due to the Added Value value of a sample of the members of the administrative and teaching staff) In all public schools.

Results related to Question 3 The question is : "Is there a statistically significant correlation between the level of institutional performance indicators and the level of the educational aspect according to the Added Value approach in a sample of the administrative and teaching staff members in some governmental schools? The results were as shown in the following Figure 6:

AXIS		FIELD	PEARSON COEFFICIENT	PROBABILITY (SIG.)
INSTITUTIONAL PERFORMANCE QUESTIONNAIRE	The first axis	Efficiency of school resources management	.881	*0.000
		Efficiency of equipment	.860	*0.000
		Efficiency of Digital Techniques	.819	*0.000
		School Finance Efficiency	.848	*0.000
	The second axis	is the level of educational product in light of work Teachers	.861	*0.000
		Product level of education in the light of employment Technology	.840	*0.000
		The level of product education in the light curriculum Education	.921	*0.000
		Product level education in management light And leadership	.878	*0.000
	The 3rd axis	Level of quality	.881	*0.000
ADDED QUESTIONNAIRE	VALUE	Teaching and Learning Area	.756	*0.000
		Student environment	.866	*0.000
		School and Community Area	.778	*0.000
		Leadership and management area	.794	*0.000
ALL AREAS			.845	*0.000

(*) Is statistically significant at the significance level (0.05 α)

Figure 6: Test (T-Test) for the second hypothesis: differences by type variable.

As demonstrated by the test of this hypothesis, using the Person coefficient - as shown in the Figure 6 above, it is clear that the average Pearson coefficient for all domains was 845, whereas the probability values (Sig) were all equal to zero at the significance level ($\alpha = 0.05$) 1. This indicates that the mean score for all domains (1 0.05 0.05) between the level of institutional performance indicators and the level of the educational aspect according to the valueadded approach. This, in turn, accepts the hypothesis of the alternative study, which stipulates that there is A statistically significant correlation between the level of the institutional performance indicators and the level of education in accordance with the added value approach to a sample of members of the (administrative and teaching) in some government schools as correct.

5 CONCLUSIONS

1 There has been an improvement in the level of institutional performance in the first, second and post-primary schools in Oman, focuses on the areas of positive interaction between school and community, and cooperation among teachers, principals and parents, feedback education, and the teacher's level of knowledge of the material objectives and enable them to achieve them.

2 The most important aspects of improving the level of institutional performance in the public schools in the Sultanate, the schools are hold periodic meetings to discuss theupdates of the ed-

ucational process, conducting continuous evaluation of students and building cooperation relations with other institutions. All that is in a framework based on immediate and future planning aimed at developing the educational process, with a focus on the implementation of remedial and enrichment plans to develop the skills of creativity and innovation of students, taking into account individual differences between them, and the development of tools to take advantage of sources of learning.

3 The efficiency of institutional performance in schools covered by field research is due to the availability of sufficient resources for schools to achieve their objectives. Especially with regard to modern technologies and software, and the skills needed to deal with them and use them fruitfully in the school work, and the educational process as a whole, at the same time in which schools are evaluating the curriculum periodically and continuously.

4 The Added Value in the field of education in the first, second and postprimary schools in Oman contributed to raising the level of indicators of school performance efficiency, especially with regard to the construction of values and positive attitudes. It also contributed to diversify of teaching strategies used by teachers, and the improvement of institutional performance of the school - as an educational institution.

5 The value-added approach contributes to the development of teachers' ability to take into consideration individual differences among students, and their abilities to employ the skills of dealing with students.

6 The Added Value approach contributes to the support of students' learning through the results of their evaluation. This is linked to the contribution of Added Value in increasing the ability of teachers to follow the students' achievement and to employ various strategies and methods that contribute to the modification of students' behavior.

7 The Added Value approach has led to the development of the teachers' self-abilities and those working in the school environment.

8 Value-added enabled students to acquire knowledge and deal with it, encouraged self-learning. It also developed students' skills and ability to solve problems, increased their focus on creative thinking and developed their social and communication abilities by developing their ability to adopt and practice positive dialogue.

9 The introduction of Added Value has enhanced the efficiency of school performance in terms of enabling parents to obtain all information about the level of educational attainment of their children and to involve them in the development of their scientific levels.

10 Value-added input can contribute to measuring institutional performance indicators in educational institutions in a holistic manner, including institutional performance indicators related to inputs, internal process indicators and educational activities, output indicators on the one hand, and efficiency indicators, effectiveness indicators as well as quality indicators Education.

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Feasibility Study of Hybrid Renewable Energy Power Generation Installation

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Keywords: HOMER, people, PLN, NPC, COE, Annualized cost, Renewable penetration, total electricity production.

Abstract: Application of electrical energy from year to year is getting bigger along with population growth, industry, and others. The National Grid Electricity (PLN) as the main provider of electrical energy networks must have a backup of electricity to meet the growing electricity needs for people. This study aims to provide a backup provider of people electricity needs sourced from renewable energy. In this plan HOMER software is used to design renewable energy power generation systems from solar and wind energy. The function of HOMER software to optimize the size of the type of generator, especially the constituent components of hybrid generator so that more economical power generator are obtained as providers of electricity reserves. The results of electrical energy generated from the design of a hybrid power system amounted to 221.866 kWh. Renewable penetration of components in generating electrical energy by 84% of the total electrical energy produced. The cost of energy (COE) issued per 1 kWh is Rp. 980,45/kWh and the net present cost (NPC) in the construction of a hybrid power is Rp. 2.789.010.000. Whereas the annualized cost of maintenance of components of hybrid power issued in a year is Rp. 215.742.140

1 INTRODUCTION

Application of electricity from year to year is increasing. This is due to the increasing population from year to year so that application of electrical energy consumed by the people is getting bigger. To meet the increasing application of electricity, new references are needed in providing electrical energy, especially energy sources from nature, because for now as a large amount of electricity generated from fossil fuels (Tangirala Venkat, 2017). Where, in application of fossil fuels will have a negative impact on the environment and the amount of fossil fuels is very limited and will run out if often used. For this reason, people are required to find energy sources that are unlimited and are environmentally friendly.

Renewable energy is an energy that comes from nature and is unlimited. In addition, in its application renewable energy is very friendly to the environment. There are several types of renewable energy that can be converted into electrical energy, namely water, wind, solar, ocean waves, biomass and others (Suherman et al., 2017).

In this study, the author will design a renewable energy hybrid power system where solar will be used as a provider of electrical energy of people. How-
ever, in the process of designing this generator there are several factors that must be considered, including wind speed and air heat. This factor is the most important factor in determining the location of this generator. For this reason, it is necessary to study in advance to determine the natural conditions in which this power generator will be located. This study aims to find out whether this power generator is effective if it is placed in a location that is the object of research.

The hybrid system design in this study uses HOMER software (Hybrid Optimization of Multiple Energy Resources). This software is able to design, simulate and determine the best system configuration. In addition, this software is able to perform mathematical calculations regarding the costs that will be incurred from a hybrid power system (Kunaifi, 2015).

This study aims to determine the effect of parameters (wind speed, sunlight intensity, and load data of electricity consumption of people) on the results of the optimization of the design of hybrid power generation systems.

2 LITERATURE REVIEW

2.1 HOMER

HOMER is a software used to design and analyze hybrid energy systems and was developed by the national laboratory renewable energy, United States. HOMER models electric power systems and costs during operation, which is the total installation and system operating costs. In addition, in HOMER there are many system design options that can be used based on technical benefits and economic value (Yasuha et al., 2017).

In operation, HOMER performs 3 main tasks, namely:

1. Simulation.
2. Optimization.
3. Sensitivity analysis.

a Net Present Cost (NPC)
Net present cost is the total cost that will be used during the installation period or the operation of the components throughout the project. To find out the value of NPC by using the equation 1.

$$NPC = CapitalCost + ReplacementCost + O\&MCost + FuelsCost - Salvage \quad (1)$$

Where:
Capital costs : Cost of capital component (Rp).
Replacement : Cost of replacement components costs:(Rp). O&M costs : Costs of operating and maintenance (Rp)
Fuel costs : Fuel costs (Rp).
Salvage : Costs of remaining components (Rp).

b Total Energy Production
To find out the amount of electrical energy generated from renewable energy systems (hybrid power) throughout the operating system can be known by using equation 2

$$ETotal\,production = Ewindturbine + EGrid \quad (2)$$

Where,
ETotal Production : Total electricity production (kWh)
EWind turbine : Total wind energy production (kWh)
EGrid : Total energy production from the PLN network (kWh)

c Annualized Cost
Annualized cost is used to determine the total annual cost of the design of a hybrid power system. To find out the annual cost of the HP system can be known by using the formula in equation 3.

$$Annualized\,cost = CapitalCosts + Replacement\,costs + O\&M\,costs + Fuel \\ costs - salvage \quad (3)$$

Where,
Annualized cost (AC) : System annual fee (Rp)
Capital costs : Cost of component capital (Rp)

d Cost Of Energy
The cost of energy is used to determine the costs incurred per kWh of the system. To find out the costs incurred can be calculated using the formula in equation 4

$$COE = \frac{TotalAC}{E_{tot.production}} \quad (4)$$

Where, COE : Costs incurred per kWh (Rp) Total AC : System annual fee (Rp) $E_{tot.production}$: Total energy production (kWh)

e Renewable Penetration
Renewable penetration is used to find out how much electrical energy is generated from the total electrical energy produced by hybrid power (HP) systems. The renewable value of penetration can be calculated using equation 5

$$RP = \frac{E_{tot.component}}{E_{tot.prod.system}} \quad (5)$$

Where, RP : Renewable penetration (%) $E_{tot.component}$: Total electricity generated from solar panels and wind turbines(kWh) $E_{tot.prod.system}$: Total production of electrical energy generated by the system(kWh)

2.2 Hybrid System Generator

The hybrid system generator is a combination of two or more power generator with different energy sources both from natural sources and those from conventional energy. The purpose of the hybrid power generation system is to complement each of the two types of combined generator, both in terms of weaknesses and increasing the amount of electricity production (Arota et al., 2013).

2.2.1 Wind Turbine

Basically, a wind turbine system that captures the kinetic energy of the wind and converts it into mechanical energy (motion) through a turbine knife and then the mechanical energy is converted intoelectrical energy through an electric generator (Aziz et al., 2018). To find out the power produced by wind turbines that will be used in this study, it can be known by using equations 6

$$P = \frac{1}{2} * p * A * V^3 \tag{6}$$

Where: P : Power (W)
p : Wind mass (1,225 kg/m3)
A : Cross sectional area of the turbine (m2) (1/4 * Φ * D)
V : Wind blow speed (m/s)
D : Diameter of wind turbine (m)

2.3 Photovoltaic

When the PV module is exposed to solar, the PV module will produce direct current (DC) electricity. By using an inverter, direct current electricity will be converted into alternating current (AC). There are 2 main types of PV systems, namely on grid and off grid (Tan and Seng, 2011).

Based on the manufacturing technology, there are 2 types of solar panels that are often used, namely:

1 Monokristal solar cell

2 Polikristal solar cell

Factors that affect the level of performance of solar panels, namely:

1 Temperature

2 Solar intensity

3 Orientation of solar module circuits

4 Angle of solar orientation

2.4 Payback Period

Payback period is a method used to determine the time needed to recover costs incurred in the project builder (ESDM, 2017). To find out the value of a payback period can be calculated using Equation 7.

$$PaybackPeriod = \frac{Investmentcosts}{yearlyincome} \tag{7}$$

Before knowing the value of the payback period, first know the value of yearly income from the sale of electricity. Income from electricity sales can be calculated using Equation 8. The selling price of renewable electricity for the Java region as a whole is Rp.911 per kWh (Negara, 2016).

$$Income = totalenergyproductionxsellingprice \tag{8}$$

Where:
Payback period : Return on capital (year)
Investment costs : Capital issued (Rp.)
Yearly income : Income earned per year(Rp.)
Total energy production: Electricity produced by generator per year (Rp.)
Selling price : Costs incurred per kWh (Rp.)

3 EXPERIMENTAL METHOD

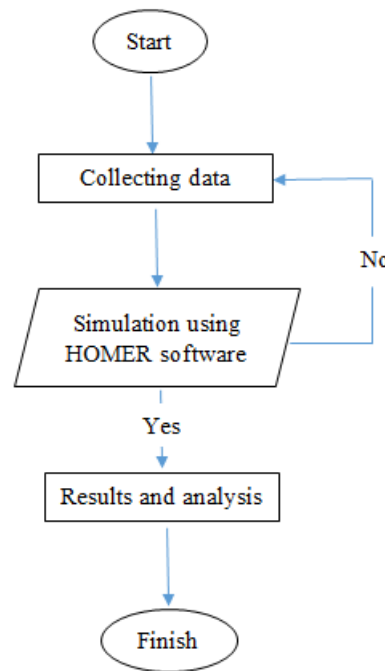The flow chart in this study can be seen in Figure 1.

Figure 1: Research flow diagram

In the first step in completing this research, it is collecting data. Data collected in the form of wind speed, solar intensity, and electricity energy consumption data (in a year). For wind speed and solar intensity data obtained from the NASA site. While the data on people electricity consumption is obtained from the PLN distribution in Bantul. In addition, additional data is needed in literature studies such as journals, papers (national and international), and

books (Daryanto, 2007). This data is used as a reference in the completion of this research. In the second step, the data that has been obtained is then processed using Microsoft Excel. Data that is processed using Microsoft Excel is the data electricity consumption of people. This data processing aims to determine the overall amount of electricity consumption of people in a year. In the third step, simulating the HOMER software. This simulation aims to design a schematic of a hybrid power (HP) system and find out the amount of electrical energy generated from a HP system. After the HP system is designed, then enter the data that has been obtained on the HP system designed in the HOMER software.In the last step, the data entered on the HP system is then analyzed by HOMER software (Betha et al., 2017). The results of the analysis of the HOMER software in the form of the amount of electricity generated, the net present cost (NPC), and others. In addition, the results of the HOMER software analysis are to produce an optimal system (Tong, 2010).

3.1 System Design

In designing schematic hybrid power (HP) generation systems there are several components used, namely wind turbines, solar cells, batteries, and converters. The design of the HP system can be seen in Figure 2.
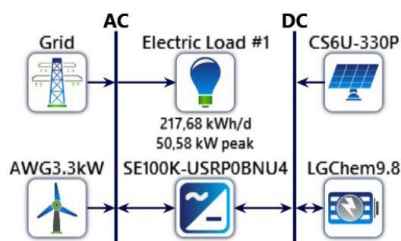

Figure 2: Schematic design of HP systems

3.2 Components of HP Systems

3.2.1 Wind Turbine

Wind turbines used to design schematic HP systems are 3 pieces aleko WG3000 3000W wind power generator and can be used for 20 years.

3.2.2 Solar Cell

The solar cell used in the schematic design of the HP system are 273 pieces of CanadianSolar MaxPower CS6U-330P types and can be used for 25 years.

3.2.3 Baterai

Batteries used in schematic HP systems are 10 pieces of LGChem RESU10 9,8kWh battery types and can be used for 10 years.

3.2.4 Inverter

Inverters used in schematic design of HP systems is 1 pieces of SolarEdge 100kW 277/480V 3-phase inverter and can be used for 15 years.

3.3 Parameters Used

3.3.1 Wind Speed

Wind speed data in this study were obtained from the NASA site. Where, the data used is monthly average wind speed data in a year. Wind speed data can be seen in Figure 3.

Month	Wind speed (m/s)
January	6,655
February	6,730
March	5,740
April	5,210
May	6,930
June	6,385
July	5,630
August	5,820
September	5,915
October	5,670
November	4,455
December	7,730

Figure 3: Monthly Wind Speed Data.

3.3.2 Solar Radiation

Solar radiation data in this study were obtained from the NASA site. Where, the data used is monthly average wind speed data in a year. Solar radiation data can be seen in Figure 4.

Month	Solar radiation (kWh/m^2/day)
January	6,070
February	3,860
March	5,340
April	6,690
May	5,120
June	4,860
July	5,490
August	5,630
September	6,560
October	6,780
November	7,040
December	2,550

Figure 4: Monthly Solar Radiation.

3.3.3 Load Data

Load data in this study were obtained from PLN Bantul distribution. The load data used is monthly average electricity consumption (kWh) of the people in a year. The amount of load data used are 100 data samples. After the load data is obtained then input using HOMER software. The window for inputting load data in the HOMER software can be seen in Figure 5.
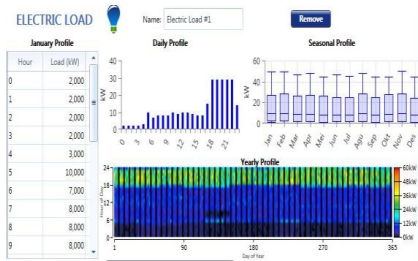

Figure 5: Load setting window

4 RESULTS AND ANALYSIS

4.1 Effect of Parameters on Hybrid System Design

There are 3 parameters used in designing the hybrid power generator system, including wind speed, solar radiation, and electricity consumption of the people. These three parameters greatly affect system output. If one of the parameters does not meet the standards for hybrid power generator constituent components, the performance of the system does not work optimally.

4.2 Results of Schematic Optimization of Hybrid Power Generator

The optimization results aim to determine the variable level of the main components in hybrid power generator when operating. Where, the optimization results were obtained when the simulation process in the HOMER software was finished running. Figure 6 shows the results of variable optimization of each component contained in the hybrid power generator schematic design.
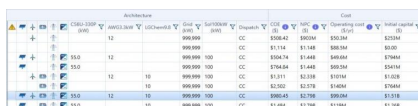

Figure 6: Results of hybrid power generator schematic design optimization

4.3 Total Energy Production

Component	Production (kWh)	Efficiency (%)
Canadian Solar MaxPower CS6U-330P	91.058	41
aleko WG3000 3000W *wind power* generator	97.024	43,7
Grid	33.784	15,2
Total	221.866	100

Figure 7: Total Energy Production.

Based on Figure 7, the total production of electrical energy from wind turbines is greater than solar cell. It can be happen because the output power of the wind turbine is greater than the solar cell which is 43.7% in producing electrical energy even though the number of wind turbines used is less than that of the solar cell while the solar cell produces electricity is 41%.

4.4 Net Present Cost (NPC)

The total cost used for components in the installation project or the operation of hybrid power generator is Rp. 2,789,010,087. The distribution of component cost can be seen in Figure 8.

Figure 8: Distribution cost of Net Present Cost

4.5 Annualized Cost (AC)

Total annual costs incurred from the hybrid power generator system is Rp.215,742,140.17. The annualized cost value will be used to determine the Cost of energy value. The distribution of annual costs of components from system design can be seen in Figure 9.

Figure 9: Distribution of annual component costs

4.6 Cost Of Energy (COE)

Cost of energy was calculated to determine the cost incurred per 1 kWh of the system design. The cost ofenergy generated from a hybrid system simulation uses a HOMER is Rp.980/kWh.

$$COE = \frac{TotalAC}{Totalenergyproductionsystem}$$
$$= \frac{Rp.215.742.140}{221.866kwh}$$
$$= 972perkwh \quad (9)$$

4.7 Renewable Penetration

Renewable penetration is used to determine the performance of wind turbine and solar cell in generating electricity (Lambert et al., 2006). To determine the performance of wind turbine and solar cell can be known by using equation 5. The amount of electrical energy generated from renewable energy components can be seen in Figure 10.

Component	Production (kWh)
Canadian solar maxpower CS6U-330P	91.058
AWG HC 3,3 kW wind turbine	97.024
Total	188.082

Figure 10: Electrical Energy Produced From Renewable Energy Components.

$$RP = \frac{E_{tot.RES}}{E_{tot.sys}}x100\%$$
$$= \frac{188.082}{221.866}x100\%$$
$$= 84,8\% \quad (10)$$

Based on the calculation of renewable penetration, the performance level of the hybrid power generator components is 84.8% in generating electricity from the total electricity produced.

4.8 Sector of Electricity Use from the Hybrid Power Generator System

Electrical energy produced from the hybrid power generator system, besides being used for the electricity needs of the Wonoroto Hamlet people is also used for the needs of tourists who come in tourist attractions located in Gadingsari Village, Bantul, such as providing charging station facilities at tourist attractions in Gadingsari Village.

4.9 Payback Period

To find out the time needed to restore development cost capital can be calculated using Equation 7 and Equation 8.

$$Income = Totalenergyproductionxsellingprice$$
$$= 221.866x911$$
$$= 202.119.926,00peryear. \quad (11)$$

$$Paybackperiod = \frac{investmentcost}{yearlyincome}$$
$$= \frac{2.789.010.086}{202.119.926}$$
$$= 13year8month \quad (12)$$

The payback period to recover the cost of capital spent to build a hybrid power generator in Wonoroto Hamlet for 13 years 8 months.

5 CONCLUSIONS

1 Total electricity generated from a hybrid power generator system as a electricity provider of people reserves is 221,866 kWh per year.

2 Electricity generated from the design of the hybrid power generator system is sufficient for the electrical energy use of the people in Wonoroto Hamlet.

3 The hybrid power generator (bayu-solar cell) is feasible to be built as a electricity provider of people energy reserves in Wonoroto Hamlet because the amount of electricity produced is greater than the people electricity usage of 110,235 kWh per year and the payback period for the construction of power is less than time project planning.

4 Hybrid power generator (wind-solar cell) can supply renewable energy at 84.8% of the total electricity produced

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Concept of Digital Information Technology Implementation of the Mosque XYZ in Industry 4.0 Era

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Keywords: Concept, Digital, Implementation, Technology, Mosque.

Abstract: The existence of the mosque and the organization underneath is essential to develop various models in its function. The abilities and development of adolescent individuals are able to become a reinforcement and agents of the change of Ummah in the organization. Childhood through adolescence requires coaching and a strong will so that they are able to be independent so that the potential in the organization and its productive resources have significant prospects in the present and the future. For this reason, it is time for the effectiveness of the functions of mosques to be one of the potentials of community development. More broadly, the role of the mosque is a place used for discussion, study, deciding on the problems of the Ummah, and others. What is raised in the function model of the mosque is how to utilize the mosque more broadly for Muslims, not only parents but also society in general, especially among children and adolescents. This paper proposed a function model of the mosque with the digital information technology implementation. This is expected that the mosque's function is not just a place of worship but is more extensive than that.

1 INTRODUCTION

The young people of the mosque is one of the elements of the mosque management who have several strategic roles in the process of achieving and developing young cadres in interacting and prospering mosque activities by targeting the optimization of the youth's role in supporting work programs for the benefit of the people (Muchlis et al., 2019). The existence of a mosque youth organization under the field of youth coaching is fundamental to do the development of models with a variety of methods so that the abilities and development of individual adolescents can become a reinforcer and agent of the changing people in the organization. The place to socialize and often meet among young people is an important thing to do to be able to raise the potential that exists in young people so that moral and spiritual aspects are formed in addition to fostering togetherness in the organization of mosque youth organizations (Karimshah et al., 2014).

Childhood through adolescence requires coaching and a strong will so that a young man can be independent so that the potential in the organization and productive resources of adolescent mosques have fundamental prospects in the present and the future (Batri, 2013). In a further view, the existence of mosque

youth is one of the resources that must be able to be optimized. It needs to get the attention and guidance of all elements of society without exception (Sapri et al., 2016).

For this reason, it is time for the effectiveness of the functions of mosques to be one of the potentials of community development. The character of the young people in the mosque should be able to become one of the potential development of the people. The personality of the mosque's youths that are expected by the people and nation can be formed into a young generation that is useful for himself and his family. With the above arguments, it is necessary to conduct many training and use of information technology in accessing the internet within the mosque. At present many mosques only function as places of worship, whereas more broadly, the function of the mosque is a place used for discussion, study, deciding on the problems of the Ummah, and others (Sumaryanto et al., 2016). What is raised in the function model of the mosque is how to utilize the mosque more broadly for Muslims, not only parents but also society in general, especially among children and adolescents (Bakri et al., 2018).This paper proposes a function model of the mosque in the implementation of the technology as the development towards the industrial era 4.0. This is expected to be able to encourage more worshipers

to use internet features in the mosque environment so that the mosque's function is not just a place of worship but is more comprehensive than that. The training conducted in the mosque environment consisted of training on installing, setting up, and managing the network, and some managements of the mosque and digital content could be improved.

2 PROBLEM

From a social perspective of the mosque XYZ, the community still carries the principle of mutual cooperation, but many of the mosque's youth are not socializing with each other. Routine activities are also less active. Some agendas go well enough even though few people handle them. In terms of technological insight, young people are not left behind in the development of information technology, and even social media is very familiar and able to use it. Utilization in the field of technology still needs to be developed and directed to support the skills of mosque youth and be encouraged to be active in ongoing activities (Aziz et al.,).

Some Muslim teenagers have not been sufficiently active in mosque youth activities. The activities of the mosque's youths were merely fostering landfill and commemorating Islamic holidays. The potential of the internet has not been utilized optimally and also complaints of mosque congregants with many children playing in the mosque when the prayer takes place since it is disturbing them.

From the determination of the priority scale, it can be taken a solution that has been offered to resolve the problems systematically in accordance with the priority scale of the problems obtained from the observation and discussion with other elements. The solutions which are offered consist of requiring to use internet network access in the mosque area so it makes the mosque as a place that functions more broadly. It also needs a variety of training and coaching, including introducing information technology and directing children to use the play method. The problem list of the condition of the mosque XYZ faced is shown in Figure 1.

But to limitation problem should be in line with the concept of the digital information technology implementation of the mosque XYZ in the issue of the industrial era 4.0, these parts must be directed to this implementation of the digital information technology including the model of technology, knowledge of technology, and its components used.

No.	Problems
1.	Some Muslim teenagers have not been sufficiently active in routine mosque activities
2.	Mosque youth activities that are still monotonous are related to fostering children under five and commemorating Islamic holidays
3.	The potential of the internet around the mosque has not been optimally utilized
4.	The routine activities of the mosque are not socialized well
5.	The functions and benefits of mosques are mostly for mosque worshipers and Muslims only

Figure 1: Problem list of the condition of the mosque XYZ.

3 METHODOLOGY

This paper uses an analytical review that are tailored to the relevant framework. In applying digital information technology in the XYZ mosque, it has used analysis, and of course, it was accompanied by making observations. This analysis is carried out objectively by determining the aims and objectives in implementing digital information technology and also identifying the targets to be achieved to obtain the priority scale (Wibowo, 2018). This paper has applied the Eisenhower Matrix, which can be shown in Figure 2. There are 4 points i.e., do first, do later, eliminate, and delegate. Do first means the problem is very urgent and important to be solved immediately. Do later means the problem is important and not urgent. Eliminate means the problem is not important and not urgent. Delegate means the problem is urgent and not important.
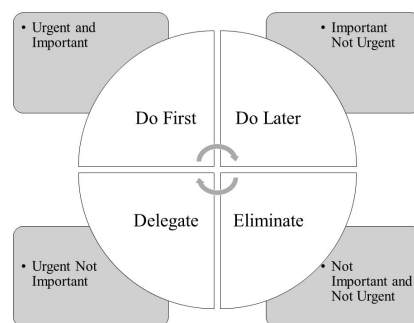

Figure 2: The Eisenhower matrix used to determine the problem to be solved in implementing the digital information technology

From the results of the analysis and observations

made, then make a priority scale by applying what is obtained from it turns out that the mosque XYZ needs a website as transparency of information and to replace paper as a media that is not environmentally friendly. Because the results of the deliberations were decided to reduce the use of paper and go to the platform of go-green. For this purpose, the website becomes an information channel, which then the information and articles will be shared through the Whatsapp group so that no more paper is distributed.

In addition to supporting more recent development activities, it is necessary to get the internet access. So that internet network procurement becomes the second priority by first applying network analysis to measure installation needs. Then apply the network configuration so that only certain people can access it, so it is not misused. If there are pilgrims who want internet access can contact the admin so that their username and password can be configured. With the hotspot, it can be developed to implement of the IoT by utilizing mobile applications and information technology applications (Wibowo and Hidayat, 2017). The design of the digital information technology implementation for the mosque XYZ can be shown in Figure 3.
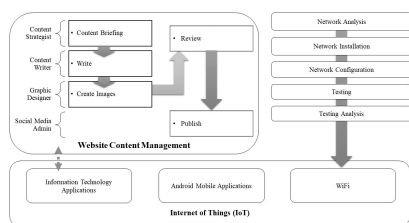

Figure 3: The design of the digital information technology implementation for the mosque XYZ.

In making a website for this mosque XYZ, it requires website content management that consists of capabilities of a content strategist (CS), content writer (CW), graphic designer (GD), and social media admin (SM admin). CS plays a role in web content briefing so that the navigation determinant of content and its contents can be monitored, CW has the role of writing web content to be published, GD plays a role in making images from the theme of the content. The results of the website content then need to be reviewed before it is published. Once published, web content can be shared through social media in order to reduce paper usage. Even though the application of this web content flow can be directly regulated independently by applying another website content management concept. For the simple conditions of this case, just use a few resources that are tailored to the needs and objectives in its implementation. The trend in enforcement is closely related to a small part of information tech-

nology applications.

4 DISCUSSION

The implementation of digital information technology has been applied in the XYZ mosque to be in line with the concept of industry 4.0 is illustrated in accordance with Figure 4.

Figure 4: The implementation of digital information technology for the mosque XYZ

The figure above shows that the admin is assigned to manage the content of the website. For the needs of this website so that it is easy to use and more familiar with the operation of additional dynamic features, the website used is applying an open source platform, namely Wordpress. While Wordpress theme is also implemented using WP mosque theme which can be downloaded for free on the website https://wpmasjid.com/download/. The features displayed are sufficient for information announcements, articles, prayer times, agenda of activities through videos and galleries, and other features that can be embedded dynamically. Share information via WhatsApp is also available. The needs of this website are enough to be implemented at the mosque XYZ. In addition, the mosque needs to be placed wireless fidelity (WiFi) as a hotspot so that coaching activities that require internet access can be available. Not only that, an Arduino with a WiFi module attached can be used to access WiFi by positioning it as a client and server. Arduino can be affixed with various devices that can be controlled remotely according to the IoT platform using the telegram application. Applications that are controlled, such as alarms with multiple functions that can be programmed, closed-circuit television (CCTV) to monitor online, and so on. Mosque worshipers can also access the internet through a variety of mobile and desktop devices.

The appearance of this website is responsive, where, when accessed on a mobile device, will follow the size of the display, as shown in Figure 5.
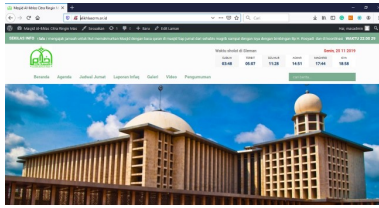

Figure 5: Website of the mosque XYZ.

After conducting the study in the network management in the mosque XYZ, there are several things that should be considered in implementing the placement of WiFi router, including:

1. The existence of WiFi in a residential neighborhood of the mosque XYZ, apparently there are customers who use the internet network access only to play online games, so if the router is installed, it will make incompatible with the aim of building workgroups or education for teenagers and the community who need internet access.

2. The existence of customers who distribute username and password to their friends to access the internet.

3. Subscription fees when using a connection via the internet per month with unlimited access is considered.

So with various considerations and input from the community members related to this matter, the network installation for internet access is done stand alone. Where the router for the access point used is sometimes not connected to the internet through the residential neighborhood network, but if it is needed for unlimited internet access, the router can be connected directly via the residential neighborhood network. Connection for internet access can use a modem if needed for internet access can by filling in internet pulses on the Simcard used. This Simcard is inserted into the modem. The configuration of the router used is shown in Figure 6.

Figure 6: Router configuration.

Figure 5 shows the network connection on the router and several workstations or devices. It will au-

tomatically form a diagram by generating each internet protocol (IP) address. This screen display is to edit and it is enough to move the cursor and click the mouse on the box or icon on the display. So the graphical user interface (GUI) is quite interactive in its use even in its setting of login.

5 CONCLUSIONS

In implementing digital information technology for mosque XYZ, what is needed first is information and transparent reporting of funds, so for this purpose, it is necessary to create a mosque website. The next thing, for the need for information technology implementation in the mosque, it is necessary to place WiFi as a hotspot area that can be accessed by worshipers and peoples for the education and activities of the mosque management and the surrounding community. From the aspect of WiFi placement, it is expected that various alarm implementations will be developed that can be controlled through an android application on a cellphone or television as a digital information board whose content can be remote using the telegram application without making any android application. In this case, WiFi can not only be used as a hotspot but can also be used to develop application based-on the internet of things (IoT) and remote control using an android application. The information paper doesn't need to be shared anymore, just use the information that is on the mosque's website and distributed directly to WhatsApp. Videos or documentaries on mosque activities do not need to be stored on the website, simply uploaded to Youtube and the link embedded into the website so that it does not overburden the mosque website hosting capacity.

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Solar Power Plant Tracker Upgrade and MPPT Control with Internet of Things

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Keywords: LDR, solar panel, dual-axis tracker, Atmega328P-PU, MPPT, IoT, Internet of Things.

Abstract: To maximize sunlight absorption by forming a perpendicular axis between the sun and the solar panel. A method which could be implemented on the solar panel system that could follow the sun's movement is needed. On this design, the system uses a light diode sensor (LDR) that functions as the light detector, an Atmega238P-PU microcontroller as the command logic storage, and a servo motor as a mover to dislocate the position of the solar panel with Internet of Things (IoT). In the solar panel test which runs for 11 hours using the dual-axis solar panel tracker has yield a power of 9.4 W and after passing the MPPT control battery, it gives an average of 10.6 W. Compared to using a static solar panel method, it only yields a power of 6.8 Watt, and after passing the MPPT control battery, it gives an average power of 9.25 W.w

1 INTRODUCTION

1.1 Background

To maximize the absorption of sunlight, a method which forms a perpendicular axis between solar panel and sunlight is needed. Hence the need to make a model that could be implemented into a solar panel system that could follow the sun's direction is crucial. There is also an excess power from the solar panel into the battery itself, so a MPPT (Maximum Power Point Tracker) control battery is also needed. While the use of dual-axis solar tracker is already discussed in past studies, the implementation of said dual-axis tracker using Internet of Things (IoT) to be remotely controlled through a website haven't been developed.

1.2 Model Simulation

The methodology used in this study is to design a prototype Solar Power Plant Tracker with the IoT-based MPPT battery using ATMEGA328P-PU microcontroller. The system are designed to calculate the sun position at anytime, at any location, and any day of the year.

2 THEORETICAL BASIS

2.1 Photovoltaic (Solar Cell)

Photovoltaics are able to convert photon energy into electrical energy. One solar cell usually could produce DC voltage around 0.5 – 2 V when illuminated. Several solar cells will need to be arranged in a series to get a larger desired voltage(Notosudjono and Adzikri, 2018).

2.2 Solar Panel Tracker System

Each square meters in the solar panel surface area that faces the sun could harvest around 1000 W solar power (assuming 100% efficiency). Thus, to increase the solar panel's energy efficiency, a simple but accurate solar detector mechanism is needed as seen in the Figure 1 below, known as tracker mechanism.

(Prinsloo and Dobson, 2015) In the following figure is the solar trajectory illustration.
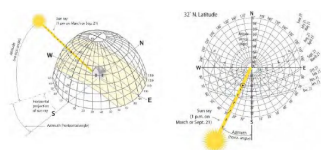

Figure 1: Solar trajectory illustration.

The Sun follows a certain path when seen from a geographical location. A sun tracker mechanism is used to find the sun's position in a certain location to keep the solar panel perpendicular against the sun. (Prinsloo and Dobson, 2015) Solar declination can also be defined as the angle between the line joining the centers of the Sun and the Earth and its projection on the equatorial plane. The solar declination changes mainly due to the rotation of Earth about an axis. It's maximum value is 23.4°Con December and the minimum is -23.4°C on June 21st (Mansour et al., 2015; Elsherbiny et al., 7 09).

2.3 Automatic Photovoltaic Tracking System

Automatic Photovoltaic system is designed using dual-axis tracker. Dual axis trackers have two degrees of freedom that act as axes of rotation. These axes are typically normal to one another. Two-axis tracker tracks the daily east to west movement of the sun and the daily declination movement of the sun. Two common implementations are TTDAT (tip-tilt dual axis trackers) and AADAT (azimuth-altitude dual-axis trackers) (Elsherbiny et al., 7 09).

This tracker gives the possibility for automatic measuring of direct solar radiation with a pyrheliometer. In the active operation mode, the tracker uses the signal of a sun detecting linear sensor to control the pointing (Roth et al., 2005). Two stepper motors move the instrument platform, keeping the sun's beam at the center of the sensor.Duarte, et al. (Duarte et al., 2011) designed a two axis sun tracking system. Figure 2 below shows Dual axis tracker.
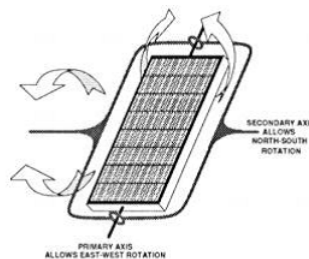

Figure 2: Dual axis tracker.

2.4 Servo Motor

Servo motors have been around for a long time and are used in many applications. They are small in size but powerful and are very energy efficient. Servos control by sending an electrical pulse of variable width (or pulse width modulation (PWM)) through control wire. Servo motor could only turn 90°C in either direction for a total of 180°C movement. The position where the servo has the same amount of potential rotation both in the clockwise or counterclockwise direction is defined as the servo motor's neutral position (Ramadhan et al., 2018).

2.5 Maximum Power Point Tracker (MPPT) Method

Tracking the maximum power point (MPP) of a photovoltaic array is an essential stage of a PV system (Femia et al., 2008) . As such, many MPPT methods have been introduced and numerous variants of each method have been proposed to overcome specific disadvantages. The methods all vary in complexity, number of sensors required, digital or analogue implementation, convergence speed, tracking ability, and cost effectiveness(Babaa et al., 2014).

2.6 ATMEGA328P-PU Microcontroller Pin Configuration

Atmega328P-PU has the ability to separate memory for program code and for memory so that it can maximize work in parallelism, or commonly called Harvard architecture which only requires 5Vdc.

2.7 Internet of Things (IoT) Concept

The Internet of Things is envisioned to allow for the interconnectivity of anyone and anything at anytime and in anyplace. This connectivity should ideally be possible using any service over any conduit, path or

network. This is popularly referred to as The IoT 6A Connectivity Concept (Takpor et al., July; Perera et al., 2013).

The IEEE IoT Community defines the Internet of Things as: "... a self-configuring and adaptive system consisting of networks of sensors and smart objects whose purpose is to interconnect "all" things, including every day and industrial objects, in such a way as to make them intelligent, programmable and more capable of interacting with humans" (IEEE, 2015).

Figure 3. shows a structure of the connectivity concept of IoT and some of IoT's application areas.
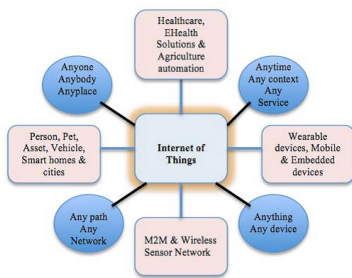

Figure 3: IoT's connectivity concept and application areas.

3 TESTING AND ANALYSIS

3.1 Solar Panel and Control MPPT Test

The Solar Panel Test and Control Battery Test with MPPT method are conducted to determine the amount of power output from the solar panel, before and after passing MPPT control. In the MPPT control test, we observe the current and the voltage detected by the current and voltage sensors on the LCD display. This is done by measuring directly on the output pin from this MPPT control electrical circuit. Fig. 4 below shows the output pin of the MPPT control.
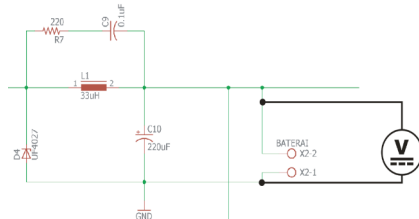
Figure 4: MPPT Control Output pin measurement.

To determine the comparison or difference between the resulting voltage and current values where the main source is the solar panel, the measurement on the input pin of the MPPT control is needed so it is

not solely based on the current and voltage values displayed by the LCD. Fig. 5 below shows the input pin of the control before passing through MPPT control.
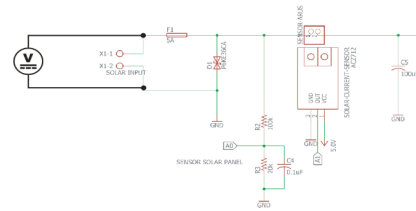
Figure 5: MPPT Control Input pin measurement.

After the current and voltage data from using tracker method and static method with and without the MPPT control is obtained, we can obtain the theoretical power value from the solar panel by using Voc and Isc as seen in the eq. 1 below :

$$SolarCellOutputPower = V_{oc} * I_{sc} \qquad (1)$$

The following 10 Wp solar panel test result using the tracker method for 11 hours in the Figure 6 and Figure 7 :

Time	Static Solar Panel		
	Voltage (V)	Current (A)	Power (W)
07.00	15,34	0,4	6,13
08.00	15,88	0,46	7,30
09.00	16,5	0,49	8,08
10.00	18,21	0,45	8,19
11.00	19,33	0,46	8,89
12.00	19,43	0,51	9,90
13.00	18,36	0,49	8,99
14.00	17,29	0,38	6,57
15.00	16,13	0,30	4,83
16.00	15,6	0,21	3,2
17.00	14,2	0,19	2,69
Average	**16,93**	**0,39**	**6,80**

Figure 6: Solar Panel Tracker and MPPT Control Test for 11 hours.

Time	Static Solar Panel		
	Voltage (V)	Current (A)	Power (W)
07.00	15,53	0,52	8,07
08.00	16,67	0,49	8,16
09.00	18,08	0,59	10,84
10.00	19,26	0,59	11,36
11.00	19,36	0,60	11,61
12.00	19,43,	0,64	12,43
13.00	19,17	0,50	9,85
14.00	18,15	0,50	9,07
15.00	16,23	0,50	8,11
16.00	15,78	0,40	6,31
17.00	15,6	0,40	6,24
Average	**17,56**	**0,52**	**9,25**

Figure 7: Solar Panel Tracker and MPPT Control Test for 11 hours (extension).

As seen in the Figure 6 and Figure 7 above, the average power from running the test for 11 hours can be measured from 07.00 – 17.00 (Indonesian Western Time) with a capacity of 10 W, 21.6 V open circuit voltage (Voc) , and 0.61 A short circuit current (Isc).

Using the static method without the MPPT control for 11 hours, it generates 6.8 W by having a loss of 3.2 W = 10 W – 6.8 W. However, after passing MPPT control battery, the power output becomes 9.25 W by only having a 0.75 W loss.

In comparison by using a tracker method which follows the same 11 hours test period from 07.00 – 17.00 (Indonesian Western Time), it can be seen that the output voltage varies and that it generates a higher power of 9.4 W with only a 0.6 W loss compared to 6.8 W using the static method. A 2.6 W difference can be observed between them.

3.2 IoT with ESP8266 Module and Thingspeak Web Test

ESP8266 Module automatically uploads data to the web *(http://thingspeak.com)* periodically. In the following Fig. 8 is a program to connect the WiFi network to ESP8266 to be uploaded to thingspeak web.

```
// -------------------------- ESP8266 --------------------------------

String apiKey = "ERXMMSGLK352QQSN"; //apiKey dari Thingspeak
const char* ssid = "hudannn";        //Nama WIFI (Hotspot Android)

const char* password = "hudan2911"; //Pasword WIFI (Hotspot Android)

const char* server = "api.thingsspeak.com"; //Alamat WEB Thingspeak

// Koneksi Pin 2 Untuk TX Sebagai Serial USB
// Koneksi Pin 3 Untuk RX Sebagai Serial USB

SoftwareSerial ser(2,3); // RX, TX
```

Figure 8: Program code using ESP8266.

The uploaded data is the voltage value data from the solar panel according to time as seen in Fig. 9 below:

Figure 9: Voltage data uploaded using ESP8266.

4 CONCLUSION

After conducting observation and instrument test, it can be summarized as below:

1. In the solar panel test for 11 hours (07.00 – 17.00 Indonesian Western Time) using the dual-axis solar panel tracker method has obtained the average power output of 9.4 W before passing through the MPPT control battery and 10.6 W after passing through the MPPT control battery which matches the maximum power on the solar panel of 10 W_p.

2. In the solar panel test for 11 hours (07.00 – 17.00 Indonesian Western Time) using the static solar panel method has obtained the average power output of 6.8 W before passing through the MPPT control battery and 9.25 W after passing through the MPPT control battery which is close to the maximum power on the solar panel of 10 W_p.

3. The Solar panel that uses the dual-axis tracker method generates a higher power output of 9.4 W compared to 6.8 W generated by static method which gives a difference of 2.6 W. This is due to the static solar panel method not always perpendicular to the sun, this problem could be solved using the dual-axis tracker solar panel to ensure the solar panel always perpendicular to the sun.

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Data Panel Modelling with Fixed Effect Model (FEM) Approach to Analyze the Influencing Factors of DHF in Pasuruan Regency

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Abstract: Dengue Hemorrhagic Fever (DHF) is one of the endemic diseases caused by the bites of Aedes mosquitoes which are infected with the dengue virus. This disease can cause death. The DHF mortality rate in Pasuruan Regency is high (above 1% per year) in the last four years. Therefore, this study aimed to find a model that can explain the influencing factors of DHF incidence. The variables used were the number of DHF patients(Y), waste volume(X_1), rainy days(X_2), health facilities(X_3), temperature(X_4), number of high-educated population(X_5), population density(X_6), and rainfall(X_7). The data used were ranging from 2015 to 2018 and obtained from several agencies in Pasuruan Regency. In this study, the method used was the Panel Data Regression with Fixed Effect Model approach. The results of the model showed R^2: 0.804 meaning that the seven variables were able to explain the effect on the incidence of DHF by 80.4% while the remaining 19.6% was influenced by other unknown variables. Of the seven predictor variables, there are six variables that have a significant effect consist of Waste Volume, Health Facilities, Temperature, Number of High-Educated Population, Population Density, and Rainfall. Henceforth, future DHF prevention and control policies can be more emphasized on these factors.

1 INTRODUCTION

Dengue hemorrhagic fever (DHF) is a disease caused by the dengue virus and is transmitted by Aedes aegypti and Aedes albopictus mosquitos. Both types of mosquitoes are found in all corners of Indonesia, except in places with altitudes above 1000 masl (meters above sea level) (Arsin, 2013). The symptoms patients is a high fever for 2-7 days (38-400°C). At the acute level, this disease can cause death. Besides that, DHF can appear throughout the year and can affect all age groups (Kemenkes, 2017).

Indonesia is the country which has the highest DHF cases in Southeast Asia (Kemenkes, 2010). In the last five years, the highest number of dengue cases was occurred in 2016 reaching up to 204,171 cases with 1,598 deaths. The number of dengue cases in 2016 increased by 57.5% compared to the number of dengue cases in 2015 which was 129,650 cases. The number of DHF deaths in 2016 also worsens by 49.2% compared to the number of deaths in 2015 which was only 1,071 people. It was also reported that the Incident Rate (IR) in 2015 increased from 50.75 to 78.85 per 100,000 population. However, the Case Fatality Rate (CFR) has decreased from 0.83% in 2015 to 0.78% in 2016. DHF has spread in 34 provinces and 463 districts/cities in Indonesia (Kemenkes, 2017).

Pasuruan Regency is one of the regions in East Java where its DHF mortality rate is above 1% in this past four years. Since 2015, DHF is determined as an Extraordinary Situation and as a result, the efforts to control DHF were carried out intensively. Based on the data released by the Public Health Office of Pasuruan Regency, the number of DHF cases in 2015 was 686 cases with 28 deaths whereas, in 2016, the number of DHF cases increased by 11% to 764 cases with a total death of 27 people. In 2017, the number of DHF cases decreased by 59% to 317 cases with 13 deaths and continued to decline by 38% with four deaths in 2018. The Incident Rate (IR) of DHF in 2015 was 43.31 per a 100,000 population while the Case Fatality Rate (CFR) was 4.1%. In 2016, the IR increased to 48.23 per a 100,000 population while the CFR dropped to 3.5%. On the other hand, in 2017, the IR decreased to 19.75 per 100,000 population while the CFR increased to 4.1%. In 2018, the IR was 11.90 per 100,000 population while the CFR was 2.1%. Based on the above data, the mortality/Case Fatality Rate of DHF in Pasuruan for the past four

years is included in the high category (CFR ¿ 1%) (Kemenkes, 2017).

The spread of DHF in Indonesia is influenced by many factors such as climate, community behaviour, environment, as well as demographic and socioeconomic conditions (Arsin, 2013). The climate factors include temperature, rainfall, rainy days, humidity, and wind speed; behavioural factor is basically a person's response towards stimuli that is related to illness and disease including knowledge, actions, and beliefs associated with DHF, availability of health resources, adequate and affordability of health facilities, community support, as well as the concern from government and health workers; environmental factors are the number of places or containers of DHF vector proliferation; demographic factors consist of the population density and population mobility; socio-economic factors are the level of education, employment, and the number of family members. Of the factors mentioned above, knowing which of the factors that have a significant effect on DHF is very important so that future efforts to prevent and control DHF can be done more effectively and efficiently.

Modelling is a method that can be used to determine the factors that have a significant effect on DHF in Pasuruan Regency. This study aimed to find a model that is able to explain the influencing factors of DHF in 21 sub-districts of Pasuruan within the period of 2015 to 2018. Different regional characteristics in each sub-district are thought to influence the incidence of DHF. By that, this study used Panel Data structure. There has never been a research which examined the factors of DHF in Pasuruan Regency so that the results of this modelling are expected to be used as early warnings or basis for the formulation of strategic policies to prevent and eradicate DHF in the future.

Several studies related to the analysis of DHF have been done before. Research conducted by (Ariani, 2018) used the Negative Binomial regression model to produce variables that significantly influence DHF, namely population density, number of health workers and rainfall. Subsequent research by (Rustiani, 2017) using multiple linear regression resulted in R^2 values of 67 percent, significant variables included population density, rainfall and larva free index. Research conducted by (Rasmanto, 2016) using Linear Regression resulted in R^2 values of 24.1 percent, variables that had a significant effect consisted of air temperature and relative humidity. The study by (Hasirun, 2016) used a Spatial regression model with spatial error resulting in R^2 values of 43.34 percent, significant variables covering rainfall, health facilities, the percentage of PHBS houses, and the percentage

of healthy houses. Subsequent research by (Martha, 2015) used panel data regression with a fixed effect model approach resulted in R^2 values of 72,76 percent, significant variables included population density, population mobility, the average age of DHF patients, and the number of DHF patients in the previous time period. Based on these studies we use several variables that have been used previously namely population density, rainfall, rainy days, temperature, and the number of health facilities. Then we add two new variables namely the waste volume and the Number of High-Educated Population.

2 LITERATURE REVIEW

2.1 Panel Data

Panel Data is a collection of data consisting of cross-section data and time series data. Time series data usually includes one individual observed in a certain period of time while cross-section data is obtained from several individuals observed in a certain period of time. Therefore, it can be said that the Panel Data presents larger and more informative data and generates a greater degree of freedom. The general form of Panel Data regression models can be seen in Equation 1 (Hsiao, 2003; I. et al., 2017).

$$\gamma_{it} = \alpha_{it} + \beta' X_{it} + \varepsilon_{it} \qquad (1)$$

γ_{it}	:	Response variable of the i-individual and t-time period.
α_{it}	:	Constant value/interception of i-individual and t-time period
β'	:	$(\beta_1, \beta_2, \ldots, \beta_\kappa)$ Regression or slope coefficient variable of k-predictor
X_{it}	:	The predictor variable value of the i-individual and t-time period
ε_{it}	:	The error of i-individual and t-time period
i	:	$1,2,\ldots N$ number of individuals
t	:	$1,2,\ldots T$ time periods

2.2 Estimation of Panel Data Regression Model

In making parameter estimation, the model depends on the assumptions about intercepts and slope coefficients. Using Panel Data allows different intercepts and slope coefficients to occur in each individual and each time period. In this concept, there are three approaches that can be used, namely CEM (*Common Effect Models*), FEM (*Fixed Effect Model*) and REM (*Random Effect Models*) (Widarjono, 2013; I. et al., 2017)

2.2.1 CEM (Common Effect Models)

The approach with CEM model assumes that intercepts and slope coefficients have the same value for all individuals at all time periods. In other words, this model ignores individual dimensions and time. The equation of CEM model is illustrated in this following Equation 2.

$$\gamma_{it} = \alpha + \beta' X_{it} + \varepsilon_{it} \tag{2}$$

2.2.2 FEM (Fixed Effect Model)

This approach believes that differences in characteristics between individuals are represented in the intercepts. Thus, intercepts for each individual will be different but the slope coefficients remain constant at all time periods. Equation 3 below presents the equation of FEM model.

$$\gamma_{it} = \alpha_i + \beta' X_{it} + \varepsilon_{it} \tag{3}$$

2.2.3 REM (Random Effect Models)

In REM, the differences in individual characteristics are accommodated by error terms. Error terms may correlate between individuals and between times. For more details, the equation of REM model is formulated in Equation 4.

$$\gamma_{it} = \alpha + \beta' X_{it} + W_{it} \tag{4}$$

α is the mean of intercept from error terms cross section and time series. W_{it} : $\mu_i + \varepsilon_{it}$ where μ_i is the random error cross section deviation, which explains the differences between individuals and each other.

2.3 Selection of Panel Data Regression Model

In choosing the model that will be used to manage Panel Data, several tests need to be done, namely:

2.3.1 Chow Test

Chow Test is used to choose a better model between CEM and FEM (Greene, 2000). The hypothesis in the Chow Test can be written as follows.

$H_0 : \alpha_1 = \alpha_2 = \cdots = \alpha_n = 0$ (CEM)

$H_1 : minimum of one \alpha_i \neq 0$ (FEM)

Next, the equation for Chow Test Statistics is:

$$F_{count} \frac{(RRSS - URSS)/(N-1)}{URSS/(nT - n - K)} \tag{5}$$

Description: RRSS: *restricted residual sum of square* CEM URSS: *unrestricted residual sum of square* FEM n: number of individuals(*cross section*) T: time periods (*Time Series*) If the value of $F_c ount \geq F_t able = F_{(n-1,nT-n-K)}$ or $p - value \leq 0.05$, then hypothesis H_0 is rejected. This means that FEM is a better model than CEM.

2.3.2 Hausman Test

Hausman test is used to choose a better model between FEM and REM (Baltagi, 2010; Sutikno et al., 2017). The hypothesis in the Hausman Test is as follows.

$H_0 : correlation(\mu_i, X_{it}) = 0(REM)$

$H_1 : correlation(\mu_i, C_{it}) \neq 0(FEM)$

This following equation 6 displays the Hausman Test Statistics.

$$\begin{aligned} W = &(\hat{\beta}_{FEM} - \hat{\beta}_{REM})' [var(\hat{\beta}_{FEM} - \hat{\beta}_{REM})]^{-1} \\ &(\hat{\beta}_{FEM} - \hat{\beta}_{REM}) \end{aligned} \tag{6}$$

If the value of $W \geq \chi^2_{table} = \chi^2_{(a,K)}$ or $p - value \leq 0.05$, then hypothesis H_0 rejected, meaning that FEM is a better model than REM. But if the value of $W < \chi^2_{table} = \chi^2_{(a,K)}$ or $p - value > 0.05$, then hypothesis H_0, is accepted. This points out that the best model between FEM and REM is REM.

2.3.3 Lagrange Multiplier Test

LM Test is used to choose a better model between CEM and REM. LM Test does not need to be done if FEM is found to be the best in the Chow Test and Hausman Test. This test is only done when the best model found in the Chow Test is FEM whereas, in the Hausman Test, the best model is REM. These are the hypothesis in the LM test:

$H_0 : \sigma_\varepsilon^2 = 0(CEM)$.

$H_1 : \sigma_\varepsilon^2 \neq 0(REM)$.

In details, the statistics of LM Test can be understood through Equation 7 (Widarjono, 2013) below.

$$LM = \frac{nT}{2(T-1)} \left(\frac{\Sigma_{i=1}^n (T\hat{e}_i)^2}{\Sigma_{i=1}^n \Sigma_{t=1}^T \hat{e}_{it}^2} - 1 \right)^2 \tag{7}$$

Description:

n:number of individuals

T:time period

$\hat{e}$:*error* on CEM

Hypothesis H_0 is rejected if the value of $LM \geq \chi^2_{table} = \chi^2_{(a,K)}$ or $p-value \leq 0.05$. This indicates that REM is a better model than CEM. Otherwise, if the value of $LM < \chi^2_{table} = \chi^2_{(a,K))}$ or $p-value > 0.05$, then the hypothesis H_0 is accepted which means that the correct model between the two models is CEM.

2.3.4 Classical Assumptions Test

To get the estimator of the parameter model in the CEM and FEM approach, Ordinary Least Square (OLS) method is used. The classical assumption is done to get the best OLS estimator known as BLUE (Best Linear Unbiased Estimator). Classical assumption tests include 1. Multicollinearity Test, 2. Normality Test, 3. Heteroscedasticity Test, and 4. Autocorrelation Test. From all the four tests, only test 3 and 4 that must be met to obtain the best estimator (BLUE) (Gujarati, 2004).

2.3.5 Multicollinearity Test

One of the assumptions used in OLS is the absence of a strong relationship between predictor variables. The presence of multicollinearity makes the model to have a large variant (Widarjono, 2013)). However, multicollinearity can still produce BLUE estimators. One way to detect multicollinearity is to use the sample of correlation coefficient (Gujarati, 2004; Sutikno et al., 2017). The sample of correlation coefficient is shown in the next Equation 8.

$$r_{12} = \tag{8}$$

$$\frac{NT \sum_{i=1}^{N}\sum_{t=1}^{T} X_{1_{it}} X_{2_{it}} - \left(\sum_{i=1}^{N}\sum_{t=1}^{T} X_{1_{it}}\right)\left(\sum_{i=1}^{N}\sum_{t=1}^{T} X_{2_{it}}\right)}{\sqrt{\left[NT \sum_{i=1}^{N}\sum_{t=1}^{T} X_{1_{it}}{}^2 \left(\sum_{i=1}^{N}\sum_{t=1}^{T} X_{1_{it}}\right)^2\right]\left[NT \sum_{i=1}^{N}\sum_{t=1}^{T} X_{2_{it}}{}^2 \left(\sum_{i=1}^{N}\sum_{t=1}^{T} X_{2_{it}}\right)^2\right]}}$$

If the correlation coefficient is > 0.85, then it is suspected that multicollinearity occurred in the model. Conversely, if the correlation coefficient is ≤ 0.85, it is assumed that the model did not contain multicollinearity (Widarjono, 2013).

2.3.6 Normality Test

This assumption test is optional, but it is better if included in an effort to get a good OLS estimator. The hypotheses in this test are:

$H_0 : E(\varepsilon_{it}) = 0 (error,$ distributed normally$)$

$H_1 : E(\varepsilon_{it}) = 0 (error,$ not distributed normally$)$

The Normality Test Statistics adopted the Jarque-Bera formula as we can see in this following Equation 9 (Gujarati, 2004)).

$$JB = NT\left(\frac{S_k^2}{6} + \frac{(K_r - 3)^2}{24}\right) \tag{9}$$

Description,

S_k: slope(*Skewness*)

K_r: height(*kurtosis*)

If the value of $JB < \chi^2_{tabel} = \chi^2_{(a,2)}$ or $p-value > 0.05$, then hypothesis H_0 is accepted. This clarifies that the error is normally distributed.

2.3.7 Heteroscedasticity Test

The assumption that the error variant has a constant (homoscedastic) nature is very important to produce the best OLS estimator. The Heteroscedasticity Test hypothesis is:

H_0 *error* does not contain heteroscedasticity

H_1 *error* contain heteroscedasticity

Glejser Method is used for the Heteroscedasticity Test Statistics, which is by regressing the absolute value of the *error* with its independent variable (Widarjono, 2013). If β_1 is not significant in t-test or the *Prob* value is > 0.05, then hypothesis H_0 is accepted. This explains that the *error* did not contain heteroscedasticity or was constant.

2.3.8 Autocorrelation Test

This assumption test is used to see if there is no serial correlation on the error. This test is crucial to get a BLUE OLS estimator. One way to detect autocorrelation is to use a Durbin Watson test method. These are the hypothesis for the autocorrelation test in this study:

$H_0 : Cov(\varepsilon_{it}, \varepsilon_{i,t-1}) = 0$ (no autocorrelation)

$H_1 : Cov(\varepsilon_{it}, \varepsilon_{i,t-1}) \neq 0$ (there is autocorrelation)

The statistics of the Durbin Watson autocorrelation test can be seen in equation 10 (Gujarati and P, 2010).

$$DW = \frac{\sum_{i=1}^{N}\sum_{t=2}^{2}(\varepsilon_{it} - \varepsilon_{i,t-1})^2}{\sum_{i=1}^{N}\sum_{t=2}^{2}\varepsilon_{it}^2} \tag{10}$$

Figure 1 below presents the critical value in the autocorrelation test:

n < dw <d_L	: There is a positive autocorrelation
d_L≤ dw ≤d_u	: There is no decision
d_u≤dw≤4-d_u	: There is no positive/negative: autocorrelation
4-d_u≤dw≤4-d_L	: There is no decision
4-d_L≤dw≤4	: There is a negative autocorrelation

Figure 1: Autocorrelation critical value of durbin watson justified.

2.3.9 Significance Test of Regression Parameters

The parameter significance test is used to find out the level of influence that the predictor variable has on the response variable. There are two tests carried out, namely simultaneous test and partial test.

2.3.10 Simultaneous Test

A simultaneous test is applied to determine the effect of predictor variables on the response variable together. The simultaneous test hypothesis is as follows.

$H_0 : \beta_1 = \beta_2 = \cdots = \beta_k = 0$ (all predictor variables have no effect on the response variable)

H_1 :*minimum of one* $\beta_k \neq 0$ (there is at least one predictor variable that affects the response variable)

$$F_{count} = \frac{R^2/(n+K-1)}{(1-R^2)/(nT-n-K)} \quad (11)$$

R2 is the coefficient of determination. If the value of $F_{count} > F_{table} = F_{(a,n+K-1,nT-n-K)}$ or $p-value \leq$ 0.05, then hypothesis H_0, is rejected, meaning that in the model there is at least one predictor variable which has a significant effect on the response variable.

2.3.11 Partial Test

A partial test is used to determine the effect of each predictor variable on the response variable. The partial test hypothesis is:

$H_0 : \beta_k = 0$ (*k*-predictor variable does not significantly influence the response variable)

$H_1 : \beta_k \neq 0$ (*k*-predictor variable significantly influences the response variable)

The statistics of the partial test is formulated in Equation 12.

$$t_{count} = \frac{\beta_k}{se(\beta_k)} \quad (12)$$

If the value of $t_{count} > t_{table} = t_{(a/2,nT-n-K)}$ or $p-value \leq 0.05$, then hypothesis H_0 is rejected. This describes that k-predictor variable has a significant effect on the response variable.

3 LITERATURE REVIEW

In this research, the data used are secondary data obtained from several agencies in Pasuruan Regency including Department of Health, Department of Population and Civil Registration, Department of Environment, Department of Irrigation, and Meteorological, Climatological, and Geophysical Agency. The scope of the research is limited to 21 sub-districts in Pasuruan Regency which are at altitudes below 1000 masl in a span of four years (2015-2018). The steps of analysis can be seen in Figure 2.

Figure 2: Steps of analysis.
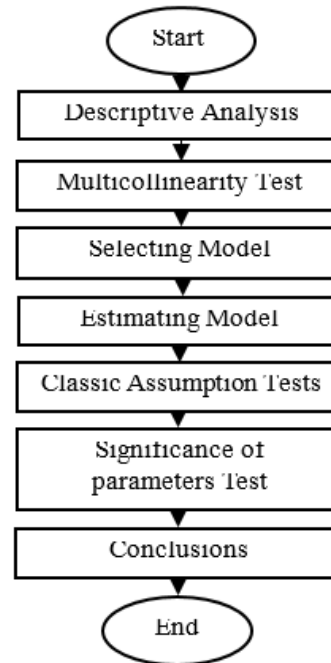
Based on Figure 2, The steps of analysis in this study can be described as follows:

1. Conducting a descriptive analysis of the variables used in the study.

2. Performing multicollinearity test on all predictor variables (X) using the sample correlation coefficient.

3. Selecting the Panel Data regression model by conducting the Chow Test, Hausman Test, and Lagrange Multiplier Test

4. Estimating the Panel Data regression model with the approach chosen in step 3.

5. Carrying classic assumption tests which include normality test, Heteroscedasticity test, and autocorrelation test.

6. Testing the significance of the regression parameters through Simultaneous Test (f-test) and Partial Test (t-test).

7. Making conclusions and suggestions.

The variables which are suspected of having an effect on DHF are presented in Figure 3.

Var.	Description	Unit
Y	Number of DHF patients	people
X_1	Volume of untransported waste	dam^3
X_2	Number of rainy days	day
X_3	Number of health facility	unit
X_4	Temperature	°C
X_5	High educated people	people per a 10.000 population
X_6	Population density	people/ km^2
X_7	Rainfall	mm

Figure 3: Variables assumed to influence dhf.

4 RESULTS AND DISCUSSION

4.1 Descriptive Analysis

The first step in this research is to do a descriptive analysis that is useful to know the characteristics of each research variable. Descriptive analysis used includes average, maximum, and minimum values. The results of the descriptive analysis are shown in Figure 4.

Variable	Mean	Max.	Min.
Y	23	115	0
X_1	54.26	95.12	11.04
X_2	110	161	71
X_3	53	135	13
X_4	26.32	27.23	22.96
X_5	253	712	75
X_6	1,631	2,954	325
X_7	1,640.41	3,309	707

Figure 4: Descriptive statistics of research variables.

Based on Figure 4, the average number of DHF patients (Y) in 21 sub-districts of Pasuruan in this past four years (2015-2018) is 23 people. Lumbang and Puspo sub-districts have the least number of patients (none) while Bangil has the highest number of patients (115 people). The average waste (X_1) that is not transported is 54.26 where Kraton becomes the sub-district that has the most non-transported waste reaching up to 95.12 dam^3. In contrast, Bangil has the least non-transported waste which is only 11.04 dam^3. The range of maximum and minimum values of the waste volume that is not transported is very

high. This indicates that the waste services are still focused on certain sub-districts or in other words, not comprehensive in all sub-districts. The average number of rainy days (X_2) is 110 where Purwosari has the most number of rainy days reaching up to 161 days of rain in a year. Meanwhile, the sub-district with the least number of rainy days is Gondangwetan and Winongan, 71 days a year. On the other hand, the average number of health facilities (X_3) is 53. The highest number of health facilities is owned by Pandaan sub-district (135 units) while the least health facilities are owned by Puspo (13 units). The average temperature (X_6) is 26.32°C. It is reported that the highest temperature occurs in Beji reaching up to 27.23°C while the lowest temperature is in Purwodadi reaching up to 22.96°C. The average number of educated population (X_5) is 253 where the area with the highest number of educated people is Bangil (712 people per a 10,000 population) while the lowest number of educated people is Lekok (75 people per a 10,000 population). The average population density (X_6) is 1,631. The most densely populated area is Pohjentrek with a population density of 2,954 people/km^2 whereas the lowest population density can be found in Lumbang, only 325 people/km^2. The range between the maximum and minimum population density is very big. This means that the population distribution is uneven or concentrated in certain sub-districts. Last but not least, the average value of Rainfall (X_7) is 1,640.41 where the area with the highest rainfall intensity is Purwosari reaching up to 3,309 mm in a year. Meanwhile, the area with the lowest rainfall intensity is Winongan, only 707 mm in a year.

4.2 Multicollinearity Test

Multicollinearity test is applied to see the correlation of each predictor variable used in the regression model. The existence of perfect multicollinearity can cause many predictor variables do not have a significant effect although the coefficient of determination is high. To detect multicollinearity, the correlation coefficient method is used (r). The results of multicollinearity test are presented in Figure 5.

	X_1	X_2	X_3	X_4	X_5	X_6	X_7
X_1		0.01	-0.09	0.09	-0.42	-0.05	0.01
X_2	0.01		0.23	-0.34	0.16	-0.08	0.84
X_3	-0.09	0.23		0.31	0.76	0.54	0.27
X_4	0.09	-0.34	0.31		0.20	0.55	-0.46
X_5	-0.42	0.16	0.76	0.20		0.60	0.27
X_6	-0.05	-0.08	0.54	0.55	0.60		-0.06
X_7	0.01	0.84	0.27	-0.46	0.27	-0.06	

Figure 5: Correlation coefficient.

From Table 4, the value of r in each column is < 0.85 so that all predictor variables are free from multicollinearity problems.

4.3 Selection of Panel Data Regression Model

To choose a model that fits the research data, researchers can conduct the Chow Test, Hausman Test, and Lagrange Multiplier Test. Chow Test is used to determine whether or not the differences between the characteristics of the districts are seen from the intercept on each regression model. From the Chow Test, it is obtained that $F_{count} = 5.618 > F_{0.05(20;56)} = 1.76$ dan $p - value = 0.0000 \leq 0.05$ with a level of reliability by 95%. This means that hypothesis H0 rejected, there are differences in the regional characteristics presented in the DHF Panel Data regression equation model of Pasuruan Regency so that the appropriate model must be FEM.

Moreover, the Hausman Test is performed to test whether or not there is a correlation between the error component in the model and its predictor variable. The Hausman Test results showed that $W_{count} = 79.223 > \chi^2_{(005;7)} = 14.07$ and $p - value = 0.0000 \leq 0.05$ with a level of reliability by 95%. It can be said that the hypothesis H0 is rejected. This points out that there is no correlation between the error component predictor variables on Pasuruan DHF Panel Data regression equation. Therefore, the corresponding model is FEM.

Because of the two tests above refer FEM as the appropriate model, it is not necessary to do the Lagrange Multiplier Test.

4.4 Model Estimation with FEM Approach

Here is the estimation of Panel Data regression model formed by using FEM approach.

$$
\begin{aligned}
\hat{\gamma}_{it} = &\hat{\alpha} + 1.785X_{1_{it}} + 0.186X_{2_{it}} + 1.470X_{3_{it}} \\
&+ 32.267X_{4_{it}} + 3.186X_{5_{it}} - 0.177X_{6_{it}} \quad (13) \\
&- 0.014X_{7_{it}}
\end{aligned}
$$

$\hat{\alpha}_i$ is the intercept that has different values in each region. This value will distinguish the prediction of the number of DHF patients in between sub-districts. Because each region has different characteristics, the characteristic differences are represented by an intercept variable in the *fixed effect* Panel Data regression model. The intercept value for each district is shown in Figure 6.

Equation 13 shows that the increase in variable Y is influenced by the increase in variable X_1, X_2, X_3, X_4, and X_5. Meanwhile, the increase in variable X_6 and X_7 will affect the decrease in variable Y.

Index *(i)*	District	Intercept ($\hat{\alpha}_i$)
1	Kejayan	-1,335.551
2	Wonorejo	-1,276.405
3	Gempol	-1,868.230
4	Beji	-1,910.659
5	Bangil	-2,840.675
6	Rembang	-1,142.526
7	Kraton	-1,273.838
8	Pohjentrek	-1,364.992
9	Gondangwetan	-1,683.950
10	Rejoso	-1,537.214
11	Winongan	-1,322.926
12	Grati	-1,599.886
13	Lekok	-925.545
14	Nguling	-1,184.983
15	Lumbang	-1,096.910
16	Pasrepan	-1,132.060
17	Purwosari	-1,734.530
18	Sukorejo	-1,662.592
19	Pandaan	-2,404.691
20	Purwodadi	-1,537.738
21	Puspo	-1,027.002

Figure 6: Estimated intercept value of each region.

4.5 Classical Assumptions Test

After the estimation of the Panel Data regression model is obtained, the next step is to carry out the classical assumption tests which include the Normality Test, Heteroscedasticity Test, and Autocorrelation Test.

The Normality Test is done by using the Jarque-Bera formula. From this test, it is obtained $JB = 0.372 < \chi^2_{(005;2)} = 5.991$ and $p - value = 0.83 > 0.05$ with a level of reliability by 95%. By that, hypothesis H_0 is accepted meaning that the error is normally distributed. Then, a Heteroscedasticity Test is performed to see whether the error variant has a constant nature or not. Glejser Test is used for the Heteroscedasticity Test and the values obtained can be seen in Figure 7 below.

Variable	t_{count}	*p-value*
X_1	-1.355	0.181
X_2	0.387	0.700
X_3	0.671	0.505
X_4	-0.811	0.421
X_5	-0.015	0.989
X_6	-1.990	0.052
X_7	0.345	0.731

Figure 7: Simultaneous test result.

Based on Figure 7, the p-value for each predictor variable is > 0.05 making the hypothesis H_0 accepted. This explains that the *error* in the model does not contain heteroscedasticity or is constant.

The last classical assumption test is the Autocorrelation Test that is done by using the Durbin Watson test method. It is obtained that $DW = 2.056$.

The value is in the area of Hypothesis H_0 which is $d_u = 1.8291 \leq DW = 2.101 \leq 4 - d_u = 2.1709$, meaning that the *error* in the model is free from the problem of autocorrelation.

4.6 Significance of Parameters Test

After the model has passed all classical assumption tests, the next step is to do a simultaneous test and partial test to determine the effect of predictor variables on the response variable both simultaneously and partially. The simultaneous test results are presented in Figure 8.

R-squared	0.8044
S.E. of regression	11.9153
Sum squared resid	7950.5320
F-statistic	8.5279
Prob(F-statistic)	0.0000

Figure 8: Simultaneous test result.

As shown in Figure 8, the value of $F_{count} = 8.528 > F_{(0.05;27;56)} = 1.686$ and $p - value = 0.000 < 0.05$ and $R^2 = 0.804$ with a level of reliability by 95%. This clarifies that hypothesis H0 is rejected, the predictor variable simultaneously affects the response variable. The value of $R^2 = 0.804$ shows that the seven predictor variables can affect the number of DHF patients in Pasuruan by 80.4% while the remaining 19.6% are influenced by other variables outside the model.

After that, a partial test is carried out. The results of the partial test are shown in Figure 9.

Variable	t_{count}	p-value
X1	2.271	0.027
X2	1.487	0.143
X3	2.730	0.009
X4	3.076	0.003
X5	2.732	0.008
X6	-2.463	0.017
X7	-2.237	0.029

Figure 9: Partial test results.

As presented in Figure 9 with a reliability level of 95%, there are six variables that have a significant effect on the response variable ($p - value < 0.05$), namely variable X_1, X_3, X_4, X_5, X_6, and X_7 while the variable X_2 does not have a significant influence on the response variable ($p - value > 0.05$).

5 CONCLUSION AND SUGGESTION

Based on the results of the analysis, it can be concluded that the Panel Data regression model with Fixed Effect Model approach can explain the effect of predictor variables on the response variable. Therefore, the model equation is:

$$\hat{\gamma}_{it} = \hat{\alpha} + 1.785X_{1_{it}} + 0.186X_{2_{it}} + 1.470X_{3_{it}} \\ + 32.267X_{4_{it}} + 3.186X_{5_{it}} - 0.177X_{6_{it}} \\ - 0.014X_{7_{it}} \quad (14)$$

From the Equation 14 above, the value of $R^2 = 0.804$ shows that the percentage of all seven predictor variables able to affect the number of DHF patients in Pasuruan by 80.4% while the other 19.6% are influenced by other variables outside this study. Of the seven predictor variables, there are six variables that significantly influence the increase in the number of DHF patients such as waste volume, number of health facilities, temperature, high-educated population, population density, and rainfall.

Last but not least, the Department of Health of Pasuruan Regency is suggested to plan the programs and activities to control and eradicate future DHF by focusing on the variables that have a significant effect on DHF patients.

In the future the model can be developed into an application that can be utilized by government or interested organizations.

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Social Media as the New Public Sphere: An Example of Turkey

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Keywords: Social media, Public sphere, Communication, networking.

Abstract: Social media, whose individual and social usage is increasing day by day, is also increasing its presence in our lives as the most important communication medium. Social media is a communication network in which the user publishes and circulates the content he / she produces. Today, many individuals and institutions are actively using social media. This makes immediate access easier to any website; contents, articles, news, thoughts, daily events, photos can be seen through social media, and anyone can reflect their views within a social network. The word that best describes social media, which is frequently spoken by today's people, is "sharing". The main issue that will be discussed in this study is whether social media is the new public space or not. The public sphere is also a common area where ideas and opinions are shared on an individual and social scale. In this sense, the study includes a theoretical analysis and discussion while focusing on the concepts of social media and public sphere.

1 INTRODUCTION

When we start to mention the concept of social media, we actually talk about social networks shaped through internet technologies. These social networks tell us the ways in which different users can enter the internet network from different places and in different time periods by means of a computer or a computer equipped tool. Thus, social networks develop as communication platforms, expanding on a global scale and causing new network societies to develop and spread. These network connections growing over the internet are formed through 'protocols', that is, agreements between mutual users and consequently they turn into networks (Ryan, 2010).

These communication platforms, which we can define and name as social media or social networking sites, allow users connecting to these networks to create profiles and personal web pages and to develop an online social network and to provide individual information about themselves. These platforms also mediate the formation of 'virtual friendships" and thus the emergence of new forms of socialization. While social network is given to these web sites, these web sites have the characteristics of web sites where daily relationships and communication forms are shaped and are called social networks (Tiryaki, 2015).

Social media or social networking sites, blogs, sharing platforms, forums or chat sites allow partici-

pants to reach different requests and achieve satisfaction. Users can share their opinions in these areas as well as reaching different opinions and making comments. They can share and distribute photos, videos, audio files or text files (Vural and Bat, 2010).

2 REVIEW

Social networks, which started to enter our lives especially in the 2000s, are increasing their importance with both the number of users and the capacity to address different areas. Today, when social network is mentioned, the following social networks, especially Facebook, come to mind.

Facebook, Twitter, Instagram, Linkedin, Google+(Plus), Pinterest, Reddit, Digg, Github, Stumble Upon, Snapchat, Tumblr ve Siledeshare

When we look at the number of users, we can see which social media site is widely used on a global scale. According to 2019 figures, the number of Internet users in the world is 2.5 billion. This figure also shows us the number of active internet users on a global scale. Another point this figure tells us is that on the global scale, one out of every three people is an internet user.

While the number of internet users above increases each day, the power and importance of the internet increase and cause many different areas to be

233

transferred to the internet. The Internet is beginning to play an important role in the destiny of humanity from today to tomorrow. Social media users, which naturally form a subgroup of Internet users, constitute a large group of 1.8 billion people on a global scale. The remaining mass of internet users has the potential to become a new social network user for tomorrow. Thus, the number of internet users increasing day by day shows us the potential level of new social media users, which is also increasing.

According to 2019 figures, the distribution of social media users to different social media platforms is as follows;

Facebook: 1,35 billion

QQ (Tencent): 829 million

Qzone: 645 million

Whatsapp: 600 million

Wechat: 436 million

LinkedIn: 332 million

Google+: 300 million

Twitter: 284 million

Tumblr (230 million)

Weibo: 156 million

The numbers given in the above lines show us the size of social media use on a global scale.

The development of internet technology, especially in the last 10 years, lies primarily behind this development level of social media platforms. Especially in the development process of web 3 technology from web 2 technology, internet users have turned from being passive users into active, producing and sharing users.

In another perspective, web 2 internet technology is like a continuation of a revolution in 1984 when Apple released Macintosh computers. (-: 1995: 143-145) Both developments have enabled personalization in terms of information and communication technologies, while paving the way for personal use, they have also created the infrastructure for increasing personal creativity and sharing all the outputs of this process in the public sphere thanks to these technologies.

According to 2019 data, the Internet access rate by population in Turkey is 45%. This shows us that 35 million people have access to the internet and that they are in a relationship with the internet. It is also possible to say that social, economic and daily relations are now shifted to the internet and in many areas the Internet is turned into a sharing platform. Just as the fact that 35 million people interact with the internet is an important indicator, the presence of 36 million Facebook accounts in our country is also an important sign of the process. Of course, this number of 36 million contains some unhealthiness, such as fake accounts, multiple accounts, corporate accounts, and

the accounts that are inactive even though they exist (Ismet, 2019).

The figures of Internet and social media usage for Turkey indicate a similarity with the ones in South America and especially in Brazil. According to population and number of Facebook users, the ranking of countries is as follows;

1 United States 313,847,465 166,029,240

2 India 1,205,073,612 62,713,680

3 Brazil 193,946,886 58,565,700

4 Indonesia 248,645,008 51,096,860

5 Mexico 114,975,406 38,463,860

6 United Kingdom 63,047,162 32,950,400

7 Turkey 79,749,461 32,131,260

8 Philippines 103,775,002 29,890,900

9 France 65,630,692 25,624,760

10 Germany 81,305,856 25,332,440

(https://webtiryaki.com/index.php?topic=121.0)

When we look at the time the users spend on social media, we see the following figures;

The users in Turkey spend an average of 2 hours 32 minutes on Social networks where a user in the United States spends an average of 40 minutes. There has been a significant increase in the use of mobile lines in recent years among the Turkish users who spend about 5 hours a day on the internet, and internet provider companies have been implementing special applications for our country in this process. In social media usage, Facebook ranks first with 93% and Twitter ranks second with 72%. Google and Linkedin social media platforms rank third and fourth (Erkek, 2016).

While Social networks are used by more people every day in the world and Turkey, they have been transformed into a common sharing area where individual or corporate users communicate, establish political, economic and cultural relations. Naturally, this "communication process" raises the following question. "Is social media and therefore the internet a public domain of our age?" "Is the new public sphere social media now?"

The concept of public sphere has emerged and developed as a result of the bourgeoisie and hence the capitalist market relations. Public sphere primarily defines a part of society. Society communicates individually or in groups in this area, exchanging opinions and ideas. The most important feature of the public sphere mentioned here is that it is open to all citizens and everyone can participate equally as a 'citizen' here. (Habermas and Jurgen, 1995) Habermas underlines that there is absolute equality among those who share the public sphere, emphasizing that those who come together in the public sphere are equal parties 'while talking'. In this context, the public sphere

and the public community formed thereon are general and everyone can participate in this debate. (Habermas, 2003) For example, coffeehouses have played a historically important function in the formation of public sphere and 'community' in the development process. (Habermas, 2003) The public sphere is the center of public debate. It also serves as a garden where modern democracies bloom.

Based on the concept of Habermas' Public Sphere, Howard Rheingold is the first name to say that the new public sphere is the Internet. The concept of "The Virtual Community" is the conceptualization of the virtual society. The conceptualization of virtual society implies that virtual spaces are public spaces. Thus, Habermas' concept of 'public sphere' is adapted to the internet and 'virtual spaces'. Conversations and interviews that people perform together as a face-to-face and interpersonal communication take place in electronic environment or virtual world today. The point that is similar in both is that it is independent from economic or political power. (Sayımer, 2008) The equality of the parties in the public sphere mentioned by Habermas takes place at this point.

While social media is turning into a multilateral discussion and sharing environment, it is inevitable that it will become a center where political communication takes place. The public sphere is also an area where the politicians and society meet in a social dimension. In this study, we examined the social media usage of AKP candidate Binali Yıldırım and CHP candidate Ekrem İmamoğlu in terms of June 23 local elections in Istanbul.

3 DISCUSSION

Table 1: Twitter Information of Istanbul Metropolitan Municipality Mayor Candidates Binali Yıldırım and Ekrem İmamoğlu.

	date of participation	Following	Follower
Binali Yıldırım	Mayıs 2016	5	1,9 Mn
Ekrem İmamoğlu	Kasım 2011	487	3,1 Mn

Table 2: Twitter Information of Istanbul Metropolitan Municipality Mayor Candidates Binali Yıldırım and Ekrem İmamoğlu.

Binali Yıldırım	Hour	Comments	Retweets	Likes	Live broadcast	Audience	Photo	Video	Views
	7:53 PM	4,8 B	7,6 B	65,1 B					
	7:52 PM	401	2,1 B	22,8 B					
	7:51 PM	520	3,1 B	31,4 B					
	7:51 PM	4,1 B	6,7 B	115,8 B					
	7:16 PM	1,2 B	2 B	13,5 B	Fxop tv	432,2 B			
	3:09 PM	1,6 B	9,3 B	49,3 B					
	1:52 PM	159	2,2 B	11,9 B				1	150,7 B
	1:43 PM	770	2,3 B	12,8 B					
	1:41 PM	31	776	3,2 B			4		
	1:19 PM	732	5,1 B	27,1 B				1	453,5 B
	12:42 AM	2,6 B	14 B	51,6 B				1	1,1 Mn
	12:22 AM	959	8,5 B	33,2 B				1	643,9 B
TOTAL	12 tweets	17,872	63,676	437,700	1	432,200	4	4	2,348,100

4 CONCLUSIONS

Both candidates actively used social media before the June 23rd Istanbul Metropolitan Mayor Elections. While both candidates used social media to communicate with voters, they presented their elective messages to the masses through these channels. In this process, AKP candidate Binali Yildirim received 17,872 comments, while CHP candidate Ekrem Imamoglu received 21,361 comments. Binali Yıldırım received 63,676 retweets while Ekrem İmamoğlu received 131,800 retweets. Binali Yıldırım's shares received 437,700 likes and İmamoğlu's shares received 1,196,200 likes.

The figures here show us that political communication process through social media is not only limited to sharing, but also a mutual communication process. Politician's shares have been responded by followers with likes and comments. Social media has mediated the emergence of a public debate, feedback and social thought.

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Optimization of Cholera Spreading using Sanitation, Quarantine, Education and Chlorination Control

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Keywords: Cholera Model, Optimal Control, Pontryagin Minimum Principle.

Abstract: Cholera is a contagious and deadly disease that requires an effective prevention and control actions. In this paper, several efforts are made to prevent the cholera spreading by reconstructing the mathematical model and adding control sanitation, treatment consisted of quarantine and education as well as chlorination on to the bacteria. The Pontryagin Minimum Principle is employed to derive the optimal control solution and solved by Runge-Kutta method. The computational results showed that the control was able to minimize the number of individuals infected by cholera with mild symptoms at the final time as many as 2 individuals and individuals infected by cholera with severe symptoms at the final time as many as 7 individuals as well as minimize the number of bacteria concentrations at the final time as much as 517 cell/ml.

1 INTRODUCTION

Cholera is an acute diarrhea infection which is caused by the consumption of food or water contaminated with Vibrio cholerae bacteria (Organization, 2008). These bacteria secrete enterotoxins in the intestinal tract which cause diarrhea accompanied with acute and severe vomiting. Therefore, an individual will lose a lot of body fluids only in several days and get dehydration. This condition can cause death if not handled quickly (Johnson and R, 2006). The spreading process of cholera can occur through the mouth, when Vibrio Cholerae bacteria successfully entered through the mouth and ingested, then these bacteria will be quickly killed when exposed to stomach acid. However, if Vibrio Cholerae bacteria successfully passes the stomach acid, the bacteria will develop in the small intestine (Setiadi, 2014).

About 75% of people infected with Vibrio cholera do not experience any symptoms, even though the bacteria are in their feces for 7-14 days after infected (Organization, 2008), but when there is an infection attack then the diarrhea and vomiting suddenly occur with serious condition as acute attack (Sack et al., 2004). Since 1917, cholera has been known as seven pandemics which spread to Europe. The Vibrio Cholerae bacteria first appeared in Sulawesi, Indonesia and caused a cholera epidemic. Cholera then spread rapidly to other East Asian countries and reached Bangladesh in 1963, India in 1964 and the Soviet Union, Iran and Iraq in 1965-1966 (Setiadi, 2014).

Cholera is rapidly spreading in densely populated areas, poor water sanitation and lack of clean water supply. Therefore, cholera is widely identified in poor and developing countries (Subchan et al., 2019). So that it does not rule out the possibility of cholera spreading in Indonesia, for it is important to conduct research on controlling the spread of cholera in order to minimize cases of the spread of cholera.Effective precautions of controlling for cholera depend on providing adequate environmental health services, such as increasing access to clean water, sanitation, availability of cholera vaccines, quarantine and treatment (Organization, 2008).

The mathematical model related to cholera spreading with its control had been many conducted in the previous research. The research about cholera disease had been examined by Bakhtiar (Bakhtiar, 2015). He studied optimum control approach of contagious disease with the control variable was the role of education and chlorination. After that, Lemos-Paião et al (Lemos-Paião et al., 2016), concerned on cholera spreading model by giving control in the form of treatment done to the population of quarantined people. The population infected which was given a treatment would be quarantined so that it obtained the quarantined population. In addition, Subchan et al

(Subchan et al., 2019). reasearched cholera disease spreading model by giving the optimal control in the forms of medication and intervention through the improvement of sanitation, education and quarantine.

In this research, the problem was reconstructed by the mathematical model of the spread of cholera with the control variable in the form of chlorination in bacteria, improved sanitation, education and quarantine. Control was given to reduce the number of individuals infected with cholera with mild and severe symptoms and reduce proliferation of the Vibrio Cholerae bacteria.

2 MATHEMATICAL MODEL

In this research, the type of mathematical model of cholera spreading used was the type of SEIQR which was reconstructed by adding chlorine to the bacteria (u_4). Other optimal controls were based on the research (Subchan et al., 2019), which are improvement of sanitation (u_1), control treatment in the form of medication during quarantine for infected individuals (u_2) and education for vulnerable individuals (u_3).

Figure 1: SEIQR Compartment Diagram the Spread of Cholera.

The spread of water-based diseases, especially cholera, can be reduced by the use of chlorine which is believed to be effective in reducing bacteria. In addition, sanitation improvements are carried out to reduce the level of absorption of bacteria caused by infected individuals. Control treatment is also given to people with cholera through quarantine to accelerate healing of infected individuals and prevent spread to vulnerable individuals. In addition, education is also provided to individuals who are vulnerable to cholera as an effort to prevent the outbreak of the disease.

The interpretation of the mathematical model of cholera spreading by giving optimal control to the compartment diagram as shown in the Fig. 1. The

mathematical models of the spread of cholera are as follows.

$$\frac{ds}{dt} = \Lambda + \nu R + \varepsilon E - \mu S - u_a \psi - (1 - u_1)\frac{\beta B}{\kappa + B}S \quad (1)$$

$$\frac{dE}{dt} = ua\psi S - \varepsilon E - \mu E - (1 - u_1)\gamma E \quad (2)$$

$$\frac{dI_A}{dt} = (1 - u_1)p\frac{\beta B}{\kappa + B}S + (1 - u_1)p\gamma E - \mu I_A - \alpha_2 I_A \quad (3)$$

$$\frac{dI_s}{dt} = \{(1 - u_1)(1 - p)\frac{\beta B}{\kappa + B}S + (1 - u_1) \quad (1 - p)\gamma E - \mu I_s - \mu_s I_s = u_2 \delta I_s\} \quad (4)$$

$$\frac{dQ}{dt} = u_2 \delta I_s - \mu Q - \mu_Q Q - \alpha_1 Q \quad (5)$$

$$\frac{dR}{dt} = \alpha_1 Q + \alpha_2 I_A - \mu R - \nu R \quad (6)$$

$$\frac{dB}{dt} = \eta I_A + \eta I_S - dB - U_4 B \quad (7)$$

with the variables and parameters that formed up the system can be seen in Figure 2. It is assumed that $S, E, I_A, I_S, Q, R \geq 0$ and all parameters are positive, which are taken from (Subchan et al., 2019)

3 OPTIMAL CONTROL PROBLEMS

The purpose of this research is to obtain control by minimizing the number of infected human populations, bacterial populations and minimizing the costs incurred for controls by considering equations (1)-(7). The objective function can be defined as follows

$$J(x,u) = \{\frac{1}{2}\int_{t_f}^{t_0}[C_1 I_S^2(t)] + C_2 I_A^2(t) \\ + C_3 B^2(t) + C_4 u_1^2(t) + C_5 u_2^2(t) \\ + C_6 u_3^2(t) + C_7 u_4^2(t)dt\} \quad (8)$$

with t_0 as initial time and t_f is final time, and C_i was the parameter weight or price coefficient issued at each control, where $C_i > 0$ for each $i = 1, 2, 3, 4, 5, 6, 7$.

The first step to solve the optimal control problem using the Pontryagin Minimum Principle is to define (Subchan and Zbikowski, 2007) as follows

$$
\begin{aligned}
H = \{ & \frac{1}{2}(C_1 I_S^2(t) + C_2 I_A^2(t) \\
& + C_3 B^2(t) + C_4 u_1^2(t) + C_5 u_2^2(t) \\
& + C_6 u_3^2(t) + C_7 u_4^2(t)) + \\
& \lambda_S(\Lambda + \nu R + \varepsilon E - \mu S - u_3 \psi S - (1 - u_1) \\
& \frac{\beta B}{(\kappa + B)} S) + \lambda_E(u_3 \psi S - \varepsilon E - \\
& \mu E - (1 - u_1)\gamma E) + \lambda_{(I_A)}((1 - u_1)p \\
& \frac{\beta B}{(\kappa + B)} S + (1 - u_1)p\gamma E - \\
& \mu I_A - \alpha_2 I_A) + \lambda_{(I_S)}((1 - u_1)(1 - p) \\
& \frac{\beta B}{(\kappa + B)} S + (1 - u_1)(1 - p)\gamma E \\
& - \mu I_S - \mu_S I_S - u_2 \delta I_S) + \lambda_Q \\
& (u_2 \delta I_S - \mu Q - \mu_Q Q - \alpha_1 Q) \\
& + \lambda_R(\alpha_1 Q + \alpha_2 I_A - \mu R - \nu R) \\
& + \lambda_B(\eta I_A + \eta I_S - dB - u_4 B) \}
\end{aligned}
\tag{9}
$$

where λ_i for each $i = S, E, I_A, I_S, Q, R, B$ was the costate vector or Lagrange multiplier that depended on the state. Next, the optimal control value u_1^*, u_2^*, u_3^* and u_4^* was found as follows

$$
\begin{aligned}
u_1^* = \{ & \frac{1}{C_4}(\frac{\beta B}{\kappa + B} S(P\lambda_{I_A} + \lambda_{I_S}(1 - p) - \lambda_S) \\
& + \gamma E(\lambda_{I_A} P + \lambda_{I_S}(1 - p) - \lambda_E)\}
\end{aligned}
\tag{10}
$$

$$
u_2^* = \frac{\delta I_S(\lambda_{I_S} - \lambda_Q)}{C_5}
\tag{11}
$$

$$
u_3^* = \frac{\Psi S(\lambda_S - \lambda_E)}{C_6}
\tag{12}
$$

$$
u_4^* = \frac{\lambda_B B}{C_7}
\tag{13}
$$

The optimal control u^* was obtained from $\frac{\partial H}{\partial u}$ and had the following characteristics

$$
u_1^* = min(u_{1min}, max(\hat{u}_1^*, u_{1max}))
$$

$$
u_2^* = min(u_{2min}, max(\hat{u}_2^*, u_{2max}))
$$

$$
u_3^* = min(u_{1min}, max(\hat{u}_3^*, u_{1max}))
$$

$$
u_4^* = min(u_{1min}, max(\hat{u}_4^*, u_{1max}))
$$

Figure 2: Variables and Parameters on Mathematical Models of the Spread of Cholera.

Equations (10)-(13) were substituted to Equation (9) so that it had the optimal Hamiltonian function H^*. The next step was to determine the state equation (Subchan and Zbikowski, 2007) as follows

$$
\begin{aligned}
\dot{S}^* = \{ & \Lambda + \nu R + \varepsilon E - \mu S - u_3^* \Psi S - (1 - u_1^*) \\
& \frac{\beta B}{(\kappa + B)} S \}
\end{aligned}
\tag{14}
$$

$$
\dot{E}^* = u_3^* \Psi S - \varepsilon E - \mu E - (1 - u_1^*)\gamma E
\tag{15}
$$

$$
\dot{I}_A^* = p\frac{\beta B}{(\kappa + B)} S + (1 - u_1^*)p\gamma E - \mu I_A - \alpha_2 I_A
\tag{16}
$$

$$
\begin{aligned}
\dot{I}_S^* = \{ & (1 - u_1^*)(1 - p)\frac{\beta B}{(\kappa + B)} S + (1 - u_1^*) \\
& (1 - p)\gamma E - \mu I_S - \mu_S I_S - u_2^* \delta I_S \}
\end{aligned}
\tag{17}
$$

$$
\dot{Q}^* = u_2^* \delta I_S - \mu Q - \mu_Q Q - \alpha_1 Q
\tag{18}
$$

$$
\dot{R}^* = \alpha_1 Q + \alpha_2 I_A - \mu R - \nu R
\tag{19}
$$

$$
\dot{B}^* = \eta I_A + \eta I_S - dB - u_4^* B
\tag{20}
$$

And costate equations can be derived as follows

$$
\begin{aligned}
\lambda_S^* = - & (-\mu\lambda_S - u_3^*\psi\lambda_S - (1 - u_1^*) \\
& \frac{\beta B}{\kappa + B}\lambda_S + u_3^*\psi\lambda_E + (1 - u_1^*)p \\
& \frac{\beta B}{\kappa + B}\lambda_{I_A} + (1 - u_1^*)(1 - p) \\
& \frac{\beta B}{\kappa + B}\lambda_{I_S})
\end{aligned}
\tag{21}
$$

$$
\begin{aligned}
\lambda_E^* = - & (\varepsilon\lambda_S - \varepsilon\lambda_E - \mu\lambda_E - (1 - u_1^*) \\
& \gamma\lambda_E + (1 - u_1^*)p\gamma\lambda_{I_A} + (1 - u_1^*) \\
& (1 - p)\gamma\lambda_{I_S})
\end{aligned}
\tag{22}
$$

$$
\begin{aligned}
\lambda_{I_A}^* = - & (C_2 I_A - \mu\lambda_{I_A} - \alpha_2\lambda_{I_A} \\
& + \alpha_2\lambda_R + \eta\lambda_B)
\end{aligned}
\tag{23}
$$

$$\lambda_{I_S}^* = -(C_1 I_S - \mu\lambda_{I_S} - \mu_S\lambda_{I_S} \\ - u_2^*\delta\lambda_{I_S} + u_2^*\delta\lambda_Q + \eta\lambda_B) \quad (24)$$

$$\lambda_Q^* = -(-\mu\lambda_Q - \mu_Q\lambda_Q - \alpha_1\lambda_Q + \alpha_1\lambda_R) \quad (25)$$

$$\lambda_R^* = -(\nu\lambda_S - \mu\lambda_R - \nu\lambda_R) \quad (26)$$

$$\lambda_R^* = -\left(C_3 B + \lambda_S(1 - u_1^*)\frac{\beta S\kappa}{(\kappa + B)^2} \right. \\ + \lambda_{I_A}(1 - u_1^*)\frac{p\beta S\kappa}{(\kappa + B)^2} \\ \left. + \lambda_{I_S}(1 - u_1^*)\right) \quad (27)$$

The optimal state and costate then can be determined by considering the boundary condition $x(0) = x_0$ and $\lambda(t_f) = 0$.

4 COMPUTATIONAL RESULT

The parameter values are taken from (Subchan et al., 2019) and used for numerical simulation. The simulation is solved by using Fordward-Backward Sweep Runge-Kutta Order 4 method (Lenhart and Workman, 2007; Burden et al., 2016; Lindfield and Penny, 1995). The purpose of numerical simulation was to determine the effectiveness of optimal control in each population. The simulation result on every population can be seen on Fig. 3 and the control can be seen on Fig. 4.

Based on Fig. 2, it was known that infected asymptomatic individual decreased. The number of infected asymptomatic individuals with the final time without optimal control was 133 individuals while with control the number of individuals at the end of time was 2 individuals. This was due to the large influence of β parameter, which was the level of consumption of bacteria through contaminated sources. If the value of β was getting bigger, then the number of individuals without optimal control would be even less. It caused the individuals with mild symptoms to change into severe symptoms if individuals were not aware of the symptoms because of lacking the knowledge or neglected the individual education. So, in this case the effectiveness of giving control in the infected asymptomatic subpopulation had an effect of 98.50%. So, the objective to minimize the number of individuals with mild symptoms had been reached.
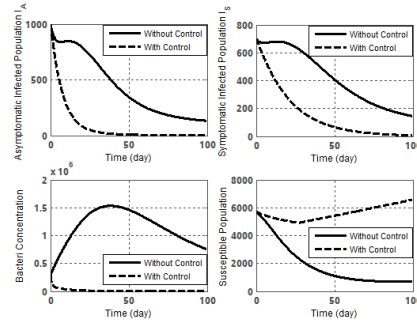

Figure 3: The Change of Rate on the Number of Infected Asymptomatic (I_A) population, Infected Symptomatic (I_S), Bacteria and Susceptible concentration.

Furthermore, the infected symptomatic individual also decreased when control is given. The number of infected symptomatic individuals with the final time without control was 145 individuals while with control, the number of individuals at the end was 7 individuals. The number of infected symptomatic individuals without control increased 680 individuals at $t = 15$, while with control, the number of infected symptomatic individuals were decreased at the beginning until the end. It means that the level of control effectiveness had an effect of 95.17%. The concentration of bacteria decreased with control. The amount of bacterial concentration at the end without control was $7,5 * 10^5$ while with control the number of bacterial concentrations at the end was 517. In this case, control had an effect of 99.93%. Based on Fig. 3, it was shown that the level of control of individuals and bacteria was on maximum value 1 and sanitation control was at value 0.4.
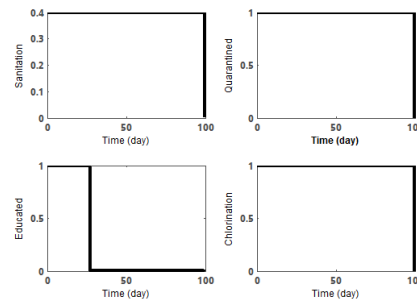

Figure 4: Sanitation (u_1^*), Quarantine (u_2^*), Education (u_3^*) and Chlorination (u_4^*).

Based on Fig. 5, it can be seen that the level of susceptible population decreased since the beginning. This was caused by the number of susceptible population interacted with cholera bacterial-contaminated environment so the population were infected. Furthermore, the population increased at about $t = 27$. The educated population was increased from the very first time and it was proportional to susceptible population level. The quarantine population increased sharply at

the beginning till day 15, then it decreased until the end. This is caused by infected symptomatic population decreased.

In this case, the recovered population increased from the beginning then it stay in the certain value until the end. The asymptomatic and symptomatic infected population decreased because bacteria concentration level kept decrease until the end.
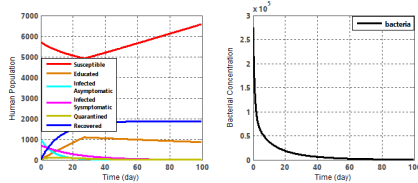

Figure 5: The Change of Subpopulation Rate and Bacteria Concentration with Control.

5 CONCLUSION

In this paper, system of differential equations were given as the dynamics model of cholera spreading that was divided into human population and bacteria population classes. The optimal control in the form of sanitation, chlorination, education, and quarantine were given as the attempt to control cholera spreading.

The simulation result showed the effect of the given control. Based on the computational result, controls affected the number of infected population and bacteria experienced decline so that cholera endemic was not quite big problem. This showed that the optimum control strategy in the form of sanitation, chlorination, education, and quarantine gave significant positive effect to minimize the spread of cholera.

ACKNOWLEDGEMENTS

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Special Autonomy Regulations in Papua Province for the Realization of Community Welfare

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Abstract: The mandate of 1945 Constitution of the Republic of Indonesia which was formulated in Law Number 32 of 2004 about Regional Government regarding the implementation of autonomous regional governments and special autonomy regions is not easy to realize. This is based on the conditions of an area such as geographical conditions, natural wealth, level of soil fertility, total population, quality of population, and number of intellectuals. We can take Bali as an example. Bali is an area that has many tourism places such as Jimbaran Beach, Besakih Temple, Uluwatu Temple, Tanah Lot, Kuta Beach and others. The customs, religion and culture of Bali are like a routine for Balinese. As a region that has various types of specificity, Bali actually wants its area to get recognition as an area with special autonomy. However, this specificity has not been granted by the Government of the Republic of Indonesia. The province of Papua, which is located on the eastern edge of Indonesia, is the widest province with a wealthiness of natural resources. However, in reality, various policies in centralized governance and development there, have not fully fulfilled the sense of justice, people's welfare, the realization of law enforcement and respect for human rights in Papua Province, especially for the Papuan. This condition resulted in disparities in almost all sectors of life, especially in education, health, economy, culture and social politics. Therefore, the government tried to overcome these problems by giving special autonomy to the Papua Province. In 2001 the government passed Law Number 21 of 2001 concerning Special Autonomy for the Province of Papua in order to implement equal welfare for the people there. Considering the tendency of more and more regions to wish to become special autonomous regions or special regions, scientific review with discussion of issues on how the basis, criteria and guidelines in granting special autonomy to an area in Indonesia is very necessary. Normative legal research methods are used to answer this problem. The approaches used are statute approach, historical approach, and comparative approach. After the legal material is collected, it is analyzed qualitatively juridically. This research shows that in addition to being regulated in Article 18B of the 1945 Constitution of the Republic of Indonesia, it can also be found in Law Number 32 of 2004 concerning Regional Government.

1 INTRODUCTION

The founders of the Indonesian have noble goals and ideals in protecting the entire nation and homeland of Indonesia, advancing public welfare, educating the lives of the nation and participating in carrying out world order based on independence, peace, and social justice. In realizing these goals and ideals, a pattern of government is needed as a system and instrument for the state to implement it.

Indonesia is an archipelago. This geographical condition affect the lives of people who live there to create different cultures and customs. This diversity sometimes become a problem for the state in carrying out a centralized government, so it is necessary to form a government in the regions as an extension of the central government in realizing the ideals of Indonesia which is a welfare for all Indonesian people. The formation of government in the regions is balanced with the authority (power) in managing the household itself in accordance with the needs of each region.

The long journey of regional autonomy based on regulation in Indonesia began in the Dutch colonial period. Decentralisatie Wet in 1903 and the 1922 Bestuars Hervormings Wet were the regulations applied at that time. During the New Order period, several regulations concerning regional autonomy such as Law Number 1 of 1945 on Regulation about the Position of Regional National Committees, Law Num-

ber 22 of 1948 on Stipulation of Basic Rules Regarding Self-Governing in the regions that Regulating and Managing their Own Household, Law Number 1 of 1957 on the Principles of Regional Government, Law Number 18 of 1965 on the Principles of Regional Government. During the New Order era, Law Number 5 of 1974 on the Principles of Regional Government was born.

During the Reformation, various concepts of regional autonomy began to keep up with the times. Regulations that have been created include Law Number 22 of 1999 on Regional Government, Law Number 25 of 1999 on Financial Balance between the Central and Regional Governments, Law No. 32 of 2004 on Regional Government, Law No. 33 of 2004 on Financial Balance between Central Government and Regional Government, Perpu No. 3 of 2005 on Amendments to Law No. 32 of 2004 on Regional Government, Law No. 12 of 2008 on the second amendment to Law No. 32 of 2004 on Regional Government, Law No. 23 of 2014 on Regional Government, and Law No. 9 of 2015 on the Second Amendment to Law No. 23 of 2014 on Regional Government.

The series of changes in regulations on regional autonomy aim to enable the relevant region to regulate and manage its own household affairs. This is intended to further improve the effectiveness of governance in the framework of service to the community and the implementation of development that is oriented towards improving the welfare of the community by paying attention to the interests and aspirations that grow in the community.

The province of Papua which is geographically located at the eastern end of the Indonesian territory is the widest province with abundant natural resources. However, various policies in centralistic governance and development have not fully fulfilled the sense of justice, people's welfare, law enforcement and human rights in the Papua Province. This condition made a disparity in almost all sectors of life, especially in education, health, economics, culture and social politics. For this issue, the government tried to overcome these problems by providing policies about Special Autonomy in Papua Province. In 2001 the government passed Law Number 21 of 2001 on Special Autonomy for the Province of Papua in order to implement equal welfare for the people there.

Other problems occur in Papua Province usually are related to human rights violations. On December 8, 2014 there were murders of four (4) students in Paniai, the persecution experienced by Blasius Simagay at the 2014 Bade, Yeremias Kaipman's foot shooting in Merauke in 2015, the persecution of Xaverius Tam-

baip and Ronald Ambungun in Merauke in 2016, the persecution of Oktovianus Beteop in Merauke 2017, the murder of Isak Kua and the sexual abuse of a sister from Isak Kua in November 2017 (Papua, 2017).

2 PROBLEM FORMULATION

Based on the background description, we can formulate a problem as follows: What is the implementation of Papua Province special autonomy arrangement in realizing the welfare of the Papuan people?.

3 REVIEW OF LITERATURE

State and law cannot be separated, as Hans Kelsen asserts that there is "Identification of State and Law" (Kelsen, 2007), then Kelsen said that "As a political organization, the state is a legal order, but not all legal orders are state." (Kelsen, 2007) Indonesia stated in its constitution that "the State of Indonesia is a rule of law." (Article 1 paragraph (3) of the 1945 Constitution of the Republic of Indonesia NRI amendments 3). In Indonesian literature there are several prominent figures who write the notion of rule of law, They are:

1. Mr. Muhammad Yamin defines the rule of law as a state that carries out a government that is not in accordance with the will of those who hold power, but according to written rules made by the people's representative bodies which are legally formed, in accordance with the principle "The laws and not menshall govern" (Yamin, 1952).

2. Soediman Kartohadiprodjo, rule of law as a country where the fate and independence of the people in it are guaranteed as well as possible by law (Kartohadiprodjo, 1953).

3. Wirjono Prodjodikoro, the one who provides an understanding of the rule of law as rulers and governments as state administrators in carrying out state duties bound to the applicable legal regulations (Prodjodikoro, 1973).

4. Joeniarto, the rule of law as a country where the actions of authorities must be limited by applicable law (Joeniarto, 1981).

5. Sri Sumantri said that there were four elements of the rule of law:

(a) The Government in carrying out its duties and obligations must be based on law or legislation.

(b) There is a guarantee of human rights (citizens).

(c) There is a division of powers in the country.

(d) There is supervision from the judicial body (rechter-lijke controle) (Soemantri, 1992).

3.1 Regional Autonomy and Autonomous Regions

The 1945 Constitution of the Republic of Indonesia stated that the Republic of Indonesia is a unitary state (Rechstaat), not a state of power (Machstaat). This means that the highest sovereignty or power in the state is not based on the power alone but is based on the law in the sense of the legal mind (Rechtsidee) which contains the noble ideals of the Indonesian people

The 1945 Constitution of the Republic of Indonesia affirms that regional government is organized based on the principle of deliberation or democracy. This means that administratively the implementation of government is carried out by making a decentralization policy which then creates autonomous regional government units. This is labeled as regional governments that regulate and manage their affairs based on the aspirations and interests of the local community (Sukriono, 2013).

Autonomy comes from Greek, auto which means self and nomous which means law or regulation, autonomy in the original sense is the legal self-sufficiency of social body and its actual independence. So, there are two essential characteristics of autonomy, legal self sufficiency and actual independence. In relation to politics or government, regional autonomy means self-government or the condition of living under one's own laws. So regional autonomy is an area that has a self-government legal self-sufficiency that is regulated and managed by own laws. Therefore, autonomy focuses more on aspirations than conditions. Autonomy contain several meanings as follows:

1. Autonomy is a condition or characteristic for "not" controlled by other parties or external forces.

2. Autonomy is a form of "self-government", it has the right to govern or self-determine

3. The government itself is respected, is recognized and guaranteed, there is no control by other parties towards regional functions (local or internal affair) or against a minority of a nation.

4. The autonomous government has sufficient income to determine its own destiny and fulfill the welfare of (Shiddiq, 2003). For the principle of autonomy and the implementation of decentralization in the relations between the central government and regional governments, M. Yamin (Mahfud, 2012) wrote that" a democratic constitution arrangement requires solving power of government in its own central part and also requires the division of power between main and regions government. The principle of democracy and the decentralization of government power is in opposition to the principle of wanting to gather everything at the center of government."

What is said by M. Yamin concludes that regional autonomy and decentralization are part of countries that embrace democracy. Long before Indonesia's independence, M. Hatta (Mahfud, 2012) also said that "According to the basic of public sovereignty, the right of the people to determine their fate is not only at the top of the government, but also at each place, city, village and region. With such circumstances, each section or class of people gets an autonomy (making and carrying out its own regulations) and zelbestuur (carrying out the regulations made by the higher Council). Such conditions are very important, because the needs of each place in one country are not the same, but different." Therefore, autonomy must be one of the joints of a democratic government structure. This means that in democracies, local governments are required to obtain autonomous rights. The existence of regional government also improves the freedom of the regional as a characteristic of a democratic state (Mahfud, 2012)).

The term autonomy means independence but not as independent state, so the top government gives freedom or independence to the autonomous region as an accountability. The accountability itself has two elements. First, is an assignment to be carried out. Second, giving trust to the government in the region in the form of authority to think and determine how to complete the task. Thus, it is to encourage or stimulate the region to try to develop their own abilities that can generate auto-activities and enhance their self-esteem at its best (Mahfud, 2012).

Autonomy is a given freedom for a government to take care their own region without neglecting the position of the regional government towards the central government to carry out the functions assigned to them. Therefore, efforts to build a balance must be considered in the context of the power relations between the central and the regions (Mahfud, 2012). This means that regions must be viewed in two positions, as regional organs to implement autonomy and as agents of the central government to conduct central affairs in the regions. Regional autonomy is also defined as the authority of autonomous regions to regulate and manage the interests of local communities according to their own initiative based on the aspira-

tions of the community in accordance with the legislation (Widjaja, 2002).

Regional autonomy is an effort to realize democratization where people's aspirations or interests from each region can be accommodated properly. Regional autonomy allows the local wisdom of each region to walk in harmony with the initiatives and of the people in the region. Framework of democratization and limitation of power is known as the principle of separation of power. The most popular theory about this problem is the idea of separation of state power developed by a French scholar named Montesquieu. According to him, state power must be separated into legislative, executive and judicial functions (Busrizalti, 2013).

Linked to the Montesquieu theory, regional autonomy is a mechanism to regulate the state power that is distributed vertically in a "top-down" relationship. As it is known that the separation of powers and the division of power are both a concept of separation of power. Academically, it can be distinguished into narrow and broad sense. In a broad sense, the concept of separation of powers also includes the notion of power division commonly referred as the "division of power". Separation of power is the concept of horizontal power relations, while the power sharing is vertical. Horizontally, state power can be divided into several branches of power that are linked to the functions of certain state institutions, such as legislative, executive and judicial branches. In the concept of power distribution (distribution of power or division of power) the power of the state is divided vertically in a "top-down" relationship" (Busrizalti, 2013). Regional autonomy in the context of democracy aims to create checks and balances in the political system.

3.2 Welfare State

Welfare State as an ideal model of development focused on improving welfare through giving a more important role to the state in providing universal and comprehensive social services to its citizens. So, the focus of the welfare state system is to create a system of social protection that is institutionalized for every citizen as an illustration of the citizens' rights and state obligations (Suharto, 2007).

Welfare state can be described as the influence of human desire of a security, peace, and prosperity. In the 1945 Constitution of the Republic of Indonesia, social welfare becomes a special title of CHAPTER XIV which includes Article 33 on the economic system and Article 34 concerning the state's concern for the weak groups (the poor and neglected children) and the social security system. This means that Indone-

sia is a country that adheres to the welfare state with a model of Participatory Welfare State which in the social work literature is known as Welfare Pluralism. This model emphasizes that the state must continue to take part in handling social problems and the implementation of social security.

3.3 Theory of Legislation

Good legislation must have a foundation in its formation, according to Bagir Manan (Manan, 1992) the foundation in the preparation of legislation are: First, the juridical foundation (juridische gelding); Second, the sociological foundation (sosiologische gelding); and Third, philosophical foundation. Jazim Hamidi also said that, good legislation must meet the following requirements: Philosophical foundation (filsofische grondslag); sociological foundation (sociologische grandslag), juridical basis (rechtsground), political basis, ecological, medical, economic, etc (Hamidi and Sinaga, 2005).

Philosophical foundation here is that the law always contains ideal norms by a society for an ideals state of life. Sociological foundation means every legal norm as outlined in the law must reflect the demands of the community's needs for legal norms that are in accordance with the reality of public legal awareness. Political foundation means that the constitutional referral system must also be described according to the ideals and basic norms contained in the 1945 Constitution of the Republic of Indonesia as a source of basic policies or legal politics to establish the relevant law. Juridical foundation, in the formulation of each law, must be placed on the "Considering" consideration section.

4 DISCUSSION

The 1945 Constitution of the Republic of Indonesia affirms that regional government is held based on the principle of deliberation or democracy. This means that administratively the implementation of government is carried out by making a decentralization policy. Therefore, an autonomous regional government unit was born, it is the regional government that regulates and manages its affairs based on the aspirations and interests of the local community (Sukriono, 2013).

The formulation of regional government was in accordance with the mandate of Article 18 of the 1945 Constitution of the Republic of Indonesia, it has produced many other laws and regulations in regional governance, including Law No. 1 of 1945, Law No.

22 of 1948, Law No. 1 of 1957, Presidential Decree Number 6 Year 1959, Law Number 18 of 1965, Law Number 5 of 1974, Law Number 22 of 1999 and Law Number 32 of 2004 (Sunarno, 2012).

In organizing regional autonomy, the regional government has rights as stipulated in Article 21 of Law Number 32 of 2004 on Regional Government, those are:

a Arrange and manage their own government affairs;

b Choosing regional leaders;

c Choosing regional apparatus;

d Managing regional wealth;

e Collecting local taxes and regional retribution;

f Get profit sharing from the management of natural resources and other resources in the area;

g Get other legitimate sources of income;

h Obtain other rights stipulated in the legislation.

The regional obligations in the implementation of regional autonomy are regulated in Article 22 of Law Number 32 of 2004 on Regional Government:

a Protect the community, maintain the unity, harmony and integrity of the Republic of Indonesia;

b Improve the quality of people's lives;

c Develop a democratic life;

d Realize justice and equity;

e Improve basic education services;

f Provide health care facilities;

g Provide appropriate social facilities and public facilities;

h Develop a social security system;

i Develop regional planning;

j Develop productive resources in the area;

k Preserve the environment;

l Manage population administration;

m Preserve socio-cultural values;

n Establish and establish laws and regulations in accordance with their authority;

o Other obligations stipulated in the legislation.

The rights and obligations of the region are realized in the form of regional government work plans. They are translated into regional revenues, expenditures and finances that are managed efficiently, effectively, transparently, accountably in the regional financial management system.

Law Number 21 of 2001 Special Autonomy for Papua Province is a rule or policy given by the Central Government as an effort to improve its development in various aspects such as economic, education, health and infrastructure. Philosophically, the Special Autonomy Law is made as a step to equalize Papua with other regions in Indonesia It is a protection measure for the basic rights of indigenous Papuans whose basic rights are neglected and marginalized since they have joined Republic of Indonesia.

The result of this stipulation of Special Autonomy is a different treatment given by the Government to the Papua Province. This means that there are fundamental things that only apply in the Province of Papua and do not apply in other provinces in Indonesia, along with that there are also things that apply in other areas that are not enforced in Papua Province.

However, the implementation of Special Autonomy also faced some obstacles and disruptions such as, the slow issuance of Government Regulations of the Special Autonomy Law (PP No. 54 of 2004 on the Establishment of the Papuan People's Assembly; the form of Perdasi and Perdasus: weak consistency over protection and enforcement of Human Rights (HAM); conflicts in the division of West Irian Jaya province, Issuance of Presidential Instruction No. 1 of 2003. In addition, there are limitations and weakness of human resources (HR) of Papua in responding to the bigger authority and responsibility as contained in the Special Autonomy Law.

5 CLOSING

The making of regional autonomy policy in the form of Special Autonomy is an effort to develop regional autonomy in the framework of the constitution guaranteed by Article 18 paragraph (1) of the 1945 Constitution of the Republic of Indonesia, mainly in government units that are special. Thus, if a synergy is created between normative ideals as contained in the substance of the Special Autonomy Law with the real attitude and consistency of both the central government and the Papuan government and all components of the Papuan community, then undoubtedly Special Autonomy can be a solution and the best alternative policy in realizing all Papuan's desires in Republic of Indonesia.

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Searching Information Tourism using Vector Space Model

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Keywords: Tourism, Searching, Vector Space Model, Waterfall, Information Retrival.

Abstract: Development of tourism is directed at creating tourist destinations that are evenly distributed in an area, including tourism in Sukabumi, West Java, Indonesia. This study conducts secondary data retrieval from the internet by using keyword "air terjun sukabumi". Information search method is to use a Vector Space Model (VSM) to see the level of similarity with the weighting term. By passing various processes such as tokensizing, filtering, stemming, tf and df, calculation of inverse document frequency and several other processes. The results shows that the proposed algorithm is very suitable for processing the sample. Determination of document ranking is done by several stages of the algorithm that produce some documents with the highest value. The study can also prove the proposed algorithm can work well in the case of searching for waterfall data in Sukabumi district.

1 INTRODUCTION

West Java has one district with promising potential for the advancement of tourism, namely Sukabumi Regency, which is located in the Java south. In the Regional Long Term Development Plan (RPJPD) of Sukabumi Regency in 2005-2025 it was stated that the priority of tourism development was directed at the creation of tourism destinations in Sukabumi as one of the leading tourism destinations in West Java. Indonesian tourism competition was increasingly sharp, so that demanding every region explore potential sources power to sell, attract and be visited by tourists (Darsiharjo, 2016). Eco-tourism is a type or type of tourism that makes natural resources an object that is one of the selling power of Sukabumi district, coupled with artificial resources. For some areas in West Java, eco-agro-tourism has developed well, but there are still many other areas that have the potential to develop eco-agro-tourism for the advancement of the region and the welfare of its people (Hasugian, 2003).

From a development perspective, ecotourism businesses should only be considered 'successful' if local communities have some control over them and if they share the benefits equitably emerge from ecotourism activities (Scheyvens, 1999). One of the visited areas at Sukabumi is the existing Ciletuh geopark in the southern region of Sukabumi. The Geopark is an earth park that is included in a conservation area, which has elements of geodiversity, biodiversity, and cultural diversity which has aspects in the field of education as knowledge geology on the uniqueness and diversity of the earth's heritage in managing the area as tourism (Darsiharjo, 2016). It has also many diversity of tourist attractions such as beaches and many waterfalls that can be visited and waterfalls in the Ciletuh area (Hardiyono et al., 2015). There are some waterfalls in Ciletuh, namely: Awang waterfall, Curung Puncak Manik, Sodong waterfall, Cimarinjung waterfall and much more.

Collaboration is very important for tourism marketing that is sucses, purpose, and electronic communication are a new opportunity to be an opportunity to work between tourism suppliers (Palmer and Mccole, 2009). The increasing number of tourists to Sukabumi is one way to increase regional income, but until now tourism development is still not evenly distributed, especially the many waterfalls, consequently even distribution of tourism objects is not yet optimal so scientific studies are needed on tourist attraction in Sukabumi.

Many countries promote nature-based tourism in Indonesia to promote the purpose of nature conservation and income generation (Hearne and Salinas,

247

2002). For natural resource management planning planners make schemes and approaches to anticipate various biased information caused by these limitations. The characteristics of coastal resources and Ciletuh geopark are quite complex and require specific management policies in order to provide optimal and sustainable life and livelihood (Wahyudin, 2011).

In this study conducted research from the Internet by using the keyword "air terjun sukabumi" to determine the extent to which tourists know about tourist objects in the region. It is expected that with using a Vector Space Model (VSM) can be known about which regions little tourists for help the Sukabumi tourism department in promoting tourism objects.

2 RESEARCH FRAMEWORK

The research framework starts from data presentation (see Figure 1). The data that will be used is secondary data taken from the internet related waterfall in Sukabumi on the internet. The data will be processed using vector space model (SVM) to calculate the amount of value obtained based on a keyword.
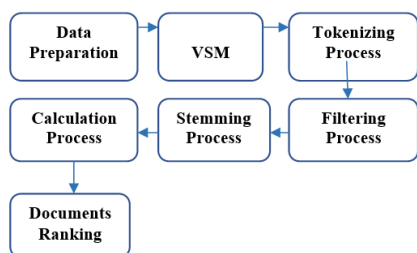
Figure 1: Research Framework.

The VSM is the basic method used for text representation. To represent the text of each feature term (Ti) considered as a coordinate in n-dimensional vector space, the corresponding weight (W1, W2, W3, ... Wn) is considered to be the coordinate of value. Then, it can be used to represent text (Houy, 2013) (Langcai et al., 2017). It is a method to see the level of proximity or similarity term by weighting the term. Documents are viewed as a vector that has a magnitude (distance) and direction. In the VSM, a term is represented by a dimension of vector space. The relevance of a document to a query is based on the similarity between the document vector and the query vector (Amin, 2013) stages in the Information Retrieval covering several processes in documents.

Then, indexing process to get the weight of each term in the document. Calculation of these weights is done by calculating the Term Frequency (Tf) and Document Frequency (Df) of each term contained in

the document collection. Next process are tokenizing, filtering, and stemming.

The tokenizing process is done by a mechanism if the document on the corpus is found in a space, so the term between spaces will be retrieved by the system. Then the term is placed in the initial table. Process results in the form of original terms (terms that still have additions, inherent punctuation marks, and numbers).

The filtering process is done by a mechanism if the terms in the initial table table are found punctuation, capital letters, and numbers. Then the program will remove (punctuation and numbers) and change capital letters to lowercase letters, then check the term with stopwords. The process results in the form of selected terms (without punctuation, without capital letters, and not including stopwords).

The Stemming process is a program for eliminating process or how to remove the rewards found in the filtering term. The eliminating process is done by removing the prefix, insertion, and suffix. The result of the process is frekuency table. Finally the calculation process and ranking of documents are carried out.

3 RESULT AND DISCUSSION

3.1 Data Preparation

The research data was obtained from searches on Google's search engine by inputting the request "air terjun sukabumi". There are 8 (eight) document sample titles (D1 - D8) search results, including:

[D1] Curug Sawer, Air Terjun Eksotis di Sukabumi

[D2] Air Terjun Cikaso, Wisata Alam Andalan Kabupaten Sukabumi

[D3] Air Terjun Pareang, kemegahan surga tersembunyi di Sukabumi

[D4] Mengintip Blue Curug Cikaso yang mempesona di Sukabumi Selatan

[D5] Curug Mawi, tempat baru untuk berada di Cibadak Sukabumi

[D6] Air Terjun Gerong Sukabumi Air Terjun Instagramable

[D7] Eksotisme Air Terjun Cimarinjung, Wisata Dunia Jurrasic dalam gaya Sukabumi

[D8] Curug Caweni, Alam Perawan Sukabumi

3.2 Tokenizing

After data is available, the next step is tokenize process. Figure 2 shows the results of the tokenize which have to group each word from the document that has been obtained.

D1	D2	D3	D4
Curug	Air	Air	Mengintip
Sawer	Terjun	Terjun	Blue
Air	Cikaso	Pareang	Curug
Terjun	Wisata	kemega han	Cikaso
Eksotis	Alam	Surga tersemb unyi	yang
di	Andalan		mempesona
Sukabumi	Kabupaten	di Sukabumi	di Sukabumi Selatan
D5	D6	D7	D8
Curuk	Air	Eksotisme	Curug
Mawi	Terjun	Air	Caweni
tempat	Gerong	Terjun	Alam
baru	Sukabumi	Cimar injung	Perawan
Berada	Air	Wisata	Sukabumi
di	Terjun	Dunia	
Cibadak	Instag ramable	Jurrasic	
Sukabumi		dalam gaya Sukabumi	

Figure 2: Tokenizing Process.

3.3 Filtering

After tokenizing, the words that appear in the data are known. It has been applied for a few words, then it will enter the filtering stage.

Figure 3 - Figure 4 shows the filtering results from the data.

Air	ala	Alam
Biru	Caweni	Cibadak
Curug	di	Eksotis
Instagramable	Jurrasic	Kabupaten
Mawi	Mengintip	ngadem
Pesona	Sawer	Selatan
Terjun	Tersembunyi	Wisata

Figure 3: Filtering Process.

Andalan	baru
Cikaso	Cimarinjung
Eksotisme	Gerong
Kemegahan	lokasi
Pareang	Perawan
Sukabumi	Surga
World	

Figure 4: Filtering Process (Extension).

3.4 Stemming

In the Filtering process is data that generates 34 words. While in this process of stemming is 31 words (see Figure 5 - Figure 6).

air	alam	andalan
Caweni	cibadak	Cikaso
Eksotis	Gerong	instagramable
kemegahan	lokasi	Mawi
Pareang	perawan	Pesona
Sukabumi	Surge	terjun
World		

Figure 5: Stemming Process.

baru	biru
cimarinjung	curug
jurrasic	kabupaten
mengintip	ngadem
sawer	selatan
tersembunyi	wisata

Figure 6: Stemming Process (extension).

3.5 Calculation

The calculation process consists of tf-idf, document weight (W), distance Q - D, the document calculation of DOT, and similarity. In the VSM approach, calculations can be found based on the term frequency

and inverse document frequency $(tf - idf)$ based on the log Number of Documents (D) / many documents (df). For example "Air" data, It is known: D = 8 ([D1], [D2], [D3], [D4], [D5], [D6], [D7], and [D 8]); df (water) = 2; then $tf - idf = log(8/2) = 0.6021$. Then to calculate document weights using equations $wf(td) = tf(td) * idft$. Based on document "air" data in document 1 [D1], then $tf(td) =; idf = 0.602. Thus wf(td) = 1 * 0.6021 = 0.6021$.

To calculate the distance query (Q) to document distance (D) using the equation : $Sqrt(\sum_{j=1}^{n} Q_j^2)$. DOT product calculations use the equation: $\sum(Q * D_i) = \sum_{=1}^{n} Q_j D_{ij}$. The result of $Q - D$ and DOT Product from documents can be seen in Figure 7 and Figure 8.

Token	Q^2	D1^2	D2^2	D3^2	D4^2	D5^2	D6^2	D7^2	D8^2
air	0	0,36248	0	0	0	0	0,36248	0	0
alam	0	0	0,36248	0	0	0	0	0	0,36248
andalan	0	0	0,81557	0	0	0	0	0	0
baru	0	0	0	0	0	0,81557	0	0	0
biru	0	0	0	0,81557	0	0	0	0	0
caweni	0	0	0	0	0	0	0	0	0,81557
cibadak	0	0	0	0	0	0,81557	0	0	0
cikaso	0	0	0,36248	0	0,36248	0	0	0	0
cimarinjung	0	0	0	0	0	0	0	0,81557	0
curug	0	0	0	0	0	0	0	0	0
eksotis	0	0,81557	0	0	0	0	0	0	0
gerong	0	0	0	0	0	0,81557	0	0	0
instagramable	0	0	0	0	0	0,81557	0	0	0
jurrasic	0	0	0	0	0	0	0	0,81557	0
kabupaten	0,81557	0	0,81557	0	0	0	0	0	0
kemegahan	0	0	0	0,81557	0	0	0	0	0
lokasi	0,81557	0	0	0	0	0,81557	0	0	0
mawi	0	0	0	0	0	0,81557	0	0	0
mengintip	0	0	0	0	0,81557	0	0	0	0
ngadem	0	0	0	0	0	0,81557	0	0	0
pareang	0	0	0	0,81557	0	0	0	0	0
perawan	0	0	0	0	0	0	0	0	0,81557
pesona	0	0	0	0	0,81557	0	0	0	0
sawer	0	0,81557	0	0	0	0	0	0	0
selatan	0	0	0	0,81557	0	0	0	0	0
sukabumi	0,36248	0,36248	0	0	0	0	0,36248	0	0
surga	0	0	0	0,81557	0	0	0	0	0
terjun	0,36248	0,36248	0	0	0	0	0,36248	0	0
tersembunyi	0	0	0	0,81557	0	0	0	0	0
wisata	0	0	0,36248	0	0	0	0	0,36248	0
world	0	0	0	0	0	0	0	0,81557	0

Figure 7: Document Calculation of Distance.

Q*D1	Q*D2	Q*D3	Q*D4	Q*D5	Q*D6	Q*D7	Q*D8
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0,665157	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0,665157	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0,131389	0	0	0	0	0,131389	0	0
0	0	0	0	0	0	0	0
0,131389	0	0	0	0	0,131389	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Figure 8: Document Calculation of DOT product.

The next process is to calculate the cosine angle between the vector Query with each document by the formula: Consine θ $D_i = (Q * D)/(|Q| * |D_i|)$. The results of each document are Cosinus [D1] = ((1.53) * (1,648809)) / (0,262778); Cosinus [D2] = ((1.53) * (1,648809)) / (0,665157); Cosinus [D3] = ((1.53) * (1,80618)) / (0); Cosinus [D4] = ((1.53) * (1,903881)) / (0); Cosinus [D5] = ((1.53) * (2,019371)) / (0,665157); Cosinus [D6] = ((1.53) * (1,648809)) / (0,262778); Cosinus [D7] = ((1.53) * (1.676064)) / (0); and Cosinus [D8] = ((1.53) * (1,411956)) / (0).

3.6 Document Ranking

From the results of the Vector Space Model (VSM) analysis, the ranking results for the top four of the 8 documents that have been calculated are Ranking 1: [D2] with a value of 0.262819; Ranking 2: [D5] with a value of 0.21459; Ranking 3: [D1] with a value of 0.10383; and Ranking 4: [D.6] with a value of 0.10382. So the documents that are most relevant to the keywords "air terjun sukabumi" is the document 4 or D4 = Mengintip Blue Curug Cikaso yang mempesona di Sukabumi Selatan.

4 CONCLUSION

The study results show that the proposed algorithm can function quite well in processing a sample of 8 (eight) documents. Determination of document ranking is done by several stages of the VSM (Vector Space Model) algorithm that produces 4 (four) large documents with the highest value, and the value 0.262819 becomes the highest value. It can prove that the proposed algorithm can work well in the case of search for keyword "air terjun sukabumi".

The development of this research still has to be done, because in this study the data taken is still in the scope of the Sukabumi district, so that more optimized results can then be taken in further development within the scope of a wider waterfall data. In further research can also be developed by trying several algorithms that are more optimal in this study case 6.

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Buried Object Detection based on Acousto-seismic Method using Accelerometer and Neural Network

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Keywords: Accelerometer, Acousto-Seismic Method, Buried Objects, Neural Network.

Abstract: A system for detecting buried objects is often needed for inspection, exploration and security purposes. This research has developed a system to detect buried objects based on the acousto-seismic principle. A sinusoidal signal is amplified by an audio amplifier to drive a subwoofer speaker to produce mechanical vibrations. The seismic vibrations propagating in the ground are measured by an accelerometer. The Fast Fourier Transform method converts vibrations in the time domain to the frequency domain. Neural Network algorithm is applied to distinguish these wave spectrums to determine buried objects. After testing in experiments, this system can distinguish between buried metal and non-metal objects. This system could also recognize the shallow buried objects with an accuracy rate of 86.6%. This method can be potentially developed to detect land mines both metal and non-metal materials.

1 INTRODUCTION

Buried object detections are often needed as an inspection and security machine. Metal detectors can detect objects within a certain distance both on the surface and inside the ground. Buried landmines with metal casings are often found in fields which can be dangerous to humans or animals around them. Metal detectors are generally only able to detect metal objects. In fact, many dangerous objects are covered by non-metal materials.

Several methods are applied to inspect buried objects. Radar-based noncontact displacement sensors can be used to detect buried landmines using seismic wave excitation (Martin et al., 2001). This system explores the elasticity characteristics of objects towards their environment. Detection of landmines can be carried out by capturing gamma rays emitted by hydrogen and nitrogen contained in the explosives (Yoshiyuki et al., 2007). The position of the buried object can be localized by the pendulum method to measure its acceleration (Maqsud and Daku, 2005). An acousto-seismic method has also been implemented in which buried objects have specific seismic (Rayleigh) wave responses in the time and frequency domains (Bulletti et al., 2010). Detection of land mines based on Time Reverse Acoustics can significantly improve the accuracy of the results (Sutin et al., 2005). The inspections of buried objects typically use low frequency mechanical vibrations of 5-100 Hz (Song et al., 2017).

In this research, a system has been designed and developed to detect buried objects based on the acousto-seismic method. Seismic vibration is generated by an acoustic signal produced by a subwoofer. The vibration that propagate on the ground is measured using micro-electro-mechanical systems (MEMS) accelerometers. Fast Fourier Transform (FFT) method converts vibrations in the time domain to the frequency domain. Neural Network algorithm will recognize the frequency spectrum pattern of the vibration in order to determine the buried object.

2 MATERIALS AND METHOD

The overall system of detection for buried objects is illustrated by Figure 1. This prototype is a wooden box with a size of 60cmx60cmx10cm containing 30 kg of sand. The 60 hertz sinusoidal signal is amplified by an audio amplifier to drive a 12-inch subwoofer speaker to produce mechanical vibrations of 125 dB. The subwoofer is located in a wooden box with a size of 60cmx45cmx100cm mounted on sand with a distance of 30 cm, as shown in Figure 2. The objects used in this study consisted of metal and non-metal objects buried 10 cm deep in sand including iron, aluminum, zinc, stainless steel, plastic, polyvinyl chloride (PVC), and acrylic, as shown in Figure 3.
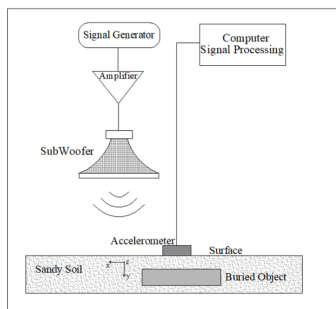
Figure 1: The overall system of detection for buried objects.
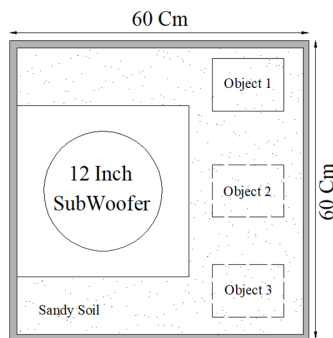
Figure 2: The layout of the buried object detection.

Figure 3: The buried objects used for the experiments.
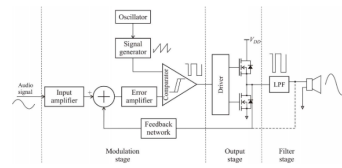
Figure 4: The architecture of switching power amplifier (Kovačević et al., 2018)
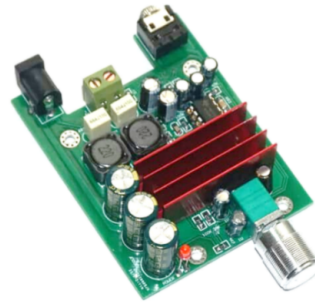
Figure 5: The MDL-049 TPA3116D2 amplifier module.

Class-D or switching power amplifier has a high power efficiency of more than 90% (Kovačević et al., 2018). This type of amplifier uses the Pulse Width Modulation (PWM) method as depicted in Figure 4. In this study, we use the MDL-049 TPA3116D2 subwoofer amplifier module as shown in Figure 5. This amplifier is a stereo digital amplifier that can drive speakers by 50 W per channel. This module is configured as a mono amplifier that can produce a power of 100 W to a 4 Ω speaker with the Bridge-Tied-Load method.
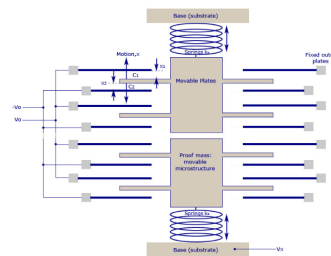
Figure 6: The working principle of MEMS accelerometer (John, 2011)

Figure 7: The neuron model.

Accelerometer is a sensor that can measure changes in speed. MEMS accelerometer is often used in many applications because of their compact size for three-dimensional space. This sensor can be used

to measure vibrations that propagate on the ground or objects (Ardiansyah et al., 2018). The working principle of this sensor is based on changes in capacitance shown in Figure 6. The output voltage of the proof mass can be expressed as:

$$V_x = \frac{X}{d}V_0 \qquad (1)$$

where x is the distance between the two plates of the internal capacitor, d is the change in distance between the plates, V_0 is the amplitude of the excitation voltage. By involving spring force, the output voltage will be proportional to the acceleration. In this study, the seismic vibrations are measured by ADXL335 analog accelerometer. This sensor operates at the voltage of 1.8–3.6V and the current consumption of 350μ. This device has a bandwidth of around 0.5-1600 hertz. The sensor signal is then digitized using an Arduino Nano microcontroller board.

The FFT method converts the signal in the time domain into a frequency domain. This frequency spectrum feature is often used for the identification of sounds produced by vibrating objects (Winjaya et al., 2017). Compared with Discrete Fourier Transform (DFT), the FFT has fewer total number of complex multiplies of (N/2) 2log (N) with N is the number of signal samples. In general, Fourier transform can be expressed as:

$$x[k] = \sum_{n=0}^{n-1} x[n]W_n^{kn} \qquad (2)$$

$$W_n^{kn} = e^{-j2\pi kn/N} \qquad (3)$$

where x [n] is a discrete signal in time domain, and x [k] is the frequency spectrum. In this study, the range of frequency spectrum is between 0-99 hertz with a step of 1 hertz. This spectrum is used as input for the Neural Network to recognize the vibrations.
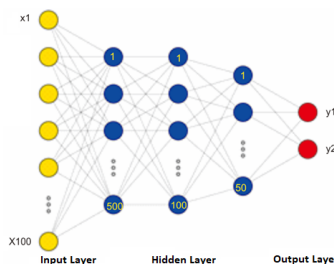
Figure 8: The Neural Network architecture used in the experiment.

Neural Network is a computational model inspired by human brain. The human brain has many neurons that are connected to each other. Figure 7 shows the model of a neuron cell. Using the logistic sigmoid function, a neuron model can be expressed by:

$$Z_j = \Sigma_i^3 (W_{j,i}X^1 + b_j) \qquad (4)$$

$$O_j = \frac{1}{1+e^{-azj}} \qquad (5)$$

Neural Networks are widely used as artificial intelligence to identify patterns (Rivai and Tasripan, 2015), (Rivai et al., 2016), (Rivai et al., 2014). The Neural Network architecture used in this study is shown in Figure 8. The input layer consists of 100 nodes that correspond to the frequency spectrum of the acousto-seismic vibrations. The hidden layer consists of three layers, each of which consists of 500, 100, and 50 neurons. Meanwhile, the 2 neurons in the output layer represent the number of classes that will be recognized. The learning and running phases are accomplished by a computer using Python Programming Language.

3 RESULT AND DISCUSSIONS

The prototype of the system for detecting buried objects is shown in Figure 9. The experimental results of the frequency response without buried object is shown in Figure 10. Whereas, the frequency spectrum for buried metal and non-metal objects can be seen in Figure 11, and Figure 12, respectively. Bandwidth spectrum of buried objects is wider than that of without objects. There are also significant differences between the spectrum patterns of buried metal and non-metal objects.

The next experiment is the detection of buried metal and nonmetal objects using the Neural Network. In the training phase, the network uses pairs between 120 spectrum patterns of all metal objects for different positions and targets (Y1 = 1 and Y2 = 0), as well as pairs between 90 spectrum patterns of all non-metal objects for different positions and targets (Y1 = 0 and Y2 = 1).

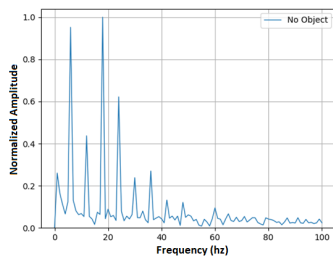Figure 9: The prototype of the buried object detection system.

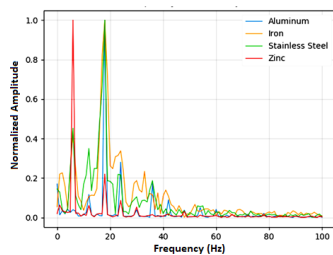Figure 10: The spectrum of vibration without buried object.

Figure 11: The spectrum of vibration with buried metal objects.

This training phase loss curve is shown in Figure 13. In the running phase, 35 spectrum patterns are tested online as shown in Table 1. The experimental results indicate that Neural Network could classify buried metal and non-metal objects with an identification level of 77%.
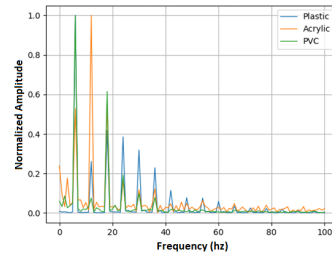

Figure 12: The spectrum of vibration with buried non-metal objects.

The next experiment is the detection of with and without buried objects. In the training phase, the network uses pairs between 100 spectrum patterns of without objects and targets (Y1 = 1 and Y2 = 0), as well as pairs between 210 spectrum patterns of all both metal and non-metal objects for different positions and targets (Y1 = 0 and Y2 = 1). This training phase loss curve is shown in Figure 14. In the running phase, 15 spectrum patterns are tested online as shown in Table 2. The experimental results indicate that Neural Network could determine the buried objects with a success rate of 86.6%. The similar results are obtained when this system is applied to identify buried objects for true field experiments, as shown in Figure 15.
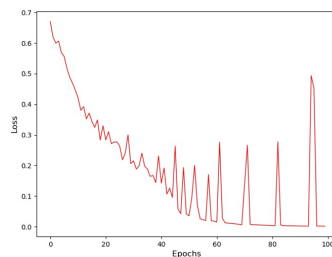
Figure 13: Loss curve of the Neural Network training phase to detect buried metal and non-metal objects.

Materials	No.	Category	Identification
Iron	1	Metal	Metal
	2	Metal	Metal
	3	Metal	Metal
	4	Metal	Non Metal
	5	Metal	Metal
Aluminum	1	Metal	Non Metal
	2	Metal	Metal
	3	Metal	Metal
	4	Metal	Metal
	5	Metal	Non-Metal
Stainless Steel	1	Metal	Metal
	2	Metal	Metal
	3	Metal	Non-Metal
	4	Metal	Metal
	5	Metal	Metal
Zinc	1	Metal	Metal
	2	Metal	Metal
	3	Metal	Non-Metal
	4	Metal	Non-Metal
	5	Metal	Metal
Plastic	1	Non-Metal	Non-Metal
	2	Non-Metal	Metal
	3	Non-Metal	Metal
	4	Non-Metal	Non-Metal
	5	Non-Metal	Non-Metal
PVC	1	Non-Metal	Non-Metal
	2	Non-Metal	Non-Metal
	3	Non-Metal	Non-Metal
	4	Non-Metal	Non-Metal
	5	Non-Metal	Non-Metal
Acrylic	1	Non-Metal	Non-Metal
	2	Non-Metal	Non-Metal
	3	Non-Metal	Non-Metal
	4	Non-Metal	Non-Metal
	5	Non-Metal	Non-Metal

Figure 14: Neural Network identification for buried metal and non-metal objects.
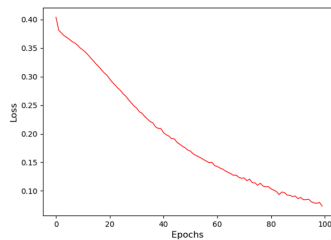
Figure 15: Loss curve of the Neural Network training phase to detect buried objects.

No.	Category	Identification
1	No Object	No Object
2	No Object	No Object
3	No Object	Object
4	No Object	No Object
5	No Object	No Object
6	No Object	No Object
7	No Object	No Object
8	Metal Object	Object
9	Metal Object	Object
10	Metal Object	Object
11	Metal Object	Object
12	Non-Metal Object	No Object
13	Non-Metal Object	Object
14	Non-Metal Object	Object
15	Non-Metal Object	Object

Figure 16: Neural Network identification for buried objects.
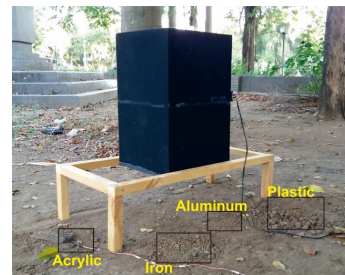
Figure 17: True field experiments for buried object identification

4 CONCLUSION

We have designed and realized a device to detect buried objects based on the acousto-seismic method. The 60 hertz sinusoidal signal is amplified by an audio amplifier to drive a 12-inch subwoofer speaker to produce mechanical vibrations of 125 dB. The seismic vibrations propagating in the ground are measured by the ADXL335 MEMS accelerometer. The FFT method converts vibrations in the time domain to the frequency domain. The Neural Network algorithm is applied to distinguish these wave spectrums to determine buried objects. The experimental results show that this system can distinguish between buried metal and non-metal objects with an identification rate of 77%. This system could also recognize the shallow buried objects with a success rate of 86.6%

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The Effect of Intellectual Capital (IC) on Financial Performance of Islamic Banking by Leverage as a Moderating Variable

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Keywords: Intellectual Capital, VAIC, Leverage, Financial Performance.

Abstract: The purpose of this study was to examine the effect of Intellectual Capital (IC) on Financial Performance which is proxied by Operational Costs to Operating Income (OCOI) and moderated by Leverage on Islamic Banking in Indonesia for annual periods from 2001 to 2018. The results of this study showed that IC can influence OCOI, but Leverage could not moderate the IC relationship to OCOI so that it had a negative and not significant value. The results of this study could be considered by Islamic banks in Indonesia to improve IC quality and financial performance.

1 INTRODUCTION

In the current era of globalization, it is encouraging business people to continue to innovate in technology development to facilitate all community activities and activities both in terms of personal and business matters. In the world of good business, trading companies, manufacturers and financial institutions such as Islamic banking are urgently needed technologies that can facilitate all activities in order to run efficiently and effectively so that they can maintain their existence. increasingly fierce competition makes Islamic banking change its business strategy based on the knowledge possessed by human resources or its workforce, so as to improve the quality of knowledge workers and intangible assets or intangible assets they have (Hurwitz et al., 2002). One of the advantages of intangible assets for companies and Islamic banking is having a long and renewable economic life (Prasetio and Rahardja, 2015). One of the intangible assets owned by the company is Intellectual Capital. Intellectual Capital (IC) or commonly referred to as intellectual capital began to be introduced by the first economist, Galbraith in 1969.

Services-based companies such as Islamic banking rely more on intellectual capital in the knowledge and creativity of employees than on physical capital in the form of land, machinery and monetary capital to obtain maximum value from the company (Barathi, 2010). In the banking business is a service sector business that requires a large amount of human capital and customer capital in maintaining its existence

(Mavridis, 2004).

Banking financial institutions are one of the most intensive sectors of IC when viewed from an intellectual aspect that is more thoroughly homogeneous among employees in the banking sector than other economic sectors (Firer and Mitchell Williams, 2003).

Since the monetary crisis that hit Indonesia in 1998 and in 2009, the impact was almost felt evenly in world countries but Islamic banks experienced a positive influence than conventional banks (Lestari et al., 2018). One of the successes achieved by Islamic banks is that they can reduce Operational Costs and Operational Income (OCOI) with minimal so that it can be said that banks can show efficiency, so that the profitability to be obtained is also higher. High banking efficiency shows that banks are able to run their business effectively (Sunardi, 2019).

The following is a graph of the development of Islamic banking OCOI in Indonesia from 2016-2019, namely:
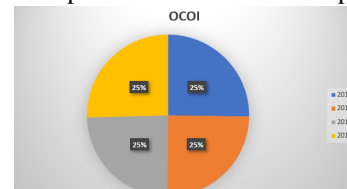
Development Period 2015-2019.png

Figure 1: OCOI Development Period 2015-2019 (OCOI Development Period 2015-2019).

Based on the above data, there is a decrease in the percentage of OCOI from 2015-2017 but there was a significant increase in 2018 and then declined again in 2019. This shows that banks can carry out their activities effectively and efficiently despite the increase in the OCOI percentage in 2018. It is necessary to do further research to find out how the influence of Intellectual Capital on Operational Costs and Operating Income or are there other variables that can improve the quality of OCOI in Islamic banking in Indonesia. But the high or low percentage of debt in a company or commonly referred to as the leverage variable can also affect the financial performance of companies and banks if it is balanced with a high intellectual capital (Barathi, 2010; Soewarno, 2011). But too much leverage can also be dangerous for the development of the Company's Financial Performance in the future.

2 LITERATURE REVIEW

2.1 Intellectual Capital

Intellectual Capital (IC) is an intangible asset that has the potential to give more value to companies and society such as copyright, intellectual property rights and franchising (Mavridis, 2004). Whereas according to (Rehman et al., 2011) intellectual capital is one of the strategic assets that has an important role in economic-based knowledge (Faradina, 2016). In this study, the independent variable is intellectual capital which consists of three components, namely Capital Employed (CE), Human Capital (HC), and Structural Capital (SC). The combination of the three added values is symbolized by the name Value Added Intellectual Capital (VAIC) developed (Pulic, 1998). Intellectual Capital is measured by value added or Value Added (VA). VA is calculated by finding the difference between output and input. Where outpun consists of total net sales and other income - other. While input consists of expenses and other costs (other than employee salaries) (Pulic, 1998).

Capital Employed (CE) shows the contribution that is made for each capital invested in the company. The CE value is obtained from available funds (equity and net income) (Goh, 2005).

Value Added Capital Employed (VACA) can be calculated with the following formula:

$$VACA = \frac{ValueAdded}{CapitalEmployee}$$

Human Capital (HC) reflects the collective ability to produce the best solutions based on the knowledge held by people in the company to add value to the company (Gupta, 2015). Value Added Human Capital (VAHU) shows the contribution made by each rupiah invested in human capital (HC) to the organization's value added, where vahu value is obtained from the employee's burden. VAHU is calculated using the following formula:

$$VAHU = \frac{ValueAdded}{HumanCapital}$$

Structural capital (SC) is a facility and infrastructure that supports employees to create optimum performance, including organizational capabilities to reach markets, hardware, software, databases, organizational structures, patents, trademarks, and all organizational capabilities to support employee productivity (Bontis, 2004). Structural capital value (STVA) can be calculated by finding the difference between VA and HC and divided by VA value, where structural capital value is obtained from the difference between VA and HC values. The formula for calculating STVA can be seen below:

$$VAHU = \frac{StructuralCapital}{ValueAdded}$$

After calculating the overall components of the IC, the last step is to calculate the value added intellectual capital (VAIC). VAIC can be calculated using the following formula:

$$VAIC = VACA + VAHU + STVA$$

$H_1 = VAIC$ has a significant effect on OCOI

2.2 Leverage

Leverage is the portion of company assets financed by debt. With the existence of leverage, also the interest costs that must be paid by the company. On the one hand, leverage can increase the ability of companies to invest in the creation of information systems that can enhance the competitiveness and excellence of companies, but the repayment of loans and interest payments can also limit funding for human resources (Nawaz and Haniffa, 2017).

H_2 : Leverage affects significantly between VAIC and OCOI

2.3 Firm Size

Firm size as an indicator that shows how much the company has wealth that is used to run a business. Firm size is used as a control variable because it has a direct effect on company performance. Firm size is used to control the impact of measures in the creation of prosperity through economies of scale, monopoly

power, and bargaining power. The size of the company (firm) can be measured using market capitalization, total assets, number of employees, and company cycles, such as growing and mature (Audreylia and Ekadjaja, 2014).

2.4 Bank Age

Older companies have better performance than younger ones, because their experience in the market helps them gain competitive advantage through better implementation of staff recruitment, production and marketing strategies (Irawan and Achmad, 2014). The age of the company is proxied by the period of time since the company was established until the research was carried out so that the age of the bank is used as a control variable because it has an effect on the duration of the establishment of the company or bank.

2.5 Financial Performance

The success of the company in achieving company goals can be seen by measuring its performance. Performance measurement is needed as information for internal and external parties to make decisions. Intellectual capital affects the company's financial performance. Companies that have human capital with the ability, competence and high commitment will increase productivity and efficiency which in general will increase company profits. Structural capital is reflected in the ability of the system, structure, strategy and corporate culture in finding market demand and achieving company goals (Puspitosari, 2016).

Bank efficiency measurements can be used by using a comparison between Operational Costs and Operating Income (OCOI). This performance is a measure of efficiency commonly used to assess the performance of banking efficiency. The greater the OCOI of a bank shows the greater the amount of operating costs, so it tends to decrease the profitability of the bank and conversely the smaller the OCOI a bank shows the more efficient, so that profitability will be higher. Banks with high efficiency show banks are more effective in carrying out their business (Sunardi, 2019).

3 RESULTS AND DISCUSSION

The purpose of this study was to see the effect of Intellectual Capital as an independent variable on financial performance which is proxied by Operational Costs

and Operating Income (OCOI) as the dependent variable with leverage as a moderating variable and total assets and bank age as a control variable in Islamic banks in Indonesia.

Good management of intellectual capital will make customers or partners loyal to banks so that they can have a good influence on financial performance. The data used in this study is secondary data obtained from annual reports from 2001 to 2018 published by the Financial Services Authority (FSA). The population in this study are all Islamic banks in Indonesia which consist of Sharia Commercial Banks (SCB) and Sharia Business Units (SBU). The sample used in this study consisted of 3 Islamic banks, namely Bank Mega Syariah, Bank Muamalat Indonesia and Bank Syariah Mandiri. The sample selection in this study uses Purposive Sampling. Purposive Sampling is the selection of samples based on several criteria, as follows: a. Banks registered consecutively during the observation period, namely 2001-2018; b. Banks that issue annual financial reports regularly. This study applied data analysis techniques using simple linear regression, multiple linear regression and linear regression with moderating variables (Moderate Regression Analysis) and control variables. The tool used in this study is to use Statistical Product and Service Solution (SPSS) version 22.0.

Before conducting multiple regression analysis to test the effect of VAIC on Operational Costs and Operating Incomes (OCOI), a classic assumption test was carried out to ensure that the data obtained passes the normality test. The classic assumption test showed that the data was normally distributed with the value of Asymp. Sig (2-tailed) 0.200 greater than α (0.05). The results of the normality test were shown in Figure 2:

		Unstandardized Residual
N		54
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	6.36621249
Most Extreme Differences	Absolute	.086
	Positive	.086
	Negative	-.071
Test Statistic		.086
Asymp. Sig. (2-tailed)		.200[c,d]

Figure 2: Normality Assumption Test of Regression Model One-Sample Kolmogorov-Smirnov Test.

Source: data processed.

After passing the classic assumption test then the research hypothesis testing was carried out as follows: From the results of multiple linear regression analysis the multiple linear regression equation was obtained

according to the research conducted (Nawaz and Haniffa, 2017) as follows:

$$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + e. \qquad (1)$$

$$Y = 121.316 - 4.186VAIC - 1.788Firmsize + 0.399AgeBank + e. \qquad (2)$$

Variable	Unstandardized Coefficients	T	Sig.
(Constant)	121.316	10.769	.000
VAIC	-4.186	-4.999	.000
FirmSize	-1.778	2.665	.009
AgeBank	.399	-2.726	.010
R Square	.438		
Adjusted R Square	.404		

Figure 3: T-test of Multiple Linear Regression Models Coefficients[a].

a Dependent Variable: BOPO

Based on Figure 4 showed that the determination coefficient value is 0.438. This showed that the OCOI variable could explain VAIC, firm size, and age bank variables of 0.438 or 43.8%. From the results of the regression analysis, it was found that VAIC had a negative effect that was significant on OCOI, indicated by a significance value of 0.000 and a t value of -4.999. This result was in line with the research of (Soheili and Pakdel, 2012; Andriana, 2014) but was contrary to the study. The high Intellectual Capital (IC) cannot guarantee that the Operational Costs Ratio (OCR) can be calculated because the development of IC in banks is not a priority but it is the focus of government policy direction and Indonesian banks are still oriented to structural improvements that focus on economies of scale, efficiency and adequacy capital. That is why the quality of the policies taken by banking companies in Indonesia is still not optimal because human resources have not been managed optimally ((Hutagalung, 2012).

Whereas for moderate regression analysis (MRA) for testing VAIC variables that were controlled by control variables against OCOI as follows:

$$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 1X1 * \beta 2X2 + \beta 3X3 + \beta 4X4 + e. \qquad (3)$$

$$Y = 121.316 - 4.186VAIC - 0.070Leverage - 1.835VAIC * \beta 2X2 - 1.835Firmsize + 0.450Agebank + e. \qquad (4)$$

Model	Unstandardized Coefficients	T	Sig.
(Constant)	110.846	10.648	.000
VAIC	-4.618	-3.690	.001
Leverage	-.070	-.074	.941
VAIC* Leverage	-.932	-.645	.522
FirmSize	-1.835	-2.746	.008
AgeBank	.450	2.639	.011
R Square	.443		
Adjusted R Square	.443		

Figure 4: T-test of Moderation Regression Analysis Models Coefficients[a].

a Dependent Variable: OCOI

Based on Figure 4 showed that the determination coefficient value was 0.443. This showed that the OCOI variable could explain the VAIC, firm size, and age bank variables of 0.443 or 44.38%. From the results of the moderation regression analysis (MRA), it was found that VAIC*Leverage had a negative and was not significant effect on BOPO, indicated by a significance value of 0.522 and a t value of -0.645. This result was in line with. Leverage cannot strengthen the relationship between IC and financial performance (BOPO) if the leverage value held by the company or bank is not too high or is still within reasonable limits.

4 CONCLUSION

This study showed that Intellectual capital (IC) could affect financial performance which was proxied to operating costs and operating incomes (OCOI) if moderated by leverage which means that H1 was accepted and H2 was rejected. Leverage cannot strengthen IC relations with OCOI, if the leverage value held by the bank is still too high level because if the bank has high debt, the bank will not be able to meet all operational costs that will have a direct impact on the bank's operations. It is important for banks to improve IC quality, especially in one component of IC, namely human capital. Quality human capital certainly can provide a

good contribution to the company so that it can minimize the amount of debt and operational costs so as to increase the income that will be received.

The limitations in this study were on data and variables, this was due to the limited data obtained by researchers. Therefore, it was expected that researchers in the future could add variables and data that would be examined so that other variables could be identified which was able to strengthen IC relations with operational costs and operating incomes (OCOI) in Sharia banking in Indonesia.

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Optimizing the Pyrolysis Process and Modelling the Calorific Value of Sawdust Charcoal as Composing Materials of Quality Briquettes

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Keywords: Optimization, Pyrolysis, calorific value, sawdust charcoal, model, briquettes.

Abstract: This study aims to optimize the pyrolysis process and build calorific value model of sawdust charcoal as composing materials of quality briquettes to fulfill the need of renewable fuels. The results showed that the calorific value of sawdust increased by 2344 Cal/g after pyrolysis. The optimum conditions of calorific value were achieved at drying temperature parameters of 60°C, pyrolysis temperature of 600°C, holding time of 120 minutes, and particle size of 100 mesh. The linearity test results between the value of R, R Square, and Adjusted R Square of the calorific value showed there is a strong correlation between drying temperature, pyrolysis temperature, holding time, and particle size. Based on validation test, the calorific value model showed that the residual normality distribution (P-value) was > 0.05 which did not form a certain pattern on the assumption of homoscedasticity, no multicollinearity ($TOL > 1$; $VIF < 10$) and the DW value was between the specified range. The model was declared valid. Based on the feasibility test model, P-value was $(0.000) < \alpha$ (0.05). This means the model of proper calorific value was reliable to be used to predict the sawdust charcoal calorific value.

1 INTRODUCTION

Energy demand is increasing every year with increasing population. One of the main energy sources needed by humans is the energy source from fossils. The availability of this fossil energy source will gradually run out, so that it becomes a serious problem because it cannot be renewed. High dependency on fossil resources combined with the need to reduce CO_2 emissions due to the climate change force people to utilize renewable energy sources, including biomass.

Biomass is a renewable energy source required to meet the energy needs, and is also used for carbon neutrality as a means of preventing climate change. Vargas (Vargas-Moreno et al., 2012) states that advanced societies have replaced the use of fossil fuels with biomass. Wisakha (Wisakha, 2015) explains that biomass is able to produce continuous heat, therefore it can be used to replace fossil fuel. One of the renewable energy from biomass as a constituent material for briquettes is sawdust (Lela et al., 2016).

Pyrolysis is needed by sawdust used to make briquettes. Pyrolysis is a thermal degradation process of solids in the absence of oxygen which allows the occurrence of several thermochemical conversion pathways so that the solid changes into gas, liquid, then back to its solid form (Blasi, 2008). Furthermore, Basu (Basu, 2013) explains that the pyrolysis reaction from biomass is as follows:

$$CnHmOp \sum liquid \rightarrow CxHyOz + \sum gasCaHbOc + H_2O + C \tag{1}$$
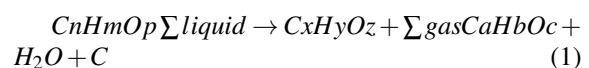
Heat pyrolysis (thermolysis) decomposition is of organic matter, such as coal heated more than 300 C° without atmospheric air. The selection of biomass materials to produce carbon is based on the availability of materials, costs and the ability to be converted into porous carbon powder after carbonization (Kalyani and Anitha, 2013). In this study, the quality of sawdust charcoal is in terms of calorific value which indicates the energy contained in the fuel per unit mass of fuel (cal/g). This research is in accordance with the development of solid bio-fuel using a wood pellet model (Giacomo and Taglieri, 2013).

The research conducted (Lela et al., 2016) concerning the physical, mechanical and thermal properties of sawdust briquettes is used as a reference for fuel quality. The optimal value obtained for the briquette making process parameters is the compression strength of 588.6 KN, sawdust mass of 46.66% and drying temperature of 22 C°. Based on the mathemat-

263

ical model, the optimal values generated are calorific values increased to 17.41 MJ/kg, ash content decreased to 6.62% and maximum compressive strength is of 149.54 $N/mm2$. Research on sawdust briquettes was also carried out by (Stolarski et al., 2013) which showed that the highest calorific value in sawdust briquettes was 18.144 MJ/kg. Moreover, sawdust briquettes have an effect of 0.40% on ash content.

2 MATERIAL AND METHOD

2.1 Material

The material used in pyrolysis is sawdust powder from teak wood.

2.2 Method

Data collection of pyrolysis process and calorific value refers to orthogonal L9(3)4 arrays. The independent variables used in the study were drying temperature, pyrolysis temperature, holding time, and particle size. The dependent variable to determine the quality of sawdust charcoal is the calorific value. The method for optimizing pyrolysis parameters is Taguchi, while for modelling of calorific value is multiple linear regression model (MLRM) analysis.

3 RESULTS AND DISCUSSION

The effect of level factor differences on the sawdust charcoal calorific value which has the highest average calorific value of 6231 cal/g was achieved at drying temperatures of 60 C°, pyrolysis temperature of 600 C°, holding time of 120 minutes, and particle size of 100 mesh. The calorific value is influenced by water content and carbon content. This study is in line with the research of (Sundaram et al., 2016) which states the water content of the particles changes with the variation of drying time in fluidized bed drying. The same study was also carried out by (Wilk et al., 2016) who stated that the carbonization of wood residue into charcoal occurred during the low temperature process.

3.1 Normality Test

The normality test of the Sawdust Charcoal calorific value variable uses a significance level of α = 0.05 and the Shapiro-Wilk statistical test shows that $P - value = 0.915$. Therefore, H0 is accepted. It means

that Calorific value of sawdust charcoal variables are normally distributed and are presented in Figure 1 and Figure 2.

	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Sawdust Charcoal on Calorific value	0.212	27	0.003

Figure 1: Normality Test of calorific value.

	Shapiro-Wilk		
	Statistic	df	Sig.
Sawdust Charcoal on Calorific value	0.915	27	0.060

Figure 2: Normality Test of calorific value (extension).

a Lilliefors Significance Correction

3.2 ANOVA

Based on ANOVA calculations, the four variables namely drying temperature, pyrolysis temperature, holding time, and particle size have a significant influence on the sawdust charcoal calorific value with the percentage value of the contribution consecutively is 7.877%; 54.77%; 11.534%; and 25.817%. In this case, the pyrolysis temperature has the greatest influence on the sawdust charcoal calorific value because the higher the pyrolysis temperature is, the lower the water content and the higher the calorific value. The results of this study was in line with the research of (Mandala et al., 2016) which states that pyrolysis temperature is varied from 200 C°to 500 C°and in using the random wood powder size, there is 29% bio-oil yield occurs at a temperature of 400 C°.

3.3 Optimization

The optimum conditions of calorific value on sawdust charcoal obtained were material drying temperature of 60 C°, pyrolysis temperature of 600 C°, holding time of 120 minutes, and particle size is of 100 mesh as shown in Figure 3 and Figure 4. The difference in mean values between factor effects is shown in Figure 5 and Figure 6. Research on optimization using the Taguchi method was also conducted by ((Azadi et al., 2011) and (Roy, 2010).

Number	Column/Factor
1	X1: Drying Temperature
2	X2: Pyrolysis Temperature
3	X3: Holding Time
4	X4: Particle size
	Total contribution all factor

Figure 3: Optimum condition of calorific value.

Description of level	Level	Contribution
60 °C	2	161.889
600 °C	3	290.666
120 minutes	3	605.888
100 mesh	3	291.444
		1349.886

Figure 4: Optimum condition of calorific value (extension.).

Number	Column/Factor	Level 1st
1	X1: Drying Temperature	6316.67
2	X2: Pyrolysis Temperature	5697.44
3	X3: Holding Time	6009.56
4	X4: Particle size	5783.67

Figure 5: Factor Effects of calorific valu.

Number	Column/Factor	Level 1st
1	X1: Drying Temperature	6316.67
2	X2: Pyrolysis Temperature	5697.44
3	X3: Holding Time	6009.56
4	X4: Particle size	5783.67

Figure 6: Factor Effects of calorific value (extension).

The average sawdust calorific value obtained before pyrolysis was 3887 cal/g, and after pyrolysis the average sawdust charcoal calorific value was 6231 cal/g. The effect of drying and pyrolysis are very significant in increasing the sawdust calorific value. This sawdust charcoal has fulfilled the Indonesia National Standard so that sawdust charcoal is suitable as a high quality briquette maker. This study is in accordance with the results of (Wilk et al., 2016) which used pyrolysis of wood waste material by varying carbonization temperatures of 230, 260 and 290 C°and carbonization times of 0.5, 1.0 and 1.5 hours. The same study was also carried out by (Al-Refaie et al., 2010) who explained that the HHV from torrefied samples increased with increasing temperature. The highest HHV was found at 26.09 MJ/kg obtained at 60 minutes and 300 C°.

3.4 Building a Calorific Value Model

Linearity test is a procedure to find out whether linear data distribution is or not. The relationship of the response variable sawdust charcoal calorific value and predictor variables is shown in Figure 7 and Figure 8.
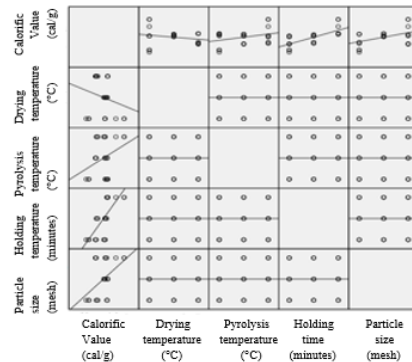
Fig 1. Relationship between independent variable and calorific value

Figure 7: Relation between independent variable and calorific value

	Kolmogorov-Smirnova		
	Statistic	df	Sig.
Sawdust Charcoal on Calorific value	0.212	27	0.003

Figure 8: Model Summary[b].

Based on Figure 8, the value of R=0.935 shows a fairly close degree of linear relationship between the response variable of the calorific value and the predictor variable. The R Square=0.875 and Adjusted R Square=0.852 showed that 85.2% of the variance in the calorific value variable can be explained by the independent variable. Meanwhile, St. Error=1.682 states the magnitude of the variance of the regression model. Thus, there is a linear relationship between the variables sawdust charcoal calorific value with drying temperature, pyrolysis temperature, and holding time and particle size. This modelling research is in accordance with the results of (Sundaram et al., 2016) that describe the process of drying materials using temperature variations of 55, 60 and 65 C°; speeds of 2.2, 2.4 and 2.6 m/s and moisture content of 27.5, 30 and 32.5% of the total weight.

3.5 Overall Test (Model Feasibility)

The feasibility test of multiple regression models at the level of significance: α0.05 using the F test is shown in Figure 9 and Figure 10. Based on ANOVA in Figure 9, P-value (0.000) < α (0.05). H0 is rejected, meaning the sawdust charcoal calorific value model is suitable for use.

Model		Sum of Squares	df
	Regression	434.057	4
1	Residual	62.274	22
	Total	496.331	26

Figure 9: ANOVA[a].

Mean Square	F	Sig.
108.514	38.336	0.000b
2.831		

Figure 10: ANOVA[a] (Extension).

a Dependent Variable: calorific value (cal/g)

b Predictors: (constant), drying temperature (°C), pyrolysis temperature (°C), holding time (minutes) and particle size (mesh)

3.6 Coefficient Feasibility Test

The coefficient feasibility test is used to determine the level of feasibility of the independent variable coefficients in the formation of a model of calorific value. The output of the coefficient feasibility test of the sawdust charcoal calorific value is presented in Figure 11 and Figure 12.

Model		Unstandardized Coefficients	
		B	SE
	(Constant)	149.644	8.777
	Drying Temperature (°C)	-0.338	0.079
1	Pyrolysis Temperature (°C)	-0.236	0.066
	Holding Time (minutes)	-0.040	0.004
	Particle size (mesh)	-0.057	0.013

Figure 11: Coefficient feasibility test[a].

Standardized Coefficients	t	Sig.
Beta		
	17.049	0.000
-0.322	-4.265	0.000
-0.269	-3.568	0.002
-0.768	-10.174	0.000
-0.328	-4.348	0.000

Figure 12: Coefficient feasibility test[a] (extension).

a Dependent Variable: calorific value (cal/g)

Based on Figure 11 and 12, all the independent variables in the model significantly affect the sawdust charcoal calorific value variable. The mathematical model to predict sawdust charcoal calorific value as a function of drying temperature, pyrolysis temperature, holding time and particle size are:

$$\hat{Y}(cal/g) = 4708.58{-}33.23X_1 + 42.71X_2 + 5.70X_3 + 12.32X_4 \qquad (2)$$

Based on the above equation (2), the higher of pyrolysis temperature, holding time and particle size are significant to the higher the calorific value. This happens because the higher the pyrolysis temperature, the higher the water content lost, the material becomes dry so that the water content becomes low and the carbon is bound as high which results in a high calorific value. The results of this study is in accordance with (Lela et al., 2016) which states that the mathematical model and optimal value produces a calorific value increased to 17.41 MJ/kg, ash content decreased 6.62% and maximum compressive strength of 149.54 N/mm^2. The same study was alsocarried out by (Al-Refaie et al., 2010) which explained that the optical mal parameter design with regression technique and grey relational analysis. Research on optimization and regression modelling were also conducted by (Vishwakarma et al., 2012).

3.7 Model Validation

Residual analysis is a way to validate the sawdust-charcoal calorific value model. The results of residual analysis summary to determine the validity of the response model to the sawdust charcoal calorific value is presented in Figure 13. The model validation test results show that the residual normality distribution (P-value) is 0.563> 0.05, no particular pattern is formed on the assumptions of homoscedasticity, no multicollinearity ($TOL > 1; VIF < 10$) and the DW value is in the range of 0.878<1.456 <1.514.

	Kolmogorov-Smirnova		
	Statistic	*df*	*Sig.*
Unstandardized Residual	0.135	27	0.200*

Figure 13: Residual normality test of calorific value.

Shapiro-Wilk		
Statistic	*df*	*Sig.*
0.961	27	0.397

Figure 14: Residual normality test of calorific value (extension).

Based on Figure 13 and Figure 14, it can be concluded that the sawdust charcoal calorific value model has met the eligibility requirements, and model validation, so that the resulting model is declared feasible and valid and can be used to predict the sawdust charcoal calorific value. The drying and pyrolysis treatment has a positive effect on increasing the calorific value. It is proved because the initial sawdust calorific value of 3887 cal/g increased to 6231 cal/g after drying and pyrolysis. Therefore, there was an increase in the calorific value of 2344 cal/g.

4 CONCLUSIONS

The optimum condition of the pyrolysis process which can increase the calorific value of sawdust is the drying temperature of 60 C°, the pyrolysis temperature of 600 C°, holding time of 120 minutes, and particle size of 100 mesh. The linearity test results show that the value of R; R Square; and Adjusted R Square at the calorific value to have a strong correlation with drying temperature, pyrolysis temperature, holding time, and particle size. The result calorific value model is $\hat{Y}(cal/g) = 4708.58 - 33.23X1 + 42.71X2 + 5.70X3 + 12.32X4$. The validation test results of the heat value model show that the residual normality distribution (P-value) > 0.05 does not form a certain pattern on the assumption of homoscedasticity, no multicollinearity (TOL > 1; VIF < 10) and the DW value is within the specified range so the model is declared valid. The model feasibility test results in a P-value $(0.000) < \alpha$ (0.05) so that the calorific value model is declared feasible and can be used to predict the calorific value of sawdust charcoal to produce a quality briquette.

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Preconditioned Gauss-Seidel Method for the Solution of Time-fractional Diffusion Equations

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Keywords: Linear System, Preconditioned Gauss-Seidel (PGS) method.

Abstract: In this paper, we deal with the application of an unconditionally implicit finite difference approximation equation of the one-dimensional linear time fractional diffusion equations via the Caputo's time fractional derivative. Based on this implicit approximation equation, the corresponding linear system can be generated in which its coefficient matrix is large scale and sparse. To speed up the convergence rate in solving the linear system iteratively, we construct the corresponding preconditioned linear system. Then we formulate and implement the Preconditioned Gauss-Seidel (PGS) iterative method for solving the generated linear system. One example of the problem is presented to illustrate the effectiveness of PGS method. The numerical results of this study show that the proposed iterative method is superior to the basic GS iterative method.

1 INTRODUCTION

Based on previous studies in (Mainardi, 1997; Diethelm and Freed, 1999; Meerschaert and Tadjeran, 2004; Zhang, 2009)many successful mathematical models, which are based on fractional partial derivative equations (FPDEs), have been developed. Following to that, there are several methods used to solve these models. For instance, we have transform method (Chaves, 1998), which is used to obtain analytical and/or numerical solutions of the fractional diffusion equations (FDE). Other than this method, other researchers have proposed finite difference methods such as explicit and implicit (Agrawal, 2002; Yuste and Acedo, 2005; Yuste, 2006). Also it is pointed out that the explicit methods are conditionally stable. Therefore, we discretize the time-fractional diffusion equation via the implicit finite difference discretization scheme and Caputo's fractional partial derivative of order α in order to derive a Caputo's implicit finite difference approximation equation. This approximation equation leads a tridiagonal linear system. Due to the properties of the coefficient matrix of the linear system which is sparse and large scale, iterative methods are the alternative option for efficient solutions.As far as iterative methods are concerned, it can be observed that many researchers such as Ghuang-hui (Ghuang-hui et al., 2006), Young (Young, 2014), Hackbusch (Hackbush, 1994) and Saad (Saad, 1996)

have proposed and discussed several families of iterative methods. In addition to that, the concept of block iteration has also been introduced by Evans (Evans, 1985), Ibrahim and Abdullah (Ibrahim and Abdullah, 1995), Evans and Yousif (Evans, 1985) to demonstrate the efficiency of its computation cost. Among the existing iterative methods, the preconditioned iterative methods (Ghuang-hui et al., 2006), Zhao (Zhao et al., 2000), Hoang-hao (Hhonghao et al., 2009), Gunawardena (Gunawardena et al., 1991), Saad (Saad, 1996) have been widely accepted to be one of the efficient methods for solving linear systems.

Because of the advantages of these iterative methods, the aim of this paper is to construct and investigate the effectiveness of the Preconditioned Gauss-Seidel (PGS) iterative method for solving time fractional parabolic partial differential equations (TPPDE's) based on the Caputo's implicit finite difference approximation equation. To investigate the effectiveness of the PGS method, we also implement the Gauss Seidel (GS) iterative methods being used a control method.

To demonstrate the effectiveness of PGS method, let time fractional parabolic partial differential equation (TPPDE's) be defined as

$$\frac{\partial^{\alpha} U(x,t)}{\partial^{\alpha}} = \alpha(x)\frac{\partial^2 U(x,t)}{\partial x^2} +$$
$$b(x)\frac{\partial U(x,t)}{\partial x} \tag{1}$$
$$+ c(x)U(x,t)$$

where $\alpha(x)$, $b(x)$ and $c(x)$ are known functions or constants, whereas α is a parameter which refers to the fractional order of time derivative.

The outline of this paper is organized as follows: In Section 2 and 3, an approximate the formula of the Caputo's fractional derivative operator and numerical procedure for solving time fractional diffusion equation (1) by means of the implicit finite difference method are given. In Section 4, formulation of the PGS iterative method is introduced. In Section 5 shows numerical example and its results and conclusion is given in Section 6.

2 PRELIMINARIES

Before constructing the Caputo's implicit finite difference approximation equation of Problem (1), the following are some basic definitions for fractional derivative theory which are used in this paper.

Definition 1. (Young, 2014) The Riemann-Liouville fractional integral operator, J^{α} of order$-\alpha$ is defined as

$$J^{\alpha} f(x) = \frac{1}{r(\alpha)} \int_{v}^{x} (x-t)^{\alpha} f(t)dt, \tag{2}$$
$$\alpha > 0 \, x > 0$$

Definition 2. (Young, 2014) The Caputo's fractional partial derivative operator, D^{α} of order$-\alpha$ is defined as

$$D^{\alpha} f(x) = \frac{1}{r(m-\alpha)} \int_{0}^{x}$$
$$\frac{f^{m}(t)}{(x-t)^{\alpha-m+1}dt}, \alpha > 0 \tag{3}$$

with $m-1 < \alpha \leq m, m \in N, x > 0$

To obtain the numerical solution of Problem (1) with Dirichlet boundary conditions, firstly we derive an implicit finite difference approximation equation based on the Caputo's derivative definition and the non-local fractional derivative operator. This implicit approximation equation can be categoried as unconditionally stable scheme. To facilitate us in getting this approximation equation of Problem (1), let the solution domain of the problem be restricted to the finite space domain $0 \leq x \leq y$, with $0 < \alpha < 1$, whereas the parameter α refers to the fractional order of time

derivative. In addition to that, consider boundary conditions of Problem (1) be given as

$$U(0,t) = g_0(t), U(l,t) = g_1(t),$$

and the initial condition

$$U(x,0) = f(x),$$

where $g_0(t), g_1(t)$, and f(x) are given functions. A discretize approximation to the time fractional derivative in Eq. (1) by using Caputo's fractional partial derivative of order α , is defined as (Young, 2014; Hackbush, 1994).

$$\frac{\partial u(x,t)}{\partial t^a} = \frac{1}{r(n-1)} \int_{0}^{\infty} \frac{\partial u(x-s)}{\partial t}(t-s)^{-\alpha}$$
$$ds, t > 0, 0 < \alpha < 1 \tag{4}$$

3 APPROXIMATION FOR FRACTIONAL DIFFUSION EQUATION

According to Eq. (4), the formulation of Caputo's fractional partial derivative of the first order approximation method is given as

$$D_t^{\alpha} U_{i,n} \cong \sigma_{\alpha,k} \sum_{j=1}^{n} \omega_j^{(\alpha)} \tag{5}$$
$$(U_{i,n} - j + 1 - U_{i,n-j})$$

and we have the following expressions

$$\sigma_{\alpha,k} = \frac{1}{r(1-\alpha)(1-\alpha)k^{\alpha}}$$

and

$$\omega_j^{(\alpha)} = j^{1-\alpha}$$

Before discretizing Problem (1), let the solution domain of the problem be partitioned uniformly. To do this, we consider some positive integers m and n in which the grid sizes in space and time directions for the finite difference algorithm are defined as $h = \Delta x = \frac{\gamma-0}{m}$ and $k = \Delta t = \frac{T}{n}$ respectively. Based on these grid sizes, we construct the uniformly grid network of the solution domain where the grid points in the space interval $[0, \gamma]$ are indicated as the numbers $x_i = ih, i = 0,1,2,...,m$ and the grid points in the time interval $[0,T]$ are labeled $t_j = jk, j = 0,1,2,...,n$. Then the values of the function $U(x,t)$ at the grid point are denoted as $U_{i,j} = U(x_i,t_j)$.

269

By using Eq. (5) and the implicit finite difference discretization scheme, the Caputo's implicit finite difference approximation equation of Problem (1) to the grid point centered at $(x_i, t_j) = (ih, nk)$ is given as

$$\sigma_{\alpha,k} \Sigma_{j=1}^n \omega_j^{(\alpha)} (U_{i,n-j+1} - U_{(i,n-j)}) =$$
$$a_1 \frac{1}{h^2} (U_{i-1,n} - 2U_{i,n} + U_{i+1,n}) \qquad (6)$$
$$+ b_i \frac{1}{2h} (U_{i+1,n} - U_{i-1,n}) + c_i U_{i,n},)$$

for $i = 1, 2..., m-1$.

Based on Eq. (6), this approximation equation is known as the fully implicit finite difference approximation equation which is consistent first order accuracy in time and second order in space. Basically, the approximation equation (6) can be rewritten based on the specified time level. For instance, we have for $n \geq 2$:

$$\sigma_{/alpha,k} \Sigma_{j=1}^n \omega^{(/alpha)} (U_{i,n=j+1} - U_{i,n-j}) = (\frac{a_i}{h^2} - \frac{b_i}{2h}) U_{i-1,n} + (c_i - \frac{2a_i}{h^2}) U_{i,n} + (\frac{a_i}{h^2} - \frac{b_i}{2h}) U_{i+1,n}$$
$$(7a)$$

$$\therefore \sigma_{/alpha,k} \Sigma_{j=1}^n \omega^{(/alpha)} (U_{i,n=j+1} - U_{i,n-j}) = p_i U_{i-1,n} + q_i U_{i,n} + r_i U_{i+1,n},$$

where

$$p_i = \frac{a_i}{h^2} - \frac{b_i}{2h}, q_i = c_i - \frac{2a_i}{h^2}, r_i = \frac{a_i}{h^2} - \frac{b_i}{2h}$$

Also, we get for $n = 1$,

$$-p_i U_{i-1,1} + q_i * U_{i,1} - r_i U_{i+1,1} = f_{i,1}, i = 1, 2, ..., m-1$$
$$(7b)$$

where

$$\omega^{(/alpha)} = 1, q_i* = \sigma_{/alpha,k} - q_i, f_{i,1} = \sigma_{/alpha,k} U_{i,1}$$

Based on Eq. (7b), it can be seen that the tridiagonal linear system can be constructed in matrix form as

$$AU_\smallfrown = f_\smallfrown \qquad (8)$$

where

$$A = \begin{bmatrix} q_1^* & -r_1 & & & & \\ -p_2 & q_2^* & -r_2 & & & \\ & -p_3 & q_3^* & -r_3 & & \\ & & \ddots & \ddots & \ddots & \\ & & & -p_{m-2} & q_{m-2}^* & -r_{m-2} \\ & & & & p_{m-1} & -p_{m-1}^* \end{bmatrix}$$

(m-1)x(m-1)

$$U_\smallfrown = \begin{bmatrix} U11 & U_{21} & U_{31} & \cdots & U_{m-2,1} & U_{m-1,1} \end{bmatrix}^T$$

$$f_\smallfrown = \begin{bmatrix} U_{11} + p_1 U_{01} & U_{21} & U_{31} & \cdots \\ & U_{m-2,1} & U_{m-1,1+p_{m-1}} & U_{m,1} \end{bmatrix}^T$$

4 FORMULATION OF PRECONDITIONED GAUSS-SEIDEL ITERATIVE METHOD

In relation to the tridiagonal linear system in Eq. (8), it is clear that the characteristics of its coefficient matrix are large scale and sparse. As mentioned in Section 1, many researchers have discussed various iterative methods such as Ghuang-Hui (Ghuang-hui et al., 2006), Zhao (Zhao et al., 2000), Hoang-hao (Hhong-hao et al., 2009), Gunawardena (Gunawardena et al., 1991), Young (Young, 2014), Hackbusch (Hackbush, 1994), Saad (Saad, 1996), Yousif and Evans (Evans and Yousif, 1986). To obtain numerical solutions of the tridiagonal linear system (8), we consider the Preconditioned Gauss-Seidel (PGS) iterative method (Ghuang-hui et al., 2006; Zhao et al., 2000; Hhong-hao et al., 2009; Gunawardena et al., 1991), which is the most known and widely using for solving any linear systems.

Before applying the PGS iterative method, we need to transform the original linear system (8) into the preconditioned linear system

$$A^* x_\smallfrown = f_\smallfrown^* \qquad (9)$$

where

$$A^* = PAP^T,$$
$$f_\smallfrown^* = Pf_\smallfrown, U_\smallfrown = P^T x_\smallfrown$$

Actually, the matrix P is called a preconditioned matrix and defined as (Kohno et al., 1997).

$$P = I + S$$

where

$$S = \begin{bmatrix} 0 & -r_1 & 0 & 0 & 0 & 0 \\ 0 & 0 & -r_2 & 0 & 0 & 0 \\ 0 & 0 & 0 & -r_3 & 0 & 0 \\ 0 & 0 & \ddots & \ddots & \ddots & 0 \\ 0 & 0 & 0 & 0 & 0 & -r_{m-1} \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$(m\text{-}1)x(m\text{-}1)$$

and the matrix I is an identical matrix. To formulate PGS method, let the coefficient matrix in (8) be expressed as summation of the three matrices

$$A^* = D - L - V$$

$$(10)$$

where D, L and V are diagonal, lower triangular and upper triangular matrices respectively. By using Eq. (9) and (10), the formulation of PGS iterative method can be defined generally as (Ghuang-hui et al., 2006; Zhao et al., 2000; Hhonghao et al., 2009; Gunawardena et al., 1991; Kohno et al., 1997).

$$x_{\curvearrowright}^{(k+1)} = (D-L)^{-1}V x_{\curvearrowright}^{(k)} + (D-L)^{-1}f_{\curvearrowright}^*$$

$$(11)$$

where $x_{\curvearrowright}^{(k+1)}$ represents an unknown vector at $(k+1)^{th}$ iteration. The implementation of the PGS iterative method can be described in Algorithm 1.

Algorithm 1: PGS method

i Initialize $U^{\curvearrowright} \leftarrow 0$ and $\varepsilon \leftarrow 10^{-10}$.

ii For $j = 1, 2, \cdots, n$ Implement
For $i = 1, 2, \cdots, m-1$ calculate

$$x_{\curvearrowright}^{(k+1)} = (D-L)^{-1}V x_{\curvearrowright}^{(k)} + (D-L)^{-1}f_{\curvearrowright}^*$$

$$U_{\curvearrowright}^{(k+1)} = P^T x_{\curvearrowright}^{(k+1)}$$

Convergence test. If the convergence criterion i.e $\left\| U_{\curvearrowright}^{(k+1)} - U_{\curvearrowright}^{(k)} \right\| \leq \varepsilon = 10^{-10}$ is satisfied, go to Step (iii). Otherwise go back to Step (a).

iii Display approximate solutions.

5 NUMERICAL EXAMPLE

By using approximation Eq.(7), we consider one example of the time fractional diffusion equation to test the effectiveness of the Gauss-Seidel (GS), and Preconditioned Gauss-Seidel (PGS) iterative methods. In order to compare the effectiveness of these two proposed iterative methods, three criteria have been considered such as number of iterations, execution time (in seconds) and maximum absolute error at three different values of $\alpha = 0.25, \alpha = 0.50$ and $\alpha = 0.75$. For implementation of both iterative schemes, the convergence test considered the tolerance error, which is fixed as $\varepsilon = 10^{-10}$.

Let us consider the time fractional initial boundary value problem be (Ali et al., 2013).

$$\frac{\partial^{/alpha}U(x,t)}{\partial t^{/alpha}} = \frac{\partial^2 U(x,t)}{\partial x^2}, 0 < /alpha \leq 1, 0 \leq x \leq y, t > 0$$

$$(12)$$

where the boundary conditions are stated in fractional terms.

$$U_{(0,t)} = \frac{2kt^{/alpha}}{r(/alpha+1)}, U(l,t) = l^2 + \frac{2kt^{/alpha}}{r(/alpha+1)}$$

$$(13)$$

and the initial condition

$$U(x,0) = x^2$$

$$(14)$$

From Problem (12), as taking $/alpha = 1$, it can be seen that Eq. (12) can be reduced to the standard diffusion equation

$$\frac{\partial U(x,t)}{\partial t} = \frac{\partial^2 U(x,t)}{\partial x^2}, 0 \leq x \leq \gamma, t > 0$$

$$(15)$$

subjected to the initial condition

$$U(x,0) = x^2,$$

and boundary conditions

$$U(0,t) = 2kt, U(l,t) = l^2 + 2kt,$$

Then the analytical solution of Problem (15) is obtained as follows

$$U(x,t) = x^2 + 2kt.$$

Now by applying the series

$$U(x,t) = \sum_{n=0}^{m-1} \frac{\partial^n U(x,0)}{\partial t^n} \frac{t^n}{n!} + \sum_{n-1}^{\infty} \sum_{i=0}^{m-1} \frac{\partial^{mn+U}U(x,0)}{\partial t^{mn+i}} \frac{t^{n/alpha+i}}{r(n/alpha+i+1)}$$

to $U(x,t)$ for $0 < /alpha \leq 1$ it can be shown that the analytical solution of Problem (12) is given as

$$U(x,t) = x^2 + 2k \frac{t^{/alpha}}{r(/alpha+1)}.$$

All results of numerical experiments for Problem (12), obtained from implementation of GS and PGS iterative methods are recorded in Table 1 at different values of mesh sizes, m = 128, 256, 512, 1024, and 2048.

6 CONCLUSION

In order to get the numerical solution of the time fractional diffusion problems, the paper presents the derivation of the Caputo's implicit finite difference approximation equations in which this approximation equation leads a linear system. From observation of all experimental results by imposing the GS and PGS iterative methods, it is obvious at $/alpha = 0.25$ that number of iterations have declined approximately by 64.87-99.82% corresponds to the PGS iterative method compared with the GS method. Again in terms of execution time, implementations of PGS method are much faster about 4.96-93.03% than the GS method. It means that the PGS method requires the least amount for number of iterations and computational time at $/alpha = 0.25$ as compared with GS iterative methods. Based on the accuracy of both iterative methods, it can be concluded that their numerical solutions are in good agreement.

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APPENDIX

Table 1: Comparison of number iterations, the execution time (seconds) and maximum errors for the iterative methods using example at $\alpha = 0.25, 0.50, 0.75$.

M	Method
128	GS
	PGS
256	GS
	PGS
512	GS
	PGS
1024	GS
	PGS
2048	GS
	PGS

Table 2: Comparison of number iterations, the execution time (seconds) and maximum errors for the iterative methods using example at $\alpha = 0.25, 0.50, 0.75$. (extension)

K	Time	Max Error
$\alpha = 0.25$		
21017	37.73	9.97e-05
7292	35.86	9.96e-05
77231	343.63	1.00e-04
26884	261.56	9.98e-05
281598	2747.34	1.02e-04
98422	1916.28	1.00e-04
1017140	68285.36	1.09e-04
357258	14064.44	1.04e-04
3631638	158914.30	1.38e-04
21156	4104.17	1.36e-04

Table 3: Comparison of number iterations, the execution time (seconds) and maximum errors for the iterative methods using example at $\alpha = 0.25, 0.50, 0.75$ (extension).

K	Time	Max Error
$\alpha = 0.25$		
13601	5.92	9.86e-05
4715	2.23	9.84e-05
50095	42.17	9.90e-05
17417	16.68	9.87e-05
183181	339.85	1.01e-04
63298	123.01	9.96e-05
663971	2454.53	1.08e-05
232784	1007.47	1.03e-05
2380946	17795.25	1.38e-04
19153.0	3239.84	134e-05

Table 4: Comparison of number iterations, the execution time (seconds) and maximum errors for the iterative methods using example at $\alpha = 0.25, 0.50, 0.75$ (extension).

K	Time	Max Error
$\alpha = 0.75$		
6695	2.94	1.30e-04
2319	1.93	1.30e-04
24732	20.70	1.30e-04
8585	12.37	1.30e-04
90783	166.75	1.32e0-4
31619	62.78	1.31e-04
330622	1209.39	1.40e-04
115617	820.93	1.35e-04
1192528	8794.26	1.71e-04
12899	1305.5	1.35e-04

Implementation PID in Coupled Two Tank Liquid Level Control using Ziegler-Nichols and Routh Locus Method

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Keywords: Ziegler-Nichols, Routh-Locus, PID.

Abstract: In this paper, we investigated liquid level controlling of coupled two tank SISO using PID controller. Zigler-Nichols (ZN) method and Routh-Locus method were compared. Three setpoint 2cm,3cm,4cm was used to show each method respond and diffrence. Output signal, error signal, and control signal of each method was analyzed. Transient parameters consist of time constant, rise time, and steady state value was demonstrated for each method. Then, those value were compared to simulation result. It results Routh-Locus method have prefer control respond.

1 INTRODUCTION

Proportional Integral Derivative (PID) is one of popular control types in industry. (Feng, 2018) used PID for controlling boom, arm, bucket of hydrolic excavator. Parameters of PID were determined by Ziegler - Nichols (ZN) method. Priyanka and Maheswari (Priyanka et al., 2018) controlled flow rate in oil pipeline transportation with PID controller. (Yadav et al., 2016) designed control system of the ball position of the magnetic levitation system (MLS) with parameter of PID. PID also was utilized to control temperature in bioreactor(Pachauri et al., 2017). El-samahy and Shamseldin (El-Samahy and Shamseldin, 2018) was using PID for controlling speed of brushless DC motor regardless of load disturbance.

One of PID control in industry is for controlling liquid level . Liquid level control is commonly used in the water purification industry, such as the pharmaceutical, biochemical, food and beverage manufacturing industries (Başçi and Derdiyok, 2016). More than 80 % of the industry automatically used proporsional-integral-derivatif PID controllers. because PID is easier to manage, cheaper and easier to implement(Roy et al., 2017). Liquid level control is widely implemented in industries such as water level controlling in nuclear steam generator, daerator, and coupled liquid two tank system (Tan, 2011) (Liang, 2018).

Coupled two tank system is one of most plant being investigated in control study. (Roy and Roy, 2016) controlled water level of one tank to be constant as another tank level is randomly varying. (Başçi and Derdiyok, 2016) developed adaptive fuzzy algorithm to control liquid level in coupled tank. Parameter of fuzzy is identified online. They showed the result is better compared to PI controller. (Roy et al., 2017) was using fractional order PI and PD to control single input single output (SISO) coupled two tank.(Pan et al., 2005) To control a two-level and level system a backstepping controller and an adaptive backstepping controller are needed. For an exponential/asymptotic stable response using a Lyapunov machine. (Ramli, 2009) For adaptive tuning to adjust neural network weights and fine tuning controller parameters can use the particle swarm optimization (PSO) technique.They designed approach for controlling liquid levels of coupled tank Two-Input Two-Output (TITO) system by using hybrid PI-Neural Network (hybrid PI-NN) controllers. (Gouta et al., 2015) Designed a model- based step-back controller combined with high gain for two tank fluid level systems. Parameters of PID could be tuned by artificial intelligent algorithm like fuzzy, neural network, genetic algorithm, BAT algorithm, neuro fuzzy, IT2FNNC as reseachers did in (Liang, 2011) (Lian et al., 1998) (Li et al., 2008) (Katal et al., 2014). In this paper, we investigated liquid level controlling of coupled two tank SISO using PID controller. Zigler Nichols (ZN) method and routh locus method were compared.

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Be advised that papers in a technically unsuitable form will be returned for retyping. After returned the manuscript must be appropriately modified.

2 SYSTEM DESIGN

The system was a single input and single output (SISO). Beside that, there are two extra tanks were used for supporting system works. Real system is demonstrated on figure 1. Figure 2 shows the construction of coupled two tank system. The input was flow rate that was supplied from tank on the top side. Water that exit from system was collected in tank below it then directly pumped up to tank on top side.

Figure 1: System design.

Components used in this system involved two 20x19 cm3 main tanks, one 20x19 cm3 discharge tank, one 24x22 cm3 top tank as container. Figure 2 shows these component in detail. Tank 1 and tank 2 was linked by 0.5 inch pipe. This pipe has resistance

R1 that handly maintained by globe valve installed on it. R1 in this case was maintained constant. The outlet of tank 2 was coupled by 90o valve that has resistance R2. Similar with R1, R2 was maintaned constant. 1 m head pump was located inside discharge tank to pump water to tank 3.

Table 1: Component and Specification.

Tag	Name	Specification
1	Tank 3	224 x22 cm^3
2	Servo (actuator)	6 Volt
3	Tank 1	20 x19 cm^3
4	Ultrasonic sensor	5 Volt
5	Microcontroller	9 Volt
6	Tank 2	20 x19 cm^3
7	Pump	18 Watt, 1m head
8	Valve 3	1/2 inch
9	Valve 2	1/2 inch
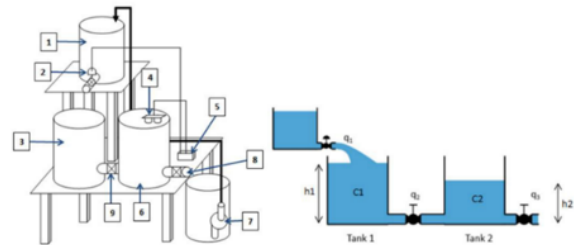
Figure 2: Construction and terminology of coupled water tank system (a) overall system (b) coupled two tank model.

Tank 2 water level h2 was sensed by ultrasonic sensor mounted on tank seal. H2 was compared with set point then error signal was appeared. Figure 3 shows a control diagram. Error signal generated control signal with PID function. Control signal actuated servo to move as error signal appearance. Flowrate was increasing proportional with servo degree.
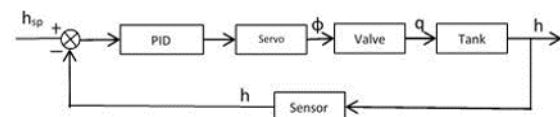
Figure 3: Control diagram.

In this system, flowrate q1 is depend on servo motor position. Figure 3 demonstrates coupled two tank system. Maximum flow rate q1 was determined by top tank level. But, top tank level was changing along with set point changing. Higher level set point, lower top tank level. In equilibrium, q1 is equal to q3. Top tank volume was decreasing, spreading in tank 1 and tank 2. Since this problem of depending flowrate to set point, relationship servo motor position in degree with h1 (cm) was non linear on all control range. To tackle this problem, control range (set point range) should be cut off to force linearity between servo motor position with h1.
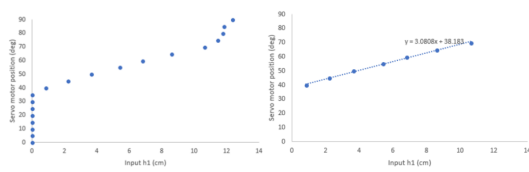
Figure 4: Servo motor position to input h1 characterization (a) original (b) after set point cutting off.

Figure 4a shows non-linearity for all output range. From 0o-35o servo motor position, system still did not give any such respond caused by too small flow rate q1. System respond started on 40o, but apparently for servo motor position more than 70o it became non-linear. Range of linerity in this system was from 40o-70o servo position or 2-10 cm. Figure 4b shows range linearity of this system. In this paper, system was analyzed in 2-4 cm set point for each method (RL and ZN). Effect of non-linearity flow rate q1 is an obstacle of each method to show their respond in control signal producing.
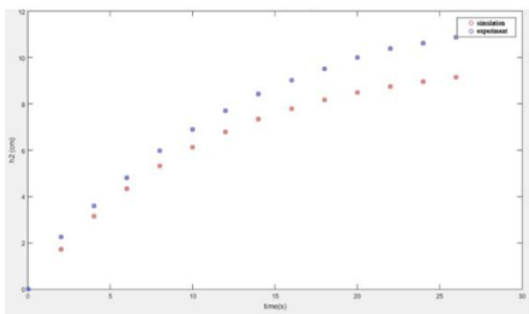
Figure 5: Validation model with step input signal.

Output from this system is level in tank 2 (h2) and the input is level tank 1 (h1). Tank 1 water level (h1) was characterized with servo 90o motor position as actuator validation. HCSR04 is ultrasonic sensor that used in output with accuracy 3-5 mm and controlled by microcontroller. Transfer function can be derived from tank equation and valve equation.

On tank 1, inlet water flow was q1 from top tank (supply tank). Outlet water flow was q2. Tank 1 has capacitance C1 and head h1. Flow rate changing (q1-q2) is proportional with rate of tank 1 volume changing that is C1h 1. Equation (1) is describing this process.

$$C_1 \dot{h}_1 = q_1 - q_2 \tag{1}$$

On tank 2, inlet water flow was q2 from tank1. Outlet water flow was q3. Tank 2 has capacitance C2 and head h2. Flow rate changing (q2-q3) is proportional with rate of tank 2 volume changing that is C1h 1. Equation (2) is describing this process.

$$C_2 \dot{h}_2 = q_2 - q_3 \tag{2}$$

Q2 is water flow rate caused by different head or level between tank 1 and tank 2. When water level tank 1 is higher than water level tank 2, water flows from tank 1 to tank 2 as consequence water flow rate has positive number. Water flow rate is depend on resistance of valve 1 (R1). Since in this case, resistance was dominant, inertance effect on pipe 1 was negligible. Equation 3 shows relationship between q2, h1, h2, and R1.

$$q_2 = \frac{(h_1 - h_2)}{R_1} \tag{3}$$

Similar with q2, q3 is water flow rate out from tank 2. This water flow rate is proportional to head or level tank2 and reciprocal to valve 2 resistance (R2). Inertance effect also was negligible. Equation 4 shows this process.

$$q_3 = \frac{h_2}{R_2} \tag{4}$$

In this system, resistance on valve 2 is very large compared to resistance on valve 1. Taking (1)(2)(3)(4) for R1 >> R2, function transfer h2 to h1 was determined.

$$\frac{h2}{h1}(s) = \frac{1}{[R_1 C_2 s + 1]} \tag{5}$$

Transfer function (5) had been validated that shows on figure 5. From validation model, time constant, settling time, and precise transfer function was generated.

Varible R1 and C2 should be analyzed to get full function transfer (5). But the way to get precise these variable needs accurately time consuming many experiments. Alternatively, value R1 and C2 could be analyzed with simple open loop experiment. These experiment also would be used for Zigler-Nichols PID parameters tuning so it will minimize time spent. From equation (5), it seen R1C1 apparently time constant of transfer function. With analyzing respond h2 to step signal h1 and getting time constant from that experiment, value R1C1 would simply get without analyze separately R1 and C1 in diffrent way of long time experiment. Figure 5 is comparison validation model with experimental data. It shows average error between model and experimen was 14%. This error

was caused by dificulty of generating purely step signal of input h1 manually. Equation (6) shows the final result of open loop function transfer.

$$G = \frac{1}{10,59s+1} \qquad (6)$$

Kp, Ti, Td with Routh locus can be obtained by deriving Gcl equation and taking $\tau_i = 2\tau, \tau_d = \frac{1}{2}\tau$ and τ value from Table 2.

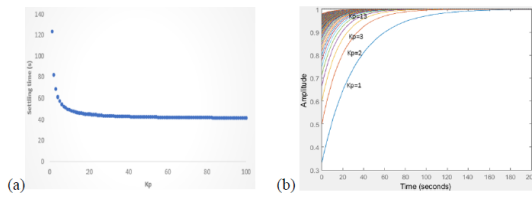$$G_{cl} = \frac{10,56s+1}{\left(\frac{2}{kp}+1\right)10,56s+1} \qquad (8)$$

Figure 6: Kp testing graph with routh locus method (a) settling time versus Kp (b) transient respong for each Kp.

Equation (8) is PID close loop function transfer with RL method. As seen from (8), system respond depends on value of Kp. In level coupled two tank system, to reach a set point from such level is time consuming as bigger tank or smaller flowrate input. The value of Kp should be chosen to minimize time consuming. Time settling (5%) is one transient variable that could show how fast system to reach steady state condition. Value of Kp was simulated to look its effect with time settling. Figure 6a shows the result of simulation with step input. When zero Kp, system was too slow respond. As value Kp riser, time settling downed then get saturation. As seen from figure 6b, for high Kp, system respond approch to critically damped. When Kp = 13 settling time was 47.7 s and it started asymptotic. Then Kp=13 was chosen. Ti and Td was generated from it. Table 3 shows PID parameters with routh locus method.

Table 3: Component and Specification.

Parameter	Kp	Ti	Td
Value	13	21,14	5,28

With routh locus method, we could adjust PID parameters (Kp, Ki, Kd) as we desire. Time settling and others transient parameter could be chosen with analyzing PID parameters. But sometimes, analyzing PID parameters with routh locus method is complicated as higher order system. When transfer function of system cannnot be gotten , or difficult to be

gotten (need long time analyses) routh locus method couldn't be implemented. Ziegler-Nichols method is easy and fast method to get PID parameters.

Table 4: PID parameter tuning with Ziegler-Nichols 1.

Type of controller	Kp	Ti	Td
P	T/L	∞	0
PI	0,9(T/L)	L/0,03	0
PID	1,2(T/L)	2L	0,5L

Ziegler-Nichols method was first introduced by J. G. Ziegler and N. B. Nichols on 1942 (Ziegler and Nichols, 1942). With these method, it does not need purely matematical approach to get PID parameters as routh locus method. By experiment, getting lag time (L) or delay and time constant (T), PID parameters could be tuned with Ziegler-Nichols rule directly (see table 4). In this system L=0.5 and T=12. Table 5 shows PID parameters with ZN method.

Table 5: PID parameters with Ziegler-Nichols method.

PID Parameter	Kp	Ti	Td
Value	10,4	60	15

Apparently Ziegler-Nichols method shown fast and simple. But it needs experiment to get PID parameters. For fast respond system, it needs varying Kp experiment make it relative time consuming. In this system, since high resistance on valve 2, minimum time to reach higher level on tank 2 was faster than to get lower level. Since this diffrence time, obvously, high overshoot was avoided. Ziegler-Nichols method and routh locus method were compared to show each respond advantages and disadvantages.

3   RESULT AND DISCUSSION

Level sensor read up and down value of ouput, not smooth graphic like simulation result. This anomaly points were caused by water ripples in tank 2. Water initially came out from top control valve. Water fell in tank 1 with such height and directly faced water surface of tank 2. This direct contant bettween water from top valve and water surface of tank 1 caused ripples. Water ripple in tank 1 affect water ripple in tank2. Water ripple in tank 2 cause anomaly reading on ultrasonic level sensor. To minimize this ripples, we implemented pipe from inlet valve to deep of tank 2. With this method, water ripples could be minimized.

Ideally, with PID parameters on table 3 and table 5, each method (RL and ZN) will create respond to exactly setpoint (0% steady state error). Routh locus method and Ziegler-Nicols method shall have small diffrence in rise time value. Routh locus will be faster to reach steady state than Ziegler-Nichols method. But in our experiment those are not exactly accurate. Figure 7 shows dinamics respond of each method with 4 cm set point. Figure 7 a shows output versus time graphic with Ziegler-Nicols. In other hand, figure 7 a shows output versus time graphic with Routh locus method. Visually, from these graphic, routh locus method has better respond than Ziegler-Nichols. It looks, Ziegler-Nichols method gives oscillation respond. This oscillation is not our desirement because it will make PID control generating control signal up and down over and over. It is energy consuming, decreasing life time of actuator (servo motor), initiating servo motor bolt joint damage. This oscillation could be looked as water ripples on tank 2. With this view, it looks clearly, Ziegler-Nichols has higher water ripples than Routh locus method. We did experiment with 3 setpoint: 2 cm, 3cm, and 4 cm and each method gave result similar water ripples level on each set point. Average water ripples of Ziegler-Nichols method and Routh locus method are 0,36 cm and 0,21 cm respectively. From water ripples view, Routh locus method has more desired method. Figure 7 c and 7 d shows error versus time graphic for setpoint 4 cm with Ziegler-Nichols method and routh locus method respectively. These graphic have strong relationship with output-time graphic on figure 7a and 7b. Error signal decreases along with output signal approach to set point. Oscillation output respond on Ziegler-Nichols method also make error signal oscillation.

(a)   (b)   (c)   (d)
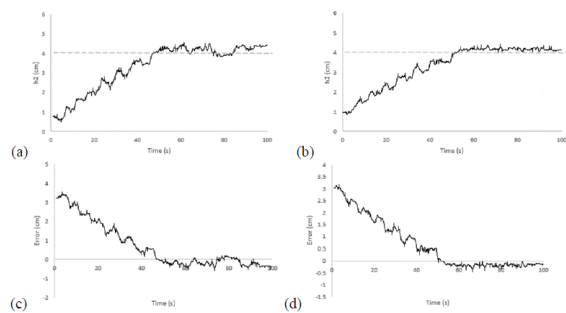
Figure 7: Output to setpoint 4 cm (a) with routh locus method (b) with zigler nichols method. Error to setpoint 4 cm (c) with routh locus method (d) with zigler nichols method.

Error signal will make PID generating control signal to operate actuator. In this case, actuator was servo motor 90o. Figure 8 shows control signal – time for set point 4 cm water level h2. As discussion ear-

lier, Ziegler-Nichols method generates relatively high water ripples or oscillation in error signal. This oscillation have strong relationship with control signal oscillation on figure 8a. Comparing figure 8a and figure 8b, Routh locus has smoother control signal than Ziegler-Nichols. Up and down control signal on figure 8a in long time period have tendency to risk bolt joint of actuator (servo motor).

This bolt joint attach servo motor to tank 3. If servo motor move over and over in extreme oscillation, bolt joint would get high oscillation torque. It would make bolt hole falling into fatigue. In several application, bolt joint fatigue is very dangerous and avoided. Reference (Ziegler and Nichols, 1942) show bolt joint fatigue damage. In control signal point of view, Routh locus method is prefer than Ziegler-Nichols.

a)   (b)
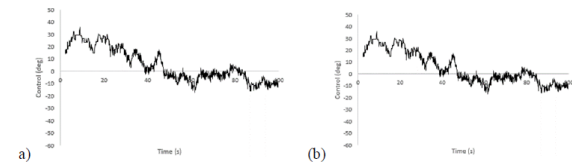
Figure 8: Control signal to setpoint 4 cm (a) with routh locus method (b) with zigler nichols method.

To compare Ziegler-Nichols method and Routh locus method, we did several experiment consist of 3 set point for each method. The result in each set point have been tabulated on table 6. Futhermore, experiment result was compared with simulation result. Rise time in simulation result should be the same in all set point that is 26,8s and 23s for Routh locus method and Ziegler-Nichols respectively. It is also valid for other transient parameters. They should be the same in all set point. But it shows value difference between experiment and simulation result. These difference was happened caused by many things of tools limited. Motion of tools platform (wood table) will cause water ripples and error sensor reading. Level sensor has limited accuracy and precission will cause output looks oscillation or changing eventhough actually it doesnt. This error appears primary because small setpoint we used for sensor spesification. Generally, from table 6, it shows Routh locus method have faster respond than Ziegler-Nichols. Also, Routh-locus method have smaller steady state error than Ziegler-Nichols. As summary, Routh- Locus have better spessification of control respond.

Table 6: System respond.

Parameter	Rise time [s]		Tou [s]		Ts 5% [s]	
	Sim.	Exp.	Sim.	Exp.	Sim.	Exp.
RL 2cm	26,8	31,1	36,5	12,2	2	2,1
ZN 2cm	23	33,1	43,1	14,5	2	2,2
RL 3cm	26,8	30,6	36,5	21,2	3	3,1
ZN 3cm	23	44	43,1	30,1	3	3,2
RL 4cm	26,8	49,4	36,5	27,9	4	4,1
ZN 4cm	23	28,7	43,1	35,1	4	4,2

4   CONCLUSION

For coupled two tank level control, tuning PID parameter with Ziegler-Nichols method is fast without long analitics formulation but respond system cannot be adjust like we want. With RL method, system respond is faster, smaller steadt state error, smaller water ripples, smoother respond. PID parameters of Routh locus method could be adjusted like we want so it made RL method powerful, more safety, more smooth, and more stable.

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