

# CELSciTech - 2019

on Communication, economics, education, law, science and technology

## Conference Proceedings

### INTERNATIONAL CONFERENCE

# “Engaging Citizens and Higher Education for Innovation and Sustainable Development Goals”

Pekanbaru, September 26<sup>th</sup>, 2019



Universitas Muhammadiyah Riau

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## FOREWORD FROM THE RECTOR OF UMRI

Assalamu'alaikum Wr. Wb.

Greetings to everyone here today, may Allah Almighty always bestow His grace and blessings upon all of us. First of all, I would like to welcome the speakers, returning and first time participants to the 4th CELSciTech International Conference who have come from several countries, namely Indonesia, United Kingdom, and Malaysia. This conference is a means of communication and sharing for researchers from universities, educational institutions, research institutions and industry to accelerate scientific development in the fields of communication, economics, education, law, science and technology. It has the potential to be a truly beneficial endeavor for all of us all. Hopefully, a lot of helpful innovations, insights, or discoveries could emerge as a result of this conference.

I'm sure we all can agree that scientific development is a monumentally crucial driving force for the progress and growth of our civilization. Scientific development is expected to almost certainly improve and increase the prosperity of our society. One path to take, in order to maximize the capacity of scientific development in improving the prosperity of our society, is to carry out more research that focuses on innovation and sustainable development goals.

To facilitate researchers to disseminate their relevant work in addressing innovation and sustainable development goals, Universitas Muhammadiyah is organizing the 4th International Conference on Communication, Economics, Education, Law, Social Humanities, Science and Technology (CELSciTech). Through this conference, UMRI initiates a forum in the form of scientific deliberation and discussions from various disciplines which are present and participating within this conference. Being able to organize such a significant event provides us here at UMRI with an immeasurable sense of pride and encouragement. Taking these steps is a huge step forward for UMRI in its journey to become a truly impactful institution in the world of academia, and in contributing to the development of potential intellectuals of the future.

There are a number of different actors involved in the success of this event. Without their cooperation and dedication, this important event would have not been possible. Therefore, it is imperative that gratitude is highly expressed where it is due. So, on this occasion, UMRI would like to express its utmost gratitude to the Institute for Research and Community Service of UMRI, CELSciTech Committee, speakers, conference participants, and sponsors as well as all other parties who support this event. Your contributions are unquestionably valuable, and they are deeply appreciated. Finally, we would like wish you all good luck, and we hope to see you next year at the 5th CELSciTech 2020.

Pekanbaru, 26 September 2019

**Dr. H. Mubarak, M.Si**

## FOREWORD BY THE CHAIR

Assalamu'alaikum Wr Wb.

On behalf of the Organizing Committee, it is my great pleasure to welcome you to CELSciTech International Conference 2019 held in Pangeran Hotel, Pekanbaru, Indonesia. The conference is an annual event organized by the Institute for Research and Community Services of Universitas Muhammadiyah Riau. It is indeed such an honor and privilege to organize this important event where experts, practitioners and researchers get together to disseminate their relevant work on communication, economics, education, law, science and technology.

This year's conference includes two main topics, namely Science and Technology, and Social Sciences and Humanities. Each main topic has several sub-topics. With this year's theme "Engaging Citizens and Higher Education for Innovation and Sustainable Development Goals", we received 120 manuscripts submitted by authors from various fields. However, after going through review process, only 91 high-quality papers were accepted to be presented in this event. 47 papers are in the scope of Social Sciences and Humanities, and 44 papers are in Science and Technology with the authors coming from 33 universities both overseas and Indonesia.

We are honored and delighted to have three prominent keynote speakers in CELSciTech 2019 who deserve my sincere thanks, namely Prof. Dr. Mohd. Hasbullah bin Hj. Idris from Universiti Teknologi Malaysia with the background of Mechanical Engineering, Dr. Ibrar Bhatt from Queen's University Belfast, United Kingdom, with the background of Education, and Dias Satria, Ph.D from Brawijaya University with the background of Economics, Finance and Banking.

CELSciTech International Conference 2019 would not be how it is without the support and advice from various parties. Therefore, I would like to extend my hearty gratitude to Rector, Vice Rectors and all staffs at Universitas Muhammadiyah Riau, and all participants for coming, sharing, and presenting their research in this conference. Special thanks go to scientific committee and reviewers for their valuable work. Most importantly, this conference is supported by dedicated organizing committee who deserves my deepest thanks and highest appreciation.

This year conference becomes special with the support from Atlantis Press as the publisher of conference proceeding. I would like to take this opportunity to give a sincere gratitude and highest appreciation to Atlantis Press, and all sponsors that cannot be mentioned one by one for their incredible supports.

Wa'alaikumsalam wr.wb.,

**Pahmi, S.Pd., MA**

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# COMMUNICATION

# *Islamic Perspectives On Social Media Literacy*

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**Abstract**—In an age of media tightness, public wisdom is needed in literating information. The necessity to literate information is also taught in Islam so that Muslims are able to filter the information received. This research includes library research and uses descriptive methods, namely discussing the Qur'anic verses relating to literacy by referring to the opinions of commentators. : 1) social media is the biggest access content, 2) Islam requires to titrate information 3), Islam forbids trusting the fascists, and 4) accountability for every act in Islam. In conclusion, Islamic teachings require every Ummah to improve literacy skills. This is because literacy is important to improve one's quality of life.

**Keywords**— *Islamic perspective, literacy, social media*

## I. INTRODUCTION

In an age of media tightness, religious understanding and media literacy are important things in the life of the nation and state (Aliasari, 2017). In the Koran, especially in surah al-Alaqaayat 1-5 explained about the command to read (literacy). Through literacy, it can add new knowledge and knowledge so that it makes it easier in life with a lot of knowledge that it has (Fahmi, 1979). However, it requires the wisdom of the community in titrating information. In order for Muslims to be able to filter the information received. One literacy that is the main concern in the acquisition of information is sourced from social media.

Social media is present in every aspect of life, dominates life, and human way of thinking, even able to influence human emotions and considerations. In addition, after a change in the political order in Indonesia, popularly known as reform, the world of social media has also undergone fundamental changes. Not only has there been an increase in the number of social media but there has also been a change in the nature and diversity of social media content qualitatively. The results of research conducted Li (2016) shows that social media is an ideal tool for public participation in promoting democracy. The interactive characteristics of social media provide new means to communicate with others more easily. It is also possible to involve an unlimited number of users.

Sophisticated social media sophistication provides opportunities for every individual to access information as they wish and can communicate easily without being limited by time. As a result, social media has an influence on how people behave and think in social life. Changes in social

institutions in a society affect social systems, including values, patterns of behaviour, or attitudes in the community that consists of various social groups (Haryanto and Nugrohadi, 2011: 237).

Social media as a form of social networking sites offers the convenience of communicating between individuals with other individuals with various facilities available. Social media also allows all forms of information or news stories to spread and can be accessed easily by everyone. Djahiri (2006: 11) explained that science and technology has given birth to concepts/propositions and new products that are all electronic-mass leaving human dependence and life on human power, animals, and nature and shortening the time gap between spaces.

The existence of social media as a tool used to communicate gives change and has a lot of influence on one's lifestyle. Changes that occur at this time is a change in material culture. Changes in material culture include changes in cultural artefacts used by the community, such as clothing models, photography works, film works, technology, and so on that continue to change from time to time to adjust the needs of the community (Bungin, 2008: 92).

Social media has a great impact on the wearer. This situation is evidenced by the user's dependence on the communication tools they have. Various social media facilities on communication tools are considered to have positive and negative influences on users. McLuhan (in Haryanto and Nugrohadi, 2011: 239) explained that information technology as the most important technology most capable of causing a change in society.

Information from uncontrolled and unorganized communication media will become enemies for communication media users. This is due to the rapid and large amount of information that must be processed and selected. With a load of information that is quite a lot (information overload) due to the speed and ease of receiving information, so the information is not handled properly and is not selected between relevant and irrelevant information (Ewald and Burnett, 1997: 81). Payari (2011) states that the variety of social media that emerged and became the latest trends for the public requires users to have self-control in their use. For that, it is necessary to study how the perspective of the Islamic religion on social media literacy with a lot of information the uncontrolled.

## II. LITERATURE REVIEW

### 2.1. Literacy Concept

Media literacy can be said as a process of accessing, critically analyzing media messages and creating messages using media tools. This statement is the opinion expressed by Hobbs (1996). Not only Hobbs, but Rubin (1998) also explained that media literacy is interpreted as understanding the source, communication technology, the code used, the message produced, selection, interpretation, and the impact of the message. Therefore, it can be argued that with the Internet or this new media changing patterns of human communication. Someone not only becomes a consumer as a connoisseur of the media but also can be a producer in the media.

The National Leadership Conference on Media Education states that media literacy is the ability to access, evaluate, and communicate messages in various forms. In article 52 of Law No.32 / 2003 concerning broadcasting interpreting media literacy as learning activities to increase the critical attitude of the community (Iriantara, 2009). Tamburaka (2013) which explains that media literacy comes from English, namely media literacy, consisting of two syllables Media means media where message exchanges and literacy means literacy, then known in terms of media literacy. In this case, media literacy refers to the ability of audiences who are literate about the media and mass media messages in the context of mass media communication. The equivalent of the term media literacy is also known as media literacy basically having the same meaning.

Thus, it was concluded that media literacy is the ability to access, analyze, evaluate, and communicate messages. This conclusion is similar to that quoted from the KPI Team. The KPI Team explained that media literacy is the ability to access, analyze, evaluate and communicate messages "( KPI Team, 2011).

### 2.2. The concept of Social Media

Social media or social media every time becomes a global phenomenon and is rooted. The existence of social media cannot be separated from the communication techniques of each individual. Henderi and Yuliana Isma (2007) explain that social media is a social networking site such as a web-based service that allows individuals to build public or semi-public profiles in a restricted system, list of other users with whom they are connected, and view and explore their list of connections made by other people with a system.

Basically, social media or social media is the latest development of new internet-based web technologies, which makes it easy for everyone to be able to communicate, participate, share and form a network online so that they can disseminate their own content. Posts on blogs, tweets or videos on YouTube can be reproduced and can be seen directly by millions of people for free (Zarella, 2010).

Gunelius (2011) briefly explained that social media is an online publishing and communication tool, website and purpose of web 2.0 that is rooted in conversation, engagement and participation. Then, social media definition by Kotler and Kevin Keller continues. According to Kotler and Kevin Keller (2012), social media is a means for consumers to share text, image, audio and video information with one another and with companies and vice versa.

## III. METHOD

This research was library research showing a series of activities relating to the method of collecting library data, reading and recording and processing research material. The approach in this study uses a qualitative approach with research procedures that produce descriptive data in the form of speech or writing and the behaviour of the people observed. As a source of research data, namely the Qur'an and the translation of the Qur'anic manuscripts of the Indonesian Ministry of Religion, as well as several Qur'anic interpretation books from experts. Data collected by the documentation method, which is looking for data about things or variables in the form of notes, transcripts, books, magazines, and so on.

## IV. FINDINGS AND DISCUSSIONS

### 4.1. Social Media Is the Largest Access to Content

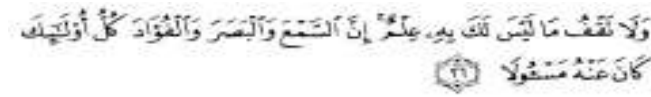
Social Media is the largest content accessed by the people of Indonesia. The importance of social media to be diluted is one of the reasons is because social media is the largest content accessed by the people of Indonesia. The survey results explained that social media was accessed by more than 97% of survey respondents. This is based on a survey conducted by the Indonesian Internet Service Providers Association (APJII) in 2016.

Not balanced with the results of a survey conducted by APJII, according to data from the World's Most Literate Nations, compiled by Central Connecticut State University in 2016, Indonesia's literacy ranks second in the bottom of the 61 countries studied. Indonesia is only better than Botswana, a country in the South African region. This fact is based on a descriptive study by examining a number of aspects. The aspects tested include five categories, namely: libraries, newspapers, educational system inputs, educational system outputs, and computer availability.

Based on the results of a survey conducted by the Indonesian Internet Service Providers Association (APJII) in 2016, it was also found that social media users from among students included the largest number of users. APJII not only conducted a survey of Indonesian internet users based on work, but this institution also illustrated that the social media content that was most accessed by Indonesian internet service users in 2016. Based on the survey results it was found that facebook is the most social media content accessed by the Indonesian people.

### 4.2. Islam Requires to Migrate Information

The teachings of Islam requires Muslims to improve their literacy abilities. The argument about the prohibition of trusting information that is not yet correct is true. This is in accordance with the teachings of Islam as stated in the Koran. In Qs. Al-Isra 'verse 36, Allah SWT said:



Meaning: *And do not follow what you have no knowledge of. Indeed hearing, vision and heart, all of that will be held accountable.*

#### 4.3. Islam Forbids Trusting the fascists

Al Qur'an explained that the wicked rarely gather with believers. When they come, it is likely that they have less or less good intentions. The wicked know that believers are not easily deceived. Believers will examine the truth of any information they receive so that the wicked person is afraid of being embarrassed. This can be interpreted in Surah Al-Hujurat Verse 6.

يَا أَيُّهَا الَّذِينَ آمَنُوا إِن جَاءَكُمْ فَاسِقٌ بِنَبَأٍ فَتَبَيَّنُوا أَن تُصِيبُوا قَوْمًا بِجَهَالَةٍ فَتُصِحُّوا عَلِيمًا فَعَلِمْتُمْ نَادِمِينَ

Meaning: *“O you who believe, if you come to the wicked, bring a message, then examine it carefully so that you do not inflict a disaster upon a people without knowing the circumstances that cause you to regret your actions.”*

#### 4.4. The responsibility of every deed in Islam

Muslims believe there is an end day. On the last day, every human being will be held accountable even though it is small which is described by Sarah seeds. Good deeds and bad deeds, everything has a reward. Include in it about spreading information that is not yet known the truth. In accordance with the proposition in the Qur'an Surah Az-Zalzalah: 7-8.

فَمَنْ يَعْمَلْ مِثْقَالَ ذَرَّةٍ خَيْرًا يَرَهُ \* وَمَنْ يَعْمَلْ مِثْقَالَ ذَرَّةٍ شَرًّا يَرَهُ

Meaning: *“Whoever does good deeds as heavy as dzarrah, surely he will see (replies) it. And whoever commits a crime as big as dzarrah, surely he will see it (in return) as well” (QS. Az Zalzalah: 7-8).*

### V. DISCUSSION

Social media does have a role in human life. But according to Morozov (2011), social media is inconsequential. Research conducted by Schilder, E., Lockee, B., Saxon, DP, & Houston, S. (2016) and Melki, J. (2011) explores the role of social media among young people in their countries and also examines assessment procedures to measure literacy skills in schools. Different from the previous two studies, this research tries to explain to the people especially those who are Muslim that Islam regulates every aspect of life, including regulating how to receive information received. Cottle's research (2011), explains that social and digital media are considered to play a role in the uprising in Arabic remains a controversial and understudied topic. Journal that reinforces the importance of literacy namely Melki (2014) which shows low media literacy levels and mostly uses media apathy towards activism politics and more focused on entertainment because of lack of government oversight.

### VI. CONCLUSION

Social media has an influence on how people behave and think in social life. The variety of social media that are emerging and becoming the latest trend for the public requires users to have self-control in their use. For this reason, it is necessary to study how the Islamic perspective on social media literacy with a lot of uncontrolled information. The importance of social media to be diliterated one of the reasons is because social media is the largest content accessed by the people of Indonesia. Islamic teachings require their people to improve their literacy. This is explained in several propositions of the Koran, including in the letter Al Isra 'verse 36, the letter Az Zalzalah verses 7 sd 8, Surah Al Hujurat verse 6, and many other propositions in the Qur'an. Believers will examine the truth of every information received. Good deeds and bad deeds, all of which have rewards, including in spreading information that is not yet known the truth. So, in the teachings of Islam clearly regulates every aspect of life, including regulating how to receive information received.

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# Knowledge Sharing Practices in Academics

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**Abstract**— Knowledge sharing is considered as the foundation of learning and research at colleges and universities. In the context of higher education, knowledge sharing is the process of exchanging and acquiring knowledge that is needed through informal and formal channels technical facilities.

This systematic literature review explained knowledge sharing practice both by university and student. In this systematic Literature Review, will identify and analyze what common practices of knowledge sharing on academic purpose from each research from 2007 until 2017.

**Keywords**—knowledge sharing, student, academics, practices

## I. INTRODUCTION

Rapid advancement in information technology has revolutionized the business organizations by introducing new methods of learning and sharing knowledge. Knowledge has become an important asset for business organizations in creating and sustaining competitive advantage. It is also widely recognized to be a critical component for any individual or organization to succeed in an increasingly demanding competitive environment.

Knowledge sharing has gained a lot of interest as organizations have come to appreciate its positive impact on organizational effectiveness and competitive advantage. Unsurprisingly, then, much research has been undertaken at the organizational level in the business sector and lessons have subsequently emerged. However, knowledge sharing is not only of interest and value to commercial organizations; lessons about knowledge sharing can be learned from, and subsequent benefits gained in, other sectors; one such sector is higher education.

Every paper explained different knowledge sharing practice both by university and student. In this systematic Literature Review, will identify and analyze what common practices of knowledge sharing on academic purpose from each research from 2007 until 2019s.

This paper is organized as follows, in section 2, describes details of conducting this SLR. the result are discussed in section 3 and conclusions are provided in section 4.

## II. METHODOLOGY

Systematic literature review is a method to identify, evaluate and interpreting all study variables relevant to a specific research question, and an interesting phenomenon [9]. Systematic literature review aimed to present a fair evaluation of the research topic, using the methodology that is reliable, accurate, and auditable [10].

This systematic literature review used kitchenham method, and divided into 3 main process, Planning, Conducting review, and Reports.



Figure 1. Systematic Literature Review Method

### A. Planning

Planning Process has two steps, Identification of the need for the review ad Specifying the research question.

1. Identification of the need for the review
2. Research Question

Table 1. Research Question

Research Question	Description of Objective
RQ1. What is the common practices of knowledge sharing among student?	To find out and understanding various and common practices of knowledge sharing in academic purposes.

### B. Conducting the Review

This process divided into five steps, which are identification of research, selection of primary studies, study quality assessment, data extraction, and data synthesis.

1. Identification of Research

The papers used in this SLR were identified by searching electronic databases, mostly from Science direct, IEEE, Springer link, and PreQuest. The studies were from 2010 until 2017. To search relevant studies, it must have specific keywords. The best keyword for this SLR is: "Knowledge AND sharing AND student OR Academic". The Boolean operator AND used to link two search strings together that contain two or more concepts, and the Boolean operator OR used to include alternative search terms [8].

2. Primary Studies Selection

Search result of electronic database returned 111320 results. The result filtered by reading the title and abstract. Selection process used 3 parameters, which are: (1) Papers have relevant title; (2) Papers has relevant abstract and introduction; (3) paper has process of the experiments; (4) papers have the analysis result.

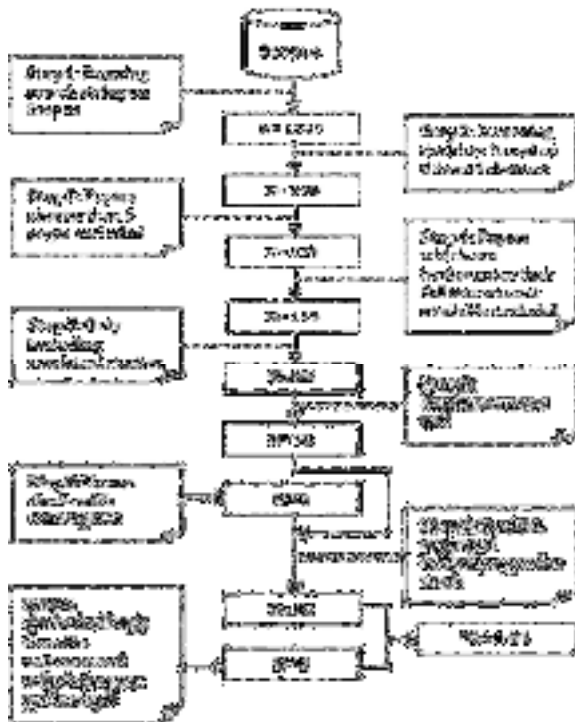


Figure 2 Study selection steps

Table 3. Collected Paper

Electronic Database	Number of Publications identified relevant to the research question
IEEE	6
PreQuest	1
Science Direct	18

The selected papers must have the criteria of this systematic literature review to obtain complete result. The table below is about Inclusion that should inclusion and exclusion that should not Criteria.

Table 3. Inclusion and Exclusion

Inclusion	Exclusion
Papers about knowledge sharing in academics	Duplicate papers
Papers about implementation of knowledge sharing in academics	Incomplete papers
Papers that can answer the research question	Papers that not in English/Bahasa
Studies reporting empirical research using methods such as case study, survey, and experiment.	Bias literature and unpublished article

From primary study selection process, there are 9 papers that will be extracted to get the data for analysis so that can answer the research question.

3. Data Extraction

The data extraction aims to identify the relevant information that should extracted from each of the papers in order to answer the research question. The selected papers will be read and understand to obtain and extract important and relevant data that support the SLR about Knowledge Sharing Practices Among Students.

4. Data Synthesis

Each extracted data will be summarized and assessed about the research question. The synthesize could help to create the conclusion of this SLR about Knowledge Sharing Practices Among Students.

III. RESEARCH RESULT

A. Significant Journal Publication

In this literature review, 9 primary studies that analyze the common knowledge sharing practices are included. A short overview of the distribution studies over the years is shown in figure 2. the distribution studies over the years.

Table 4. Percentage of Publication in each database.

Electronic Database	Number of Publications identified relevant to the research question
IEEE	2
Science Direct	7

B. Knowledge Sharing Practice

Table 5. Knowledge Sharing Practices from each paper

Paper	Knowledge sharing practice
Mustafa I.M. Eid,	The result of the study implies

Ibrahim M. Al-Jabri “Social networking, knowledge sharing, and student learning: The case of university students”	that the use of Social Networking Service (SNS) for chatting and online forum or discussion for file sharing are common among university student and positively affects knowledge sharing and student learning.
B. J. Krämer, M. Klebl, and A. Zobel, “Sharing educational knowledge and best practices in edu-sharing,”	the study presented a comprehensive e-learning portal called Edu-sharing and methodological foundations that allow educators to relate reusable content with codified best practices in teaching and learning.
Mohammed A. Balubaid, “Using Web 2.0 Technology to Enhance Knowledge Sharing in an Academic Department”	The study shows that 70 % of the students prefer to use facebook as the best platform for sharing an information and knowledge.
C. S. C. Asterhan and E. Bouton, “Teenage peer-to-peer knowledge sharing through social network sites in secondary schools,”	The combined findings from the two studies presented here reveal a more balanced picture: In contrast to the argument that SNS activity consists of mere socializing and entertainment which comes at the expense of academic involvement, we found that teenagers have adopted SNS technology for academic purposes as well.
S. Moghavvemi, M. Sharabati, T. Paramanathan, and N. M. Rahin, “The impact of perceived enjoyment, perceived reciprocal benefits and knowledge power on students’ knowledge sharing through Facebook,”	examine the usability of a Facebook, to share knowledge within a specific learning context, and therefore present considerations for educators to enhance and alter their respective practices.
K. W. Chu, C. M. Capio, J. C. W. van Aalst, and E. W. L. Cheng, “Evaluating the use of a social media tool for collaborative group	The findings showed that most of the students participated in this study shared learning related knowledge through social software tools especially the social network sites.

writing of secondary school students in Hong Kong,”	
H. Adenan, “Communication Technology on Academician’s Knowledge Sharing Behavior at Private University,”	Private university students prefer face-to-face interactions compared to their counterparts in public universities. Public university students are keen to use online chat, and to some extent, e-mail. This may indicate that the bond between the private university students is stronger where a lot of face-to-face interactions occur during their academic pursuit.
C. Chin Wei, C. Siong Choy, G. Geok Chew, and Y. Yee Yen, “Knowledge sharing patterns of undergraduate students,”	The authors contend that the most equitable way to proceed with group work is for educators to make multiple allocation methods available and then allow individual students to choose the method that they feel is most appropriate to their needs. It is contended that this returns a degree of ownership to students, and provides the best possible opportunity for students to work with like-minded colleagues to pursue their own aims and fulfil their individual needs through their group work experiences.
Kelly Mills, Elizabeth Bonsignore, Tamara Clegg, June Ahn, Jason Yip, Daniel Pauw, Lautaro Cabrera, Kenna Hernly, Caroline Pitt “Connecting Children’s scientific funds of knowledge shared on social Media to science concepts”	The research findings suggest that Social Media Sharing can facilitate the students for discuss and share valuable knowledge, both science or non-science knowledge among them.

### C. Data Synthesis

From the result, there are 9 kind of knowledge sharing practices that can be use in Academics. In this stage, those knowledge sharing practices reduced into 3 knowledge sharing practices based on similar meaning, and similar context. Every practices is

supported by the concept within and across the studies.

Table 6. Knowledge Sharing Practices

No	Knowledge Sharing Practices
1	Social Network Services / Social Media
2	E-learning
3.	Face to Face Interaction (during class or group work)

#### IV. CONCLUSION

The systematic literature review used Kitchenham method, and consist of three main process, which are Planning the review, conducting the review, and report the review. The paper collected about 25 studies from year 2010 until 2019.

The results of the study imply that the use of SNS or Social Media for discussion and sharing information is becoming common among university students, and this positively affects knowledge sharing and impact student learning. In addition, the study found that the major SNS tools used by students in order of preference are WhatsApp, YouTube, and Facebook.

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# *Islam and Terrorism in the Discourse Analysis of Riau Mass Media*

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**Abstract**— This study aims to analyze the attitudes and media discourse towards labeling of terrorists against Islam. Data was collected using interview and a review of news about terrorists in Pekanbaru. Informants included are those who were in charge of reporting to each newspaper. This study deploys Fairclough CDA model of critical discourse analysis procedure consisting of three stages, description, interpretation and explanation. The results showed that the attitudes and discourse shown by two media essentially put forward the true values of journalism, such fair, independent, objective and factual. However, the attitude was precisely trapped in Western discourse such an effort to fight Islam as a terrorist religion. This research contributes to media efforts to gatekeeping news about terrorists, so that they are not trapped into Islamophobia by the western perspectives.

**Keywords**—Islam, Terrorists, Discourse, Media

## I. INTRODUCTION

As a predominantly Muslim country, Indonesia is apparently absorbed by the western campaign against terrorists. The enormity of the attack on the herd of terrorists was perceived to be extraordinary food for the mass media worldwide, including Indonesia.

In Indonesia, cases of attacks carried out by a group of 'Hardline Islam' also occurred. For example, the Bali bombing case involved Amrozi and Imam Samudra as intellectual actors and executors. Such was the case with the bombing of several churches in Indonesia in 2004 during Christmas celebrations. In the case of the Bali bombing, many people were the victims of the suicide bombing. This was the case with the church tragedy in several regions in Indonesia which were carried out simultaneously.

Now these cases have become historical records that will never be forgotten. Even so, many are left and scattered from cases of terror committed by a group of understandings of 'Hardline Islam'. One thing left and scattered is the western phobia of Islam and the terrorist seal of Islam by the mass media. In the Qur'an Surah As-Shaf verses 7, 8 and 9, Allah SWT says:

يَهْدِي لَّا وَاللَّهِ الْإِسْلَامَ إِلَىٰ يُدْعَىٰ وَهُوَ الْكُذِبَ اللَّهُ عَلَىٰ أَفْتَرَىٰ مِمَّنْ أَظْلَمُ مَنْ  
وَلَوْ نُورَهُ مِثْمُ وَاللَّهُ بِأَفْوَاهِهِمْ اللَّهُ نُورٌ يُنْفِئُهَا يُرِيدُونَ ﴿٧﴾ الظَّالِمِينَ الْقَوْمِ

لِيُظْهِرَهُ الْحَقَّ وَدِينَ بِالْهَدَىٰ رَسُولُهُ أَرْسَلَ ذِي الْأَهُوَ (٨) الْكَافِرُونَ ﴿٩﴾  
الْمُشْرِكُونَ ﴿٩﴾ كَرَهُ وَلَوْ كَلَّمَهُ الدِّينَ عَلَىٰ

Translation of Surah As-Shaf, verses 7,8 and 9:

And who is more unjust than one who invents about Allah untruth while he is being invited to Islam. And Allah does not guide the wrongdoing people (7)

They want to extinguish the light of Allah with their mouths, but Allah will perfect His light, although the disbelievers dislike it. (8)

It is He who sent His Messenger with guidance and the religion of truth to manifest it over all religion, although those who associate others with Allah dislike it. (9)

Islam is a *rahmatan lil alamin* religion. This belief gave birth within many prominent figures mastered all sectors and aspects of the world. Unfortunately, Islam is tarnished by individual actions of for which it is considered as a religion teaching violence and will never create peace on earth. 9<sup>th</sup> September 2001 terrorist activities in the United States, the Bali bombings, the Intifada suicide bombings, the violence in its Clarify and several other bombings in Indonesia basically complemented the controversy about who or which party was more suitable to be called a terrorist [1]. Western society began to worry and fear of the existence of Islam, they view as a terrorist religion teaching the believers to behave anarchist [2].

The outmost current issue is that the freedom of press turns out to be a big question for public. Some people accuse the press as a propaganda medium for a number of interest and motives [3]. It seems as if the mass media are unable to play an important role as social control, trusted source of information, and enlightenment for many people. Allegations of the mass media considered only as a tool of interest to reach power and to seize projects in government agencies and various other interests triggered the attitude of public apathy towards the shows of mass

media news. Whereas the government has regulated the existence of the press through Law Number 40 of 1999 concerning the Press stating that freedom of the press is a right granted by the constitutional or legal protection relating to the media and published materials such as disseminating, printing and published newspapers, magazines, books or other materials without government interference or censorship [4].

Related to the news about terrorist cases, many opinions stress out that Islam is not a terrorism belief, yet it never teaches violent behavior in the state of life [5]. Islam is still Islam and terrorists must be burned down. The problem that occurs, the mass media coverage always tends to link Islam and terrorists which leads to the labeling of terrorists against Islam [6].

Admittedly, the mushrooming of the media industry is inseparable from market principles. Free competition seems to force the mass media to bring up their creativity to attract and gain interest from the public. As a result, mass media are bound by massive commercialization flows so that everything is done to get profit. Furthermore, the mass media is also trying to put a network of production and distribution of cultural products such as news, advertisements, soap operas, films, quizzes, and so on to be integrated directly in market principles. Therefore it is easy to guess, as a "cultural industry", whatever is done is always at the point of hope of creating an increase in circulation, hits and ratings [7].

Therefore, based on this reality, the researcher wants to find out more deeply about the attitudes and discourses of the media that are rolled out related to the labeling of terrorists against Islam in the mass media. Thus the researcher specifies the research through the title: Islam and Terrorism in the Discourse Analysis of Riau Mass Media.

## II. LITERATURE REVIEW

There are several articles examining media, terrorists and Islam, including *Is it Terrorism: Public Perception, Media and Labeling The Las Vegas Shooting* by M.J. Dolliver and friends using mass media content analysis to see the perspective of the media in reporting terrorist acts [8]. Then, Khatarina Niemeyer's research entitled *from live-tweets to the archives of the future: Mixed media temporalities and the recent French Terrorist Attacks* adopting phenomenological approach in his research to examine the use of the terrorism term in mass media content [9]. Recent research entitled *We are at war Continuity and rupture*

*in French anti-terrorist discourse* by Julien Fragnon using the method of critical discourse analysis. [10].

In the study of *Why to Choose the Path of Terror*, the meaning of terrorism is understood as a method of violence, carried out by certain individuals, groups or countries for specific political objectives in a planned, systematic and organized manner by causing fear and threat on the enemy where the chosen target is not a direct target the intended but symbolic target. Social science researchers define the terrorist axis as follows:

"... violence calculated, shocking and directed against civil society, including security personnel and military who are not on duty, occurs in peaceful conditions and other symbolic targets carried out by secret agents for psychological purposes, namely publicizing political problems, religion and/or intimidation or coercion of governments or civil society to approve their demands. "[11]

Despite the never-ending controversy over mutual accusations, contemporary terrorism is more easily understood as the action of a group by using violence to create fear to support the group's goals. One of the controversies over media coverage is rooted in the question of the mass media as part of or even one of the groups [12]. Impressed, the media seemed ignorant of the various faces of terrorism. For the media, terrorism is terrorism and terrorists are terrorists. Preaching that results in the emergence of psychological fear of criminal crime is paralleled by reporting that results in a sense of terror in the community by blasting and threat of bombing. In addition, the mass media tends to show their coverage of a series of terrorist acts and their consequences compared to coverage of the motives behind the terrorist group's own attacks and efforts to crush terrorist acts.

In Indonesia, the labeling process has been going on for a long time. In fact, it has often happened that the label has been internalized in everyday life as if it were an ordinary thing, not a stigma anymore [13]. Herbert Strentz in the News Reporters and News Sources stated "terrorism is not a phenomenon that colors the 20th century, but this action is increasingly prominent because of news media coverage" [14]. No doubt, almost most of the issues of terrorism were obtained from the media. The media unceasingly uncover stories whose purpose is nothing but to satisfy readers who are curious for more information about terrorist activities and networks. It is no doubt that the temptation of news sensation to attract audiences often colors the news about terrorism. It is not even impossible for reporters



to be able to speculate on the suspect in the process of finding the news so as to lead readers to make a relationship between one event and another.

In historical records, the political conflict between the West and the Islamic world or more precisely the destruction of the Islamic world reached its peak when the Ottoman Caliphate collapsed on May 23, 1924. Along with the destruction of the last bastion of the Islamic Caliphate in Turkey, Muslims were scattered and divided into States nationally inspired revival of European nationalism. As a result there were disputes and even wars between 191 Islamic Radicalism countries [15]

In the discourse of Islam, many people associate the ideology of terrorism with the doctrine of jihad, which in Christianity is equated with the crusade. There are 35 times the words of jihad found in the Qur'an. In the Islamic tradition, jihad has a variety of meanings. However, the jihad is generally divided into two concepts: First, the moral concept, which is defined as the struggle of Muslims against the passions or the struggle against oneself (jihad al-nafs), which is called jihad al-akbar. Second, the political concept is defined as the concept of "just war," jihād al-asghar [16]. These two concepts, side by side, are always changing and developing all the time. First, at the beginning of Islam when the borders of the Islamic territory did not yet exist, jihad was interpreted as a concept of war. But the meaning of this jihad changed when the Islamic government was established and had set the limits of its territorial authority. The next process, the Islamic world is recognized and in fact, living in harmony with neighboring countries that are not Muslim. Bonney asserted that the use of the concept of early jihad in Islam to define the meaning of "war" in the modern era of Islam was an anachronistic, while damaging the reputation of Islam [17].

David Rapoport in *The Four Wave Terrorism* said that the current period is perceived to be a religious terrorism. However, entering the year 2010, terrorism that occurred showed differences from previous years with a religious orientation. From these oddities then the question arises whether there has been a change in orientation in the terrorism movement in Indonesia from a religious orientation to another orientation? [18].

Preaching about terrorism is also an inseparable part of the construction process. Mubarak's research results, 2012 showed that the terminology of terrorism in the

mass media coverage in Indonesia has always been associated with bombing actions occurred. Terrorism diction is chosen more than other terms such as anarchist acts, acts against the law [19].

### III. RESEARCH METHOD

This study deploys Fairclough CDA model of the critical discourse analysis procedure which consists of three stages; description, interpretation and explanation [20]. The research methodology in this research uses a qualitative research methodology. Qualitative methodology is intended to present a picture of how and why a phenomenon or reality occurs [21]. In qualitative research, researchers go directly to the location [22]. Data collection techniques were carried out through a process of documentation and interviews with key informants.

### IV. RESULT AND DISCUSSION

More specifically, the concepts and theories used as a reference in analyzing data using Norman Fairclough Discourse Analysis can be described as follows: First is the description, the researcher outlines the discourse strategy used by newspapers positioning terrorist labeling of Islam in the news discourse. Second is interpretation, namely interpreting the results of data analysis in the first stage by linking it to the process of producing text. Lastly, the explanation, at this stage the analysis is intended to seek an explanation of the results of the interpretation in the first and second stages, so that finally the positioning, motives and labeling of terrorists against Islam are revealed in the newspaper news discourse.

From the results of data analysis conducted, the editorial attitude towards each report is based on the philosophy that was built at the beginning of the establishment of the press company. It was revealed to be a vision and mission with the goals and objectives to be achieved by the mass media. On the basis of that vision and mission the media construct every reality into news that is accompanied by official regulations by the government in Press Law No. 40 of 1999.

The ruler of the media industry in Indonesia today is in the invisible hand, the market power. The mass media can also be cruel and heartless. At the end, the market also applies a very straightforward and simple rule of the game: survival of the fittest. There came a media irony related to media survival. The media to be independent of course must be able to support themselves. The media clearly cannot accept public funding if you want to be truly independent.

Therefore, a common thread can be drawn that the attitudes of Pekanbaru and Riau Pos Tribun Daily Newspapers towards the reporting of terrorist cases remain basically based on the principles of journalism. The editor of Pekanbaru Tribune Newspaper seeks to see events around terrorists as a real and objective reality without being based on subjective prejudice. While editorial attitude of Riau Pos daily newspaper

towards the news about terrorists is emphasized on the principle of accommodative journalism which eventually becomes their philosophical values. The principle of accommodative journalism boils down to peaceful journalism. Editors see reality in true objectivity. The editorial staff tries to photograph events based on the ideology of the press as the initial and main foundation of the media in carrying out its functions. The ideology of the media carried is accompanied by aqidah values as a belief in the existence of God.

The news about terrorists has succeeded in rolling the discourse about the figure of the perpetrators of the 'jihad' identified with Islam. This portrait finally gave rise to the discourse that Islam as a radical religion eventually gave birth to a phobia of Islam among non-Muslim laypeople. Fear of being part of the world community towards Islam has not only become a western trap, but this condition has led to misunderstandings of people in the concepts and values of the Islamic Shari'ah that is kaffah.

For example, meaning of jihad is sometimes partially understood while the concept of jihad in Islam according to Alquran is that

(( أَخْبَارَكُمْ وَنَبَلُوا وَالصَّابِرِينَ مِنْكُمْ الْمَجَاهِدِينَ نَعْلَمُ أَيُّ وَنَبَلْتُمْ ))

And We will surely test you until We make evident those who strive among you [for the cause of Allah] and the patient, and We will test your affairs. (Muhammad, Verses 31)

(( جَهَنَّمَ وَمَأْوَاهُمْ عَلَيْهِمْ وَاغْلُظْ وَالْمُنَافِقِينَ الْكُفَّارَ جَاهِدِ النَّبِيُّ أَيُّهَا يَا ( الْمَصِيرُ وَيَسُنَّ ))

O Prophet, fight against the disbelievers and the hypocrites and be harsh upon them. And their refuge is Hell, and wretched is the destination. (At-taubah, Verses 73)

Jihad against the munafiq here is to convey blasphemy to them and not with the sword as illustrated by the Apostle when the munafiqs appeared, including Abdullah bin Ubay bin Salul as based on the hadith of the Prophet:

( اللَّهُ نَهَى مَا هَجَرَ مَنْ وَالْمُهَاجِرُ اللَّهُ طَاعَةَ فِي نَفْسِهِ جَاهِدَ مَنْ الْمَجَاهِدُ ( عَنْهُ )

"Mujahid is a person who strives / sincerely performs obedience to Allah and the person who does hijrah is a person who hijroh from anything that is prohibited by Allah" (HR Ahmad 6/21, Mrs. hibban: 25 and Alhakim and agreed by Imam Ad- dzahabi)

From the description of jihad above, it is very clear that jihad does not only have the meaning of war. It is additionally to seeking knowledge, to practice it, preach, fight the lust and worship to God can also be called jihad, if the words of jihad are coupled with the pious deeds.

From the news presented by Riau Pos and Tirbun Pekanbaru newspapers, the discourse developed by the two media is more directed at acts of terror committed by radical groups without labeling the aqeedah believed.

Even so, the news that had been rolled out turned out to have made the image of the teachings of Islam and Muslims as a whole cornered. Intentionally or unintentionally, Islam in the West's perspective is perceived as a religious teaching that justifies and spreads terrorism on earth. Whereas Islam as a religion that is rahmatan lil alamin (a blessing for the universe) actually forbids the occurrence of such terrorism whatever its pretext. It is precisely terrorism in the name of Islam and its people in totality. Not only piracy of the teachings of Islam itself in accordance with the interpretation of the passions, but also destroy Islam and its values from within.

Although the discourse rolled out by the two media does not label aqeedah, the symbols of Islam remain soluble in the news. This is due to the unprofessional redaction of the packets covering the both sides. So skewed propaganda related to global terrorism in the Islamic world is caused by wrong views of Islamic teachings, hatred towards Islam and its people, as well as inter-media competition and internal unprofessional work of the media.

#### IV. RESULT AND DISCUSSION

The attitude and discourse shown by the two media are essentially promoting the true values of journalism, such as fair, independent, objective and factual. However, the attitude they have actually contradicts the discourse that was rolled out, where the news discourse about terrorists being rolled out is trapped in Western discourse in an effort to fight Islam as a terrorist religion. The news that had been rolled out turned out to have made the image of Islam and the Muslim community as a whole cornered. Intentionally or unintentionally, Islam in the West's perspective is perceived as a religious teaching that justifies and spreads terrorism on earth.

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# *North Rupert Island Governance Development as Rural Area Cultural Tourism of Bengkalis Regency in Destination Branding*

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**Abstract**— Administratively Rupert Island located in Bengkalis Regency of Riau Province, which currently developing into a tourism area, both nature and cultural tourism. This area specifically has a rural area cultural tourism such as, customs, daily life, traditional architecture, and rural spatial structure. The aim of this research is to analyze government regulation that has been compile in Rupert Island development as a cultural tourism rural and the gate of Bengkalis Regency's Malay Cultural. To explore the government efforts of building the public space in Rupert Island as the rural area cultural tourism in destination branding, and find out the locals, entrepreneurs, and business people real involvement in creating destination branding-based infrastructure, and desire to compile the development infrastructure towards the growth of cultural tourism rural and another sectors that has been supporting the living of society in this area. This research use qualitative method, obtaining the data with interview, observation and enough reference. The result of this research, shows that government hasn't act based on the regulation regarding North Rupert Island with tourism rural awareness. Regardless, this research able to find some main potential related to public space specifically eventful public space on the Island as starter community for rural area cultural tourism. Local society, stakeholder and the media also keep on giving their support towards the development following the acceleration growth of infrastructure.

**Keywords**— *Rupert, Cultural Tourism Rural, Malay, Destination Branding*

## I. INTRODUCTION (*HEADING 1*)

Tourism sector which one of the main supporting system of living for a society now shifting from industrial perspective to cultural perspective (Stebbins, 2006). Cultural tourism is a tourism with specific interest towards the visitor participation on new and deeper cultural experience that can create an aesthetic experience, intellectual, emotional or psychological (Reisinger, 2004:24). Anthropologically, cultural refers to ritual, ceremony, dance and performance that provided by the locals to tourist or visitor (Fridgens, 2006:77).



The shifted perspective of tourism from industrial to cultural also happen in Indonesia. In fact, the cultural aspect is the prime movement of tourism world in Indonesia and currently on progress developing in another region of Indonesia, Riau Province is one of them, with Malay Cultural Tourism as the topic. For the last few years, the government of Riau has been trying hard to make some territory of Riau becoming the main destination of cultural tourism, Rupert Island is one of them. Administratively this island located in Bengkalis Regency, Riau. This island has about 1.500 km<sup>2</sup> area and 47 thousand citizens that consist of two districts, Rupert District and Rupert Utara District. Rupert Utara District is the one that currently in progress on becoming the tourism area, both nature and cultural tourism.

In general this research focusing more to this problem for further elaboration of structuring possibilities to increase the effectiveness of rural area cultural tourism in Rupert Island. Researcher assuming that the program of rural area cultural tourism in this area is still weak, it is determined by the extent of local society participation on all of the program. Referring to the backgrounds that has been stated before, the formulation of the problem is how to organize Rupert Island into the rural area of cultural tourism in destination branding of Bengkalis Regency. And the aim of this research is:

1. Analyzing the regulation (laws and regional regulation) that has been arranged by government in order to developed Rupert Island as the rural area cultural tourism and the gate of Bengkalis Regency's Malay Cultural
2. To excavate government efforts on building the public space in Rupert Island as the rural area cultural tourism of Bengkalis Regency in destination branding
3. Finding the actual fact of locals, entrepreneurs, and business people participation on making

infrastructure in North Rupert Island based on destination branding.

4. Mapping the construction of infrastructure towards tourism development, especially the cultural tourism and other sectors that being the support system for locals in North Rupert Island.

## II. LITERATURE REVIEW

This research based on some conceptual framework, not only on exploring the field information, but also develop the result to achieve a scientific research, comprehensive and useful. Some concept that uses are management, rural area tourism and destination branding.

Management is one of technical term to show an arrangement, organiza, carry out or managing. So, management here means to re-arranging or re-organize the things that has been done before. In this research management or re-arranging the development of Rupert Island started from the proses of developing cultural potential it self.

The rural area cultural tourism is one of the common cultural tourism program. Based on Bonink (1992) there are two kinds of approachment to cultural tourism. First is "sites and monument" approachment that focusing on various type of attraction that visited by the tourist or generally known as the approachment that take culture as a product. Those site includes the archeology and museum sites; architectural site (ruins of buildings, well-known building or historical, city); statue, artworks, handicraft, gallery, festival and cultural event; drama (theater, film, etc); language and literary studies, and another literary event; religious festival; and cultural or sub-cultural that conclude everything in one certain area. The second approachment called conceptual approachment, an approachment that defined cultural tourism qualitatively through an analysis of practice, experience and the meaning of each approachment from tourist to the other place or culture. Richard (1996) describe this conceptual approachment is a way to find the motive and the meaning that attach in cultural tourism activity.

The last concept is destination branding. Destination branding is a guide on developing the strategy that also an evaluation framework to measure the successability of branding in one area of tourism (Blain, Levi and Ritchie, 2005 : 78). Generally, destination branding known as the whole action of creating a positive image over the specific region and communicating this action towards various group that become the goal through visual, narrative, event, not only local but also internationally to gain advantage in order to compete with another cities (Kavaratzis, 2008).

## III. RESEARCH METHOD

This research held in North Rupert Island, Bengkalis Regency, Riau Province. All of the research activities will be done for 2 (two) years from 2019 to 2020, where each year it will be hold for 10 months

range. The technic of determining the research subject or informant is purposive. In this occasion the informant consist of 2 (two) groups of society. First group is consist of the decision maker, meanwhile the second group consist of the original public taht has been living in Rupert Island for more than 10 years and currently older than 17 years old. The information or the data that needed in this research is consist of primary and secondary data. As qualitative research, the data analysis technic in this research will be conducted through three activites, first, data reduction process; second, data display and; third, an analysis from conclusion drawing and verifying. After all data has been collected, the data will be checked for validity.

## IV. RESULT AND DISCUSSION

This research obtain four major discussion such as:

### A. *The Regulations of Rupert Island Development as The Rural Area Cultural Tourism in Bengkalis Regency*

Rupert Island development as a rural area cultural tourism in Bengkalis Regency has juridical and constitutional regulations that include in some regulations, the decision and determination that government created nor national or province level. This section will once again observes those regulations and underline several important point as the starting point on carry out this research and analyzing the data that found in the field.

First of all regulations that describe the position and provision regarding Rupert Island in Indonesia. Rupert Island was decided as one from 111 Outer Small Island in Presidential Decree Number 06 of 2017. Another relevant policy is Indonesian Government Regulation Number 62 of 2010 about the utilization of Outer Small Islands. The next regulation is Indonesian Act Number 1 of 2014 about the modification of Act Number 27 of 2007 about the Supervision of Coastal Region and Small Islands. Specifically, government also put Rupert Island in Indonesian Government Regulations Number 50 of 2011 about National Masterplan for Tourism Development 2010 - 2025, namely in section 35 about the direction of tourism image development policy. And to build this image, government named tourism in Rupert Island especially the beach as 'The Longest White Sandy Beach Island'.

Then, at the provincial level, in the meeting of Provincial Development Plan which was carried out on July 1, 2019, the government decided to include development related to Rupert Island infrastructure in the Riau Province Medium Term Regional Development Plan (RPJMD) 2019-2024. Proposal from Bengkalis Regency Government for this sector. Among them, increasing the development of Rupert Island, increasing the status of the National Tourism Strategic Area (KSPN) to the Special Economic Zone (KEK) of Rupert island, then connecting between islands, bridges,

ports and RoRo, increasing the status and improving the quality of roads and developing the Coastal Region and borders; handling abrasion, empowering and improving the community's economy and peatland management (AntaraRiau, 3 July 2019).

From several regulations, laws and results of various plans that have been prepared both by the central government and local government above, it can be drawn some of the main focus and position of Rupert Island in the current Indonesia Tourism discourse, then to be able to become the background of this ongoing research. As one of the small islands in the outer category, the first aspect emphasized by the government is defense and security. This priority provides a nuance that closing the possibility of establishing dynamic relations of the islands with overseas territories. This is a little contradictory to the spirit of the government in the field of tourism which actually wants to open the widest possible range of these islands to be reached by visitors from domestic and overseas. Therefore, a more detailed explanation is needed that related to defense points which at the same time considering or even support other government programs such as the development of the tourism aspect.

Next are the points related to the utilization of Rupert Island. In this case, almost all regulations prioritize tourism aspect as one of the fields that can be maximized. But if we pay attention, tourism refers mostly to natural tourism, the source of which is nature itself, not centered on the people or communities. Although it has been stated in the rural area tourism platform developed by the government, Indonesia's tourism work program in the future is dominated by cultural tourism. The government focus must be lowered and applied also in local governments, especially Riau Province and Bengkalis Regency in developing Rupert Island.

Based on the laws and regulations above, they are the most important parties in relation to the resources available on Rupert Island. All services should be directed to them and all of the regulations they have should be maximized, included on how they are as one of the unit of cultural village are promoted and maximized their existence. To carry on this intention, we need to look at the locals and residents of Rupert Island in the frame of their cultural heritage.

Judging from the various aspect of the cultural heritage, the image created related to Rupert Island is not only a place where there is *The Longest White Sandy Beach Island*, but it must be more than that. Then the *branding* of the tourist village in Rupert, which includes both the cultural heritage of objects and its intangible must be multidimensional awareness. Branding must consist of aspects of economy, society, policy, culture, ecology, and geography.

*B. Government efforts to build a public space in Rupert Island as a cultural village to support cultural tourism destination branding.*

Public space in general defined as a "stage" where the drama of local's lives unfolds (Carr, Francis, Rivlin & Stone, 1992:3). Public space has a significant roles on locals daily life and also their daily space as a community (Gallacher, 2005). It is intertwined with the locals daily social activities. Public space includes not only physical dimension but also social dimension and psychological dimension of the society.

Based on those reasons, we can conclude the meaning of public space in Rupert Island it self as a cultural village or settings, not only physics but also social and psychological in Rupert Island where social interaction between locals or tourist occurs in tourism context. And this research found various kind of public space in Rupert Island such as:

*a. Eventful Public Space in Rupert Island*

Eventful public space in Rupert Island includes Rupert Beach Festival, Mandi Safar Festival, International Moto Cross (Ketapang-Lelong-Lohong-Makeruh), and Raptor bird migration. Mandi Safar Festival is one of significant and attracting example related to Riau and Bengkalis government efforts on developing the eventful public space. This festival not only mark as eventful public space, but also mark as religious and recreational public space. This festival is one of the tradition that exist for decades. It is held for every forth week of Safar. Said that every Wednesday on the forth week is considered as an unlucky day to travels. To avoid the bad things, one day, since decades ago Rupert citizen has done Mandi Safar ritual, which centered in Tanjung Lapin Beach. The water used for Mandi Safar said as a holy water that has been prayed which is taken in an old well not far from the Tanjung Lapin Beach, Tanjung Punak Village, Noth Rupert.



This festival also part of multidementional. The purpose it self widen not limited to an cultural event only, but also for recreational facilities, and more importantly, it is also provide locals a better meaning and function on their life. This festival bringing up the awareness of a space or a public place for example



government who give their attention in increasing the values of beaches in Rupert Island, also the awareness of how important Rupert Island is as the outer island which now has now changed its public perception become the face of Indonesia, that has plenty of tourism potential. Function and symbol that have expand to be one of public space significant prove in various rural area tourism forming elements in Rupert Island. And furthermore, how locals are involved and give their though creates what we called public behavior landscape. If public behavior towards a place can be mapped, it will be easier to build the place.

#### **b. Religious Public Space in Rupert Island**

Meanwhile, religious public space includes the activity that be done in a worship place or another location that related to spiritual association such as an activity in Klenteng Vidya Sagara, Klenteng Cin Bu Kiong, Klenteng Cin Hang keng and grave pilgrimage to Putri Sembilan. Festival Mandi Safar as mention before is also part of this religious public space.

What attractive from this part is how the activity in religious public space shows various aspect of tolerant and beliefs also high multiculturalist attitude. Each celebration of religious rituals not only involving the people who have the same belief but also all of the society of North Rupert. the society end up having the celebration that supposedly exclusive and the sites from public space is open to public.

Another example that really actual is can be seen through the celebration of Chinese New Year and Klenteng Cin Bu Kiong Vihara Vidaya Sagara 45th birthday that just being held in Januari-Februari in Kador Village, Rupert. The artist from both inside and outside of the country are attending the celebration (Taiwan, Singapore, Thailand) and barongsai performance enliven the celebration. Buddhist people from various region in Indonesia, even from outside of the country came to pray and do another religious ritual. This celebration also welcomed by locals because this event can help them increase their income by selling foods or souvenirs.

#### **c. Daily Life Public Space in Rupert Island**

Daily life public space is a public space where all of daily activities are being held (Sun, 2009 : 2). Daily life public space is not included or mentioned in the main plan and in the Kawasan Strategi Pariwisata Nasional (KSPN) North Rupert Island. Meaning, the purpose of daily public space now is only for locals doing their activities, not for the main course of tourism destination in Rupert Island. We need to increase locals awareness of daily public space to be the main course of a rural area tourism.

The matters that included in daily public space in Rupert Island can actually we see through daily activities of the locals. As an example we can cite a research from Julianus Limben from 2011 about Suku Akit in Rupert Island, that also able to be one of cultural tourism destination for Riau government.

Akit has taken river flow or strait between islands area as their residence that are overgrown by mangrove

forests. They are depending on environment or nature around them to live. Therefore, their livelihood is inseparable from natural resources that can be used, even now part of them are able to cultivate those natural resources, for example produce a charcoal from lumber. But again, the tradition that they still persist up until now is fishing activities. Almost 80 percent of Akit tribe working as a fisherman and farming the rubber tree.

Because most of the majority livelihood is fishing, their residence are not far from the sea and river although some of the Akit tribes also knows how farming and the fields. They built houses along the riverbanks of Morong Straits or on the bays or niches in their fields. (Limbeng, 2011 : 36-37).

From Limbeng explanation above, we can discover some of daily public space that are potential to be cultural tourism point in Rupert, such as locals residence, their livelihoods; rubber trees, beach and the river where they catch fish and the last one is their fields where they farm.

#### **d. Recreational Public Spaces in Rupert Island**

Recreational public spaces exist to fulfil people's needs for public places that can be used to spend time and get entertainment (Sun, 2009: 38). Meanwhile, Carr et al (1992) identified more than five needs sought by the public from recreational public spaces, namely comfort, a place to rest, engagement with the environment both passive, active, and discovery. Based on the understanding and category, will be seen how far the existence and development of the recreational public spaces on Rupert Island.

Recreational Public Space on Rupert Island covers all the tourist attractions beaches until now. For more details, it can be seen in the blueprint of the public spaces plan that will be built at several points of tourism potential on Rupert Island, especially the coastal area below:

Looking at the blueprint, at a glance all the communal facilities are exists. The need to equip a region into a tourist area, not just the nature, but culture is also well recognized, by incorporating amphitheater buildings, stages and museums as part of the tourist area. However, the government should look further to the extent to which the design of the region reflects or becomes a manifestation of its people's realm of minds. For example, to what extent the design has taken into account people's trust in spatial order, or to what extent the design does not oppose or crash into the cosmological beliefs of citizens regarding a particular place. Such matters need to be considered in the process of developing recreational public spaces, especially when referring to the five functions mentioned above.

#### **e. Public Art as part of the Public Space on Rupert Island**

Another thing that needs to be examined in the blueprint is the presence of public art as part of public

space. For example, the most obvious example is the Zapin Api Monument which planned to be built as the icon of North Rupa National Tourism Strategic Area (Kawasan Strategi Pariwisata Nasional/KSPN), as well as the construction of a plaza on Pesona Beach. Although not clearly concretized, in addition to the two examples above, what goes into the Rupa's Core Area Development Plan is also the construction of Malay building images on each house. Perhaps what is meant by 'imagery' is part of the local residents' houses architecture or public buildings that characterize Malay architecture.



Even though it has been included in the development plan, the existence of artworks that are part of the public space is not or has not been based on the awareness as a public art. For this reason, in this section, the nature of public art and its significant functions will be explained in supporting the development of the Rupa National Tourism Strategic Area (KSPN) in the context of a tourism village.

**f. Real involvement of local residents, entrepreneurs, and business people in creating the infrastructure of Rupa Island's cultural village that is aware of destination branding.**

This section will describe how local residents, entrepreneurs, and business people become part of the process of developing Rupa Island as a cultural village, especially in terms of infrastructure and how they are branding the effort. Local residents refer to the native who are the first parties to bear the infrastructure of Rupa Island. These locals have a place and infrastructure that is part of their daily lives, which they maintain and preserve, indirectly supports the Rupa Island tourist village program. While entrepreneurs and business people refer to people who run businesses that support the program. They may or may not be local residents. A more detailed description of these parties will be presented below.

**g. Local Residents as Owners, Keepers, and Users**

On Rupa Island, Riau Province, there is an indigenous community called Akit. In some government sites, for example the Department of Settlement and Regional Infrastructure (Kimpraswil), Department of Social Affairs, they are often referred to as isolated or disadvantaged tribes. On Rupa Island, this tribe spreads in several villages, such as Tanjung

Medang, Tanjung Punak, Tanjung Rhu, Hutan Panjang and Titi Akar, all of which enter the District of North Rupa (5). Until now they are still actively carrying out their cultural systems, such as beliefs, social organizations, political systems, and other. This cultural system must be supported by existing infrastructure and maintained since the beginning of their existence. This section will detail the one and only social life system and their infrastructure, which is expected to support the creation of the Rupa Island tourism village program.



**h. The Role of Entrepreneurs and Business People in the Development of Village Culture on Rupa Island**

The role of entrepreneurs and business people can be seen most clearly in the existence and sustainability of Small and Medium Enterprises (SMEs) having been established in the midst of the Rupa community. These SMEs include:

1. Salted Fish Processing SME in Teluk Rhu Village;
2. Fish crackers manufacture SME in Teluk Rhu Village;
3. Durian blocks manufacture SME in Suka Damai Village;
4. Pandan woven SME in Kadur village;
5. Weaving SME in Tanjung Medang Village.

In addition to SMEs, the community is also incorporated in the Tourism Awareness Group (Kelompok Sadar Wisata/Pokdarwis) which until now scattered in several areas of Rupa as follows:

1. Pokdarwis Tuah Negeri, Tanjung Punak Village;
2. Pokdarwis Pantai Tanjung Lapin, Tanjung Punak Village;
3. Pordarwis Pesona Utara, Teluk Rhu Village;
4. Pokdarwis Kilau Pasir Putih, Teluk Rhu Village.

In this Tourism Awareness Group (Pokdarwis), there is a Tourism Community Capacity Building Program which includes:

1. English Tourism Village, a tourism community that able to speak English. As an attraction for visitors who want to practice passive or active English, they

- just need to come to Tanjung Punak Tourism Village;
2. Cultivation of flower trees, namely nursery colorful flower tree cuttings to add beauty and have a sale value;
  3. Fostering homestay owner groups, organized coaching on tourism, especially regarding *sapta pesona*;
  4. Procurement Program for Supporting Facilities of Tourism Activities;
  5. Procurement of culinary materials, especially to sellers of special food, homestay facilities, tour guide equipment, namely procurement of Pokdarwis costumes, secretarial equipment, permanent space facilities for superior products of Tanjung Punak Tourism Village, and documentation equipment. Cultural Arts Appreciation Improvement Program, procurement of equipment and raw materials for craft and product labeling, procurement of art equipment, and exhibition/gazebo spaces.
  6. Organizational management training in improving the performance of the Tanjung Lapin Tourism Awareness Group.

This program looks promising even though in reality there are several obstacles that inhibit the progress of these programs. The obstacles came mainly from the aspect of infrastructure. Procurement of homestays and other tourism supporting facilities require the availability of adequate infrastructure. Meanwhile, infrastructure is still a very lacking aspect on Rupert Island. This section will be elaborated further in the final section of this research.

Aside from Pokdarwis, the community is also incorporated in other community organizations that directly or indirectly contribute to the improvement of tourism village infrastructure. For example, Tanjung Punak Village has community organizations like NGOs, LINMAS, FKPM, and arts organizations such as *Perkumpulan Kompang* and *Perkumpulan Rabbana*.

Meanwhile, there are parties that need to be observed which are not only located on Rupert Island, but also at the national level, namely the Association of Indonesian Travel and Tourism Agents (ASITA), especially the Rupert Island branch.

Some of ASITA's proposals on Rupert Island have been raised. One of them was once said by the chairman of the Indonesian Travel and Tourism Agents (ASITA) of Riau, Dede Firmansyah. I hope President Jokowi can make Riau as one of the new 'Bali' because Riau has many potential tourist attractions. One of them is the beautiful North Rupert Island and the outer islands of Indonesia that faces Malaysia. He hopes the President can build a port on Rupert Island to support the accelerated development of tourist attraction on that island (Antaraneews, 2019). Dede also hopes the government can beautify and revive old airports in Riau, such as the airports in Dumai, Rengat, Tembilahan, and others. "If it is turned on and maximized, surely Riau tourism will be better in the

future," hoped Dede as he told Hallorriu (17 December 2018).

Besides Asita, there are other associations that also support the efforts to improve Rupert Island as a tourist attraction, especially cultural tourism. The association is an online media called *genPi.co*, an online media serves news and information about Indonesian and international tourism published by PT. *Pesona Digital Com*.

One of the highlights news by *genPi.co* related to North Rupert Island is the discourse of making it a Special Economic Zone (*Kawasan Ekonomi Khusus/KEK*) which was raised by the Minister of Tourism Arief Yahya during a working visit to Rupert Island, Bengkalis Regency, Riau Province, Tuesday (20/8/2019). Reported by *genPi.co*, Rupert island which is very close to Malaysia has a combination of two industries in it, namely agriculture and tourism. With two industries and an area of approximately 1,500 square km, North Rupert Island is ideal to be a Tourism Special Economic Zone.

***i. Mapping infrastructure to the development of tourism, especially cultural tourism and other sectors supporting the life of the people on Rupert Island***

Based on Presidential Regulation No. 42/2005 concerning the Committee for the Acceleration of Infrastructure Provision, it is explained that procurement of several types of infrastructure must be regulated by the government, namely transportation infrastructure, road infrastructure, irrigation infrastructure, drinking water and sanitation infrastructure, telematics infrastructure, electricity infrastructure, and natural gas and oil transportation infrastructure. The classification of infrastructure above is categorized as basic infrastructure, because it is needed by the wider community so it needs to be regulated by the government regarding its provision.

In the context of the development of the tourist village area on Rupert Island, infrastructure is supporting the main aspects of accessibility and amenities. Bengkalis government itself has described the latest accessibility conditions to North Rupert Island as follows:

1. The access road condition to National Tourism Strategic Area (KSPN) North Rupert can be reached in 2 ways, by land and by sea;
2. Access conditions using the land route through the Port of Roro Dumai - Rupert by using the Roro Ship with a distance of  $\pm 25$  minutes to the Port of Roro Tanjung Kapal on Rupert Island.
3. Then the journey continues with a landline with partial road conditions paved with concrete rebates.
4. But the rest are still dirt roads with quite apprehensive conditions, especially if it is raining. Travel time from Tanjung Kapal Harbor to North Rupert is  $\pm 3$  hours' drive.

Overall, the accessibility condition is still far from feasible. The government then detailed some of the

shortcomings in terms of accessibility, for example, in land routes there was no public transportation and there was only motorcycle taxis (Ojek) at Tanjung Medang Port. Meanwhile road conditions at several points were heavily damaged, especially in the rainy season. While in the sea lane there are only two crossings, namely the Dumai-Tanjung Kapal roro crossing and the Speedboat to Dumai-Tanjung Medang. Moreover, the air route so far can only be reached via Dumai with three flight routes which is Dumai-Batam, Dumai-Medan, and Dumai-Jakarta.

To be more precise, look at the illustration made related to the limitations of accessibility below:

Infrastructure is also related to amenity. North Rupert Island itself is supported by amenities consisting of tourism facilities and its supporting facilities. Existing tourism facilities on Rupert Island include:

- ❖ Lodging: 12 inns, 3 guest houses, 22 homestays.
- ❖ Restaurants: 10.
- ❖ The condition of the roads are partly concrete pavement and some are still dirt roads.

Meanwhile supporting facilities include:

- ❖ Lighting conditions are under construction in 2016;
- ❖ Tourist boats are available;
- ❖ Water games (banana boat, jetski) available at Pesona Beach;
- ❖ ATM (not yet available).

Looking at the mapping infrastructure in North Rupert Island that has been carried out by the government, it seems that this sector needs the most attention in a high level of urgency given its existence is still far from the ideal picture even on the most basic infrastructure, especially if juxtaposed with the Tourism Destination Development Step standard in the form of a Village Tourism Development Acceleration issued by three Indonesian ministries namely the Ministry of Villages, Disadvantaged Regions, and Transmigration (Kemendes PDTT), the Ministry of Cooperative and SMEs (KemenKUKM), and the Ministry of Tourism (Kemenpar). Programs from these three ministries related to accessibility and amenities include:

1. Airport development and improvement of international direct flights to airports in urban areas as the entrance to rural areas;
2. Improving the roads quality to rural areas;
3. Construction of clean toilets and other tourism facilities;
4. Development of international standard homestays;
5. Establishment of souvenir center facilities and culinary areas for tourists.

How to catch up then? What needs to be prepared first is the awareness that underlies the development of these infrastructures. The infrastructure development of the tourism village on Rupert Island needs to be based on the awareness of an integrated infrastructure development, means the development carried out by being connected to each other, has a positive impact and goes hand in hand through three main consolidation steps; first, infrastructure improvement

for access to leading tourist destinations. Second, consolidation of local cultural wealth. Third, consolidation of the tourism community, including by preparing patterns of community behavior on Rupert Island towards tourists, as well as foreign tourists (Kusuma, 2014:124).

This integrated infrastructure development has been triggered since a long time by experts, one of which was conveyed by Grigg (1988) in the definition of separate infrastructure. Infrastructure is a physical system that provides transportation, irrigation, drainage, buildings and other public facilities, which are needed to fulfil basic human needs, both social and economic needs. This understanding refers to infrastructure as a system. Where infrastructure in a system are parts in the form of facilities and infrastructure (networks) that are inseparable from one another.

One form of integrated development can be seen through infrastructure development that is economic in conjunction with the development of social and administrative infrastructure. For example, the construction of roads or the provision of pioneer buses to tourist village on Rupert Island are carried out in conjunction with the construction of health and communication facilities such as the provision of Wi-Fi, also with the construction of administrative facilities at each tourist destination like counters and information centers. Only through this integrated infrastructure development can the backwardness infrastructure turn into an ideal infrastructure of a tourist village on Rupert Island be realized.

## V. CONCLUSION

This research analyzes several subjects regarding the efforts to promote Rupert Island in Bengkalis Regency as a cultural tourism village destination. The first one is related to policies formulated by the government regarding Rupert Island, which has no awareness yet to develop the 'cultural' aspect of the island. This research also found there are several types of public spaces existed and need to be improved. These public spaces include eventful public spaces, religious public spaces, daily life public spaces, and recreational public spaces. In addition to it, this research also suggests the making of public art as part of these public spaces.

The next point, this research traces the roles of those who are members of the pentahelix model, which is the government as regulator, academics as drafter, media as catalyst, private sectors as filler of business aspect, and community as accelerators. This section mainly outlines the role of private sector, community, and media in the branding effort of the tourism village on Rupert island. As the result, it was found that there are many communities were active in supporting the creation of that tourism village. The communities are in

the form of Pokdarwis or SMEs. Likewise, the private sector and media continue to provide input to the government in order to improve and realize the branding effort of the Rupert Island tourism village.

The last point outlines the existence of infrastructure on Rupert Island. Based on data held by the government, the infrastructure in Rupert Island, in various aspects (economic, social, and administrative infrastructure) is still very concerning. To improve, enhance, and accelerate the development, this research suggests that the government conduct integrated infrastructure development, namely by building together various interrelated sectors that support the realization of a tourist village on Rupert Island.

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**ECONOMIC**

# *The Role of Users in the Success of Accounting Information Systems Utilization in Cooperatives : Study Case Kota Pekanbaru*

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**Abstract**— This research aims to understand the usage of accounting information systems in cooperatives in the city of Pekanbaru. The type of data used in this study is multiple linear regression analysis with where the sample-taking process utilizes purposive sampling. From the research results obtained from two factors that are examined only one that supports it, namely user involvement in the system development process. While the ability factor of personal information system technique was found to be incompetent.

**Keywords**—Accounting Information System, Cooperatives

## I. INTRODUCTION

The development of information technology today makes information technology an important requirement for a company and an organization. Information technology is also inseparable from the information system used. Information technology can facilitate transactions in the business of a company or organization and can accelerate the processing of accounting data. According to [1] states that the information quality criteria stated must be accurate, relevant, timely and complete. Information is accurate, meaning that information has sufficient accuracy and is close to the actual reality. Relevant information is when the information is able to make changes in decision making in accordance with user objectives and problems faced by users. Timely information, that information must be available to decision makers when needed and the information does not appear in the past or the previous time. The quality of accounting information is influenced by the quality of accounting information systems.

In the research [2] it states that there are three basic functions of Accounting Information Systems, which are as follows:

1. To support management functions. Service structuring refers to the responsibility of management to properly manage company resources. Information systems provide information about the use of resources for external users through traditional financial

reports and other mandate reports. Internally, management receives information from various stewardship reports.

2. To support management decision making. Information systems provide managers with the information they need to carry out decision-making responsibilities.
3. To support the daily operations of the company.

The information system provides information for operational employees in carrying out their daily tasks efficiently and effectively.

With the provided elaboration upon accounting information systems, it is possible to see why they are also very necessary in cooperatives. In the study done by [3], it is stated that generally, traditionally run cooperatives have not adopted a more technologically driven paradigm. The same statement could be applied to the cooperatives that operate within Pekanbaru. The purpose of cooperatives is to provide services to members and not to make a profit, but it should be noted and watchful in their implementation, that selling goods on a cost basis will be able to encourage members to buy a lot of goods from cooperatives at cooperative prices, and then sell them outside the cooperative at market prices, aside from that, cooperatives need to benefit from the businesses that are run to be used for capital fertilization [3]. Achieving this purpose would be much easier and more effective if accounting information systems were to be applied, especially in the current technologically based era.

With the development of increasingly sophisticated technology, accounting information systems can actually be consider more as a necessity in the operation of cooperatives and SMEs, not merely a useful addition. Many factors need to be explored to be able to know the appropriate accounting guidance model that needs to be conveyed to the managers of cooperatives or small industries. So that they can carry out accounting even if it is simple in nature, so that the prediction of business development and small industry development can be directed and more focused.

Starting with a background explanation of this study, the remaining part of this paper would be organized as follows. In the next section, would discuss the Problem description and the purpose of the study. In section 3, a brief description of the theory used and related work. Section 4 explains the data analysis using multiple linear regressions as well as explain the results of the study and concludes the research.

## II. PROBLEM DESCRIPTION AND THE PURPOSE OF STUDY

The data processed in this study were in the form of questionnaires distributed to the Pekanbaru City Cooperative with a purposive sampling method. The cooperatives given the questionnaire must meet the accredited criteria of at least B from the Indonesian cooperative department. The questionnaire given is the adoption of previous research that has been done and has been adjusted to the needs of research. The questionnaire is distributed and collected over a period of more than 3 months (May-Jul). In addition to the questionnaire data, interviews were conducted to provide stronger justification for the study.

Problem Formulation Based on the background described above, the problem will be examined in this study are:

1. Does the involvement of users in the development of systems affect the success of the use of accounting information systems? Cooperative Accounting in Pekanbaru City
2. Does the ability of personal techniques affect the successful use of the accounting information system of the Cooperative in Pekanbaru City
3. Does the lateness of use in the development and ability together influence the successful use of accounting information systems?

Research Objectives: The purpose of this study is to find solutions to problems related to the successful use of accounting information systems, when connected with user competencies and organizational culture in cooperatives in Pekanbaru City.

## III. LITERATURE REVIEW

Information is fundamental in an organization, especially in the decision making process. The usefulness of information is to reduce the existence of uncertainty in making decisions about a situation. Information in relation to decision making is obtained from SI or also known as information processing systems.

The system is a combination of several elements that interact with each other to achieve goals. The system is a collection of elements that give rise to one another's relations. Information system development is the process of modifying or providing updates to some or all information systems.

As in [4] states that information is basically resources such as factories and equipment. Productivity as an important thing to stay competitive, can be improved through better information systems. Companies will be able to create competitive advantages through the information systems they build.

### A. Definition of Accounting Information System

Accounting is a set of knowledge that studies the engineering of service provision in the form of quantitative financial information of organizational units or companies in a particular country environment and how to deliver (report) that information to interested parties to be used as a basis for economic decision making. The accounting model in the information technology era requires that the accounting model can measure the rate of change in resources, measure the rate of change in processes, measure intangible fixed assets, focus outward on customer value, measure processes in realtime, and enable networks [4].

[5] states that all forms of business and non-profit organizations serve accounting information to help stakeholders both from within the company as managers and external sources such as investors, government agencies, banks and others for decision making in the economic field.

### B. Factors of Successful use of Accounting Information Systems

Research conducted by [6] states that there are factors that influence the performance of SIA including:

- 1) User Involvement in the System Development Process, that more and more user involvement will improve SIA performance due to a positive relationship between user involvements in the information system development process in SIA performance.
- 2) Personal Information System Technical Capability, the higher the personal technical ability of the AIS will improve the SIA performance due to a positive relationship between the personal technical ability of the AIS and the SIA performance.
- 3) Organizational Size, the greater the size of the organization will improve the performance of the AIS due to a positive relationship between the size of the organization and the performance of the AIS.
- 4) Top Management Support, the greater the support given by top management will improve the performance of the AIS due to the positive relationship between top management support in the process of developing and operating the AIS with the performance of the AIS.
- 5) Formalization of Information Systems Development, the higher the level of formalization of information systems development in the company will improve the performance of the AIS because there is a positive relationship between the formalization of the development of the system with the performance of the AIS.



6) User Training and Education Program, SIA performance will be higher if user training and education programs are introduced.

7) The existence of the Information System Steering Board, SIA performance will be higher if there is a steering board that is able to direct the SIA to run well.

8) Location of the Information Systems Department. SIA performance will be higher if the information systems department is separate and independent.

### C. Cooperative Definition

Based on information obtained from the Central Statistics Agency data on the Statistics of Savings and Loans Cooperatives in 2016, the Cooperative is a collection of people to work together for the common good. Koperasi Indonesia was born on July 12, 1947 [7]. The cooperative business in Indonesia is based on Law No. 25 of 1992. Based on this law, the steps of cooperatives become more flexible because cooperative associations are considered to be the same as other business entities.

Cooperatives in Indonesia play a strategic role in driving the pulse of the people's economy and national development. The role and function of cooperatives is not only limited to economic activities, but also as a manifestation of the collective spirit, togetherness, and the principle of justice rooted in our society, namely mutual cooperation [5].

Cooperatives according to business level consist of primary cooperatives and secondary cooperatives [6].

1. Primary Cooperatives are cooperatives established by and consisting of individuals. Primary cooperatives can be formed by at least 20 (twenty) people.

2. Secondary Cooperatives are cooperatives established by and having cooperative members. Secondary Cooperatives are formed by at least 3 cooperatives. Secondary cooperatives can be divided into three types, namely:

1) Central Cooperative is a cooperative consisting of at least 5 (five) primary cooperatives.

2) Joint Cooperative is a Cooperative whose members have a minimum of 3 (three) central cooperatives.

3) Main Cooperative is a cooperative whose minimum membership is 3 (three) joint cooperatives. Main cooperatives are established in each capital city.

Cooperatives based on the type of business can be divided into:

1. Savings and Loans Cooperatives are cooperatives that have a single business that is to hold members' savings and serve loans.

2. Consumer Cooperative is a cooperative whose business field provides members' daily needs. Such needs are for example the need for food, clothing, and household furniture.

3. Producer's Cooperative is a cooperative whose field of business is making or producing goods.

4. Service Cooperative is a cooperative whose business activities are engaged in service activities.

### D. Previous Research

Several studies on factors that influence the successful use of accounting information systems that have been carried out have different research results. Research conducted by [5] to find solutions to the problems of the quality of accounting information systems, which when connected with user competencies and organizational culture through deductive analysis that supports phenomena, then looks for evidence through empirical facts. While research conducted by [7] stated that partially the factors that had a significant effect on the satisfaction of SIA users in Susut Sub-district were the factors of the involvement of SIA users, while the personal technical ability variable had no significant effect. Simultaneously the factors that have a significant effect on performance Research conducted by [8] states the factors that influence the performance of accounting information systems, namely user involvement, personal technical ability, do not affect user satisfaction. Formalization of system development influences user satisfaction.

## IV. RESULTS AND DISCUSSION

The role of users as the successful use of accounting information systems in cooperatives is analyzed using multiple linear regression equations (Multiple Linear Regression). The equation used is written as follows:

$$\text{Log } Y = b_0 + b_1 \log X_1 + b_2 \log X_2 + e$$

Obtained results as below:

$$\text{Log } Y = 0.492 + 0.170 \log X_1 + 0.42 \log X_2$$

Where

X1 is a user engagement factor in the development of accounting information systems

X2 personal information system engineering capabilities.

Model	Coefficients <sup>a</sup>				t	Sig.	
	Unstandardized Coefficients		Standardized Coefficients				
	B	Std. Error	Beta				
	(Constant)	.492		.034		14.433	.000
1	Log_X1	.170		.052	.323	3.280	.001
	Log_X2	.042		.043	.096	.976	.331

a. Dependent Variable: Log\_Y

A. *The influence of user involvement in the development of accounting information systems*

Estimation results show that the regression value of  $x_1$  is 0.170 so every time a user is involved in the development, the successful use of the system has the potential to increase by 0.170 fold assuming other variables are constant. Significant value of  $x_1$  of 0.001 < 0.05 indicates that user involvement has a significant effect on system success. This is because, users are the people who use the system directly so that when involved in system development, their role is very important to maximize what things are needed in the system so that it can be used effectively and as efficiently as possible [9].

I. *Influence of personal information system technical capabilities*

Estimation results show that the regression  $x_2$  value of 0.042 then when the user has the ability to use technology, the success of using the system has the potential to increase by 0.042 fold assuming other variables are constant. Significant value of  $x_2$  of 0.331 > 0.05 indicates that the user's technological ability has no significant effect on the success of the system. This result can be justified because, the ability of users may be able to simplify using the accounting information system but to succeed the system to function properly according to the desired function does not have a direct effect [10].

C. *The influence of user involvement and technical ability are tested jointly*

ANOVA <sup>a</sup>					
Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	.024	2	.012	6.361	.003 <sup>b</sup>
1 Residual	.171	92	.002		
Total	.195	94			

a. Dependent Variable: Log\_Y

b. Predictors: (Constant), Log\_X2, Log\_X1

Based on the ANOVA table above, the significance of  $F_{text}$  is 0.003 < 0.05. This shows that the independent variables  $x_1$  and  $x_2$  (user involvement; the ability of user techniques) significantly influence the Y variable (the successful use of accounting information systems). This result is because if the user has a good competency in the use of information technology and is given the opportunity to be involved in the development of the system, the system will be developed according to needs so that the objectives of the use of the system are achieved [11].

V. CONCLUSION

The conclusion of the study shows that, the involvement of users in the development of the information system should be carried out by the cooperatives in the city of Pekanbaru to be able to have a system that is both usable and user friendly. Whereas Personal' ability to use technology should not be an important priority, users who are not yet proficient can be given training prior to using the system. But that does not mean that the ability to be ruled out, the results of the study, the combination of the two variables tested, will have a significant influence on the successful use of the accounting information system. So, it is expected that the Cooperative in the city of Pekanbaru can consider these two factors in the benchmark to see the success or failure of the use of the system. The weakness of this study is that it still examines in terms of user factors, there are still variables that should be examined for further research. From the aspect of the sample, hopefully the researcher can then multiply the sample under study so that the results obtained will be better.

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# *The Influence Of Sharia Bond Issuance And Capital Adequacy Ratio Towards Return On Asset In Indonesian Sharia General Banks*

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**Abstract** — This research aims to (1) test and analyze the influence of Sharia Bond Issuance towards Return On Asset (ROA). (2) to test and analyze the influence of Capital Adequacy Ratio (CAR) towards Return On Asset (ROA). (3) test and analyze the influence of Sharia Bond Issuance and Capital Adequacy Ratio (CAR) towards Return On Asset (ROA).

The sampling technique used is purposive sampling. The samples obtained totaling 10 Sharia General Bank in Indonesia. The data analysis technique used was multiple linear regression and hypothesis test using t-statistic to test partial regression also F statistic. In addition, it was also conducted classic assumption test that includes normality test, multicollinearity test, heteroscedasticity test and autocorrelation test.

The result of this research shows that (1) The issuance of bond has significant influence towards Return On Asset (ROA). (2) Capital Adequacy Ratio (CAR) has significant influence towards Return On Asset (ROA). (3) The issuance of Sharia Bond and Capital Adequacy Ratio (CAR) simultaneously has significant influence towards Return On Asset (ROA) variable.

**Keywords** — Issuance of Sharia Bond, Capital Adequacy Ratio (CAR), Return On Asset (ROA)

## I. INTRODUCTION

Sharia bank is a finance institution that has function and important purpose in economy. Function and purpose of Sharia General Bank includes widespread economic prosperity, employment, and optimum economic growth level, social economic justice, prevalent income and wealth distribution, money value stability, mobility, and savings investments that guarantee a fair and effective return. The purpose of Sharia General Bank shows the implementation of national development in order to improve justice, togetherness, and equality of society. Sharia Banks run their business based on sharia principles and stay away from usury practices, to be filled with investment activities based on result of trade fund. Considering the important role of sharia in Indonesia, then sharia banks needs to improve their

performances to create banks with healthy and efficient sharia principles.

Profitability is the most right indicator to measure the performance of a bank. Profitability level of a sharia bank is the best in the world measured from ration of profit to assets. (ROA). Both for full fledge bank category and Sharia Business Unit category. Profitability is measuring the capability of a company to obtain profit from their business activities related to sale, total assets, or their own capital that is seen from profitability. The last important function to be achieved by a company is obtain maksimum return or profit as targeted., comapny can do more for employee prosperity, also improve product quality and conduct nwe investment, the meaning of profit must be achieved and corresponding to what is expected. To measure the profit level of a company, used profit ratio or profitability ratio. (Ramadhani, 2013). The implementation of profitability analysis is in profitability ratio or called operating ratio. One of the ratios that mostly used in measuring company performance is Return On Asset (ROA). ROA is used to measure management skill of a bank in obtain profit. ROA is focused on company ability to obtain earning in company. (Febrianti, 2015). The greater the ROA of a bank, the greater the level of profit achieved by the bank, and the better the bank's position in terms of asset use. (Putri & Herlambang, 2015)

In the last few years, capital government is specified their focus on sharia banks products includes sharia obligation or called sharia bonds, noted that the total of Indonesian citizen is Moslem in majority and this is a potentio to improve obligation market, but sharia banks sectors are still not yet efficient in the development of sharia obligation. Sharia obligation as one instruments of sharia finance that rapidly developed in global finance market nowadays. It is also adopted as one of the funding instruments based on shariah principle by government of Indonesia since 2008. Sharia Bonds can be said as the answer of moslem investor requests. Because sharia bonds is sharia obligation issued by company based on sharia priciples published by issuer to owner of sharia obligation that required issuer to pay back the obligation fund that at its deadline. Sharia Obligation has role as one

of the resource of state funding towards state budget deficit to fund any government programs in the term of development and improvement of state infrastructure.

Table I. The development of Sharia Bond in Indonesia

Year	Emission of Sharia Bonds		Sharia Bonds Outstanding	
	Total (Billion)	value Amount	Total (Billion)	Value Amount
2013	11.994,40	64	6.883,00	36
2014	12.956,40	71	7.105,00	35
2015	14.483,40	80	8.444,40	41
2016	20.425,40	100	11.748,00	52
2017	26.394,90	137	15.740,50	79

Source : www.ojk.co.id

Sharia banks sectors as part of sharia finance industry also get benefits from the issuance of Sharia bonds (*sukuk*). That is can assist to manage excess of liquidity in sharia banks industry. As (Rahmah, 2017) stated that security can reduce the delegation cost that certified by banks industry, where the function of bank as intermediary institution collect more dana owned by society in the form of savings, giro, deposit and then distributed in various form of funds, which then in the distribution process, need supervision process that make additional cost for bank and systematic risk, to minimize that risk, banks can allocate their funds through asset diversification, one of which through derivative activity, so that banks can run their function as intermediary effectively..

Sharia Bonds (*sukuk*) as one form of securities based on sharia principles can give benefit for sharia banks industry that are able to improve sharia banks profitability by preventing the risks, with government guarantees for payment of rewards and the value of Islamic bonds (*sukuk*), makes sharia bonds (*sukuk*) as one of the alterative for banks industry to diversify funds they owned to instruments with low risk, give income in the form of outcome, competitive fee/margin with low risk makes sharia bond (*sukuk*) becomes one of the favorite instruments for banks to invest their funds. Beside that, other benefir obtained by sharia banks from distribution of fund in sharia bond (*sukuk*) is that sharia bond (*sukuk*) can be traded in secondary market in accordance to market rate so that investor is potential to obtain capital gain, and sharia banks are also give role to support fund for national development.

Beside the issuance of sharia bonds, other factor that influence Return On Asset (ROA) is Capital Adequacy Ratio(CAR) that is bank ability to cover the decrease of its assets as the impact of bank lost caused by risk assests. The greater the CAR is the better bank ability to bear the risk of every productive assets credit at risk. (Prasanjaya & Ramantha, 2013).

While according to (Dewi & Wisadha, 2015) is ratio of capital adequacy that show banks ability in rproviding fund used to overcome lost risk. This ratio is important because by protecting the the CAR in the safe limit (minimal 8%), meaning that also protect the customers and keeping the finance system stability overall. The greater the value of CAR reflects the better ability of banks in dealing with possible risk of loss. CAR can be obtained by dividing total capital by weighted assets according to risk (ATMR).

According to Archie Marlon and Adler Haymans Manurung that the issuance of sharia bonds is significantly influence the Return On Assets (ROA) and Car significantly influences ROA. (Marlon and Haymans 2016.)

Next, according to Rianda Ajeng Ardiyanti Putri, sharia bond (*sukuk*) significantly influence the Return On Assets (ROA) because the company processes reliably and professionally. Therefore the processing has an increased impact on investment income of a company. (Putri and Herlambang 2015)

And the last research by Ikromi Ramadhani, Sharia Bonds (*sukuk*) that the issuance of Sharia Bond has no significant influence to Profitability (ROA). (Ramadhani, 2013)

Some researches above is dominated by results that have no significant influence and direct impact towards profitability of sharia bond issuance. (*sukuk*). According to research background, then this research aims to analyze the influence of Sharia Bonds (*sukuk*) and Capital Adequacy Ratio (CAR) influences towards Return On Asset (ROA) in Sharia General Bank period of 2013-2017.

## II. METHOD

Method used in this research is associative quantitative research. The location of this research is Indonesian Sharia General Banks, with the data collection on 2013 – 2017 from *official website* of finance report in every bank listed in Sharia General Bank in period of 2013-2017. Population of this research is company in Sharia General Bank in Indonesia listed in Financial Service Authority. The observation year is from 2013 -2017. Sample in this research was taken by Purposive sampling method, that is sampling conducted based on research purpose that has been conducted, by seeing annual finance report in Sharia General Bank in Indonesia. Certain considerations as the sample determinant are:

- Bank that is included in Indonesian Sharia General Bank and it has finance report that is complete and published in 2013-2017
- Bank that has complete sharia bond issuance in Indonesian Sharia General Bank in 2013-2017
- Bank that has complete report of *Capital Adequacy Ratio* (CAR) in Sharia General Bank in 2013-2017.

**List of Sample Company**

No	Sharia General Bank	Criteria			Description
		A	B	C	
1	Aceh Bank	√	×	√	–
2	Sharia BCA	√	√	√	Sample 1
3	Sharia BJB	√	×	√	–
4	Sharia BNI	√	√	√	Sample 2
5	Sharia BRI	√	√	√	Sample 3
6	Sharia BTPN	√	×	√	–
7	Sharia Maybank	√	√	√	Sample 4
8	Sharia Mega	√	√	√	Sample 5
9	Indonesian Muamalat	√	√	√	Sample 6
10	Sharia Panin	√	√	√	Sample 7
11	Bukopin Sharia	√	√	√	Sample 8
12	Mandiri Sharia	√	√	√	Sample 9
13	Sharia Victoria	√	√	√	Sample 10

**III. RESEARCH FINDINGS**

**Normality Test**

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		50
Normal Parameters <sup>a,b</sup>	Mean	.0000000
	Std. Deviation	1.19394683
Most Extreme Differences	Absolute	.171
	Positive	.094
	Negative	-.171
Kolmogorov-Smirnov Z		1.207
Asymp. Sig. (2-tailed)		.109
a. Test distribution is Normal.		
b. Calculated from data.		

Note that based on the table above, the probability value p or Asymp. Sig. (2-tailed) of 0.109. Because the probability value of p, which is 0.109, is greater than the level of significance, which is 0.05. This means that the assumption of normality is fulfilled

**Multicollinearity Test**

Model	Collinearity Statistics	
	Tolerance	VIF

1 (Constant)		
Issuance of Sharia Bond (X1)	.755	1.325
CAR (X2)	.755	1.325

Based on the table above, the value of VIF from the issuance of sharia bond is 1,325 and CAR is 1,325. It is found that total value of VIF < 10. It means that there is no multicollinearity.

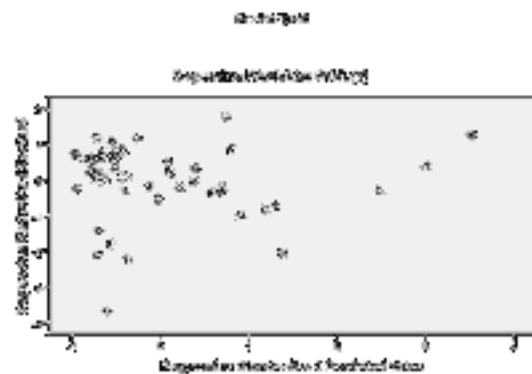
**Autocorrelation Test**

**Autocorrelation Test with Durbin-Watson Test**

Model	Durbin-Watson
1	1.632

Statistic value of Durbin-Watson test that is smaller than 1 or bigger than 3 is indicated as have autocorrelation. Based on Table 4.6, the statistic value of Durbin-Watson is 1,632. Note that because the statistic value of Durbin-Watson is between 1 and 3, that is  $1 < 1,632 < 3$ , the assumption of non-autocorrelation is fulfilled. In other word, there is no autocorrelation.

**Heteroscedasticity Test**



Note that based on Figure above, there is no clear pattern, also scattered dots above and under 0 in Y axis, then there is no heteroscedasticity.

**Descriptive Statistic Analysis**

**Descriptive Statistic Based on Sharia Bonds Issuance Variable, CAR and ROA**

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
ROA	50	-4.13	5.50	.8068	1.53006

(Y)					
Sharia Bonds Issuance (X1)	50	10.23	74.11	28.1931	17.70402
CAR (X2)	50	11.10	75.83	21.7862	14.77783
Valid N (listwise)	50				

Based on table above, it is found that in ROA variable, the minimum value of ROA is -4,13 and the maximum value of ROA is 5,50. The average value of ROA is 0,8068, with deviation standard 1,53006. Minimum value of sharia bonds issuance is 10,23 (in hundreds of billions), while the maximum value of sharia bond issuance is 74,11 (in hundreds of billion). The average of sharia bonds issuance is 28,1931 (in hundreds of billion), with deviation standard of 17,70402. The minimum value of CAR is 11,10, while the maximum value of CAR is 75,83. The average of CAR is 21,7862, with deviation standard of 14,77783.

### Multiple Linear Regression Analysis

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.889	.354		-2.509	.016
Sharia Bond Issuance (X1)	.031	.011	.356	2.720	.009
CAR (X2)	.038	.014	.367	2.800	.007

Based on table above it is obtained equation of multiple linear regression as follows:

$$= -0,889 + 0,031X_1 + 0,038X_2 + e$$

It is known that the constant value is -0,889. It means that if the issuance of sharia bonds and Capital Adequacy Ratio (CAR) is 0, then the dependent variable value (Y), that is ROA is -0,889. Regression coefficient value from sharia bond issuance is 0,031. That value can be interpreted when the sharia bond issuance is increase for 1 rupiah, then ROA is increased for 0,031 percent. Regression coefficient value from CAR is 0,038. That value can be interpreted when CAR is increased for 1 percent, then ROA is increased for 0,038 percent.

### Partial Significance Test (t Test)

### Partial Influence Significance Test (t Test)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.889	.354		-2.509	.016
Sharia Bond Issuance (X1)	.031	.011	.356	2.720	.009
CAR (X2)	.038	.014	.367	2.800	.007

Based on t test in Table above, the result is:

#### 1. Sharia Bonds Issuance Variable (X1)

It is known that the coefficient value of sharia bond issuance is 0,031, that has positive value. This means that the issuance of sharia bonds has positive influence towards ROA. The statistic value of t (t count) is |2,720| > t table |2,011| with Sig from sharia bond issuance variable is 0,009 < 0,05, then the issuance of sharia bond is significantly influence the ROA.

#### 2. CAR Variable (X2)

It is known that the coefficient value of CAR is 0,038, that has positive value.

It is known that the statistic value t (t count) is |2.800| > t table |2,011| with Sig of CAR variable is 0,007 < 0,05, then CAR is significantly influence the ROA.

### Simultaneous Influence Test with F Test

ANOVA <sup>b</sup>						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	44.863	2	22.432	15.094	.000 <sup>a</sup>
	Residual	69.850	47	1.486		
	Total	114.713	49			
a. Predictors: (Constant), CAR (X2), Sharia Bonds Issuance (X1)						
b. Dependent Variable: ROA (Y)						

Then the variable value of F table with df1 = 2, df2 = 47 and significance level of 5% or 0,05 is 3,195. It is known that the value of F count 15,094 > F table 3,195 and Sig value is 0,000 < 0,05, then the sharia bonds issuance and

CAR jointly or simultaneously have significant influence to ROA.

### Determination Coefficient Analysis (R<sup>2</sup>)

#### Determination Coefficient

Model Summary <sup>b</sup>					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.625 <sup>a</sup>	.391	.365	1.21909	1.632
a. Predictors: (Constant), CAR (X2), Sharia Bonds Issuance (X1)					
b. Dependent Variable: ROA (Y)					

Based on table above it is known that determination coefficient (R-Square) is 0,391. Sharia bond issuance variable and CAR jointly and simultaneously can influence ROA for 39,1%, the rest is 60,9% explained by variable or other factors.

#### IV. RESULT AND DISCUSSION

The influence of Sharia Bond Issuance towards Return On Asset (ROA) in Sharia General Bank

From the result of statistic test the coefficient value obtained is 2,720 > 2,011 with significance of 0,009 < 0,05 this shows that the issuance of sharia bond has positive and significant influence towards Return On Asset (ROA). This means that the higher the issuance of sharia bonds, the more profitability (ROA) increases. The issuance of sharia bonds has a positive and significant influence on profitability (ROA) indicating that the issuance of sharia bond in Sharia General Banks has increased every year. There are several factors that make sharia bonds increase because sharia bonds is a sharia investment product that emphasizes the nature of its investment. So with sharia bond investment, investors are considered to have ownership certificate assets. The second sharia bond issuance is published by the government as the state organizer. Therefore the level of security is guaranteed by the country. Third is profitable, that is when it is published, the level of competitiveness of benefits and lower taxes compared to deposit. The fixed rate of compensation until maturity is paid monthly. The fourth liquid where the sharia bond is traded and has the potential to obtain Capital Gain if the sharia bond is sold at a price higher than the purchase price, sharia bond can also be used as collateral or mortgaged to other parties. And fifth, the issuance of sharia bond is in accordance to sharia principles and has obtained fatwa also sharia opinion from National Sharia Council of the Indonesian Ulema Council. Because of these factors, the interest of investors to invest in sharia bond has increased every year. It has an impact on increasing the investment income of the company. So with the increase of sharia bond issuance, a company will get benefit and it indicates that the performance of the

company can be said to be good because with the Return On Assets (ROA) which is increased, the company will be more efficient in utilizing the assets owned to generate profits.

The result of this research is in accordance with the research of (Putri and Herlambang 2015) and (Nurjanah And Herlambang 2014) stated that there is significant influence of sharia bond issuance towards ROA.

The influence of Capital Adequacy Ratio (CAR) towards Return On Assets (ROA) in Sharia General Banks

From the statistic test, the coefficient value obtained is 2.800 > 2,011 with significance of 0,007 < 0.05. This shows that Capital Adequacy Ratio (CAR) has significant influence towards profitability (ROA). Shows that variable has positive and significant influence towards Return On Asset (ROA), The result of this research shows that the bigger the Capital Adequacy Ratio (CAR) then the Return On Asset (ROA) obtained by bank is bigger, because the smaller the Capital Adequacy Ratio (CAR) then the higher the bank capital ability in keeping the possibility for the occurrence of lost risk in their business activities, so that bank performance can be increased. In addition, the higher the bank capital, then banks can conduct expansion of their business more safely. With the business expansion, at the end will influence the bank finance performance.

The result of this research is in accordance with research by (Pranabawa and Adi Kencana 2016) and (Archie Marlon and Adler Manurung 2014 ) stated that there is influence of Capital Adequacy Ratio (CAR) towards profitability (ROA)

The Influence of Sharia Issuance And Capital Adequacy Ratio (CAR) towards Return On Assets (ROA)

From the statistic test, coefficient value obtained that with significance of 0,05, the F count is 15,094 > F table 3,195. and significance 0,000 < 0,05, it can be concluded that sharia bond issuance and Capital Adequacy Ratio CAR is jointly or simultaneously has significant influence towards Return On Asset(ROA). This is because the high of sharia bond issuance every year so that by the increase of fund in bank capital structure will assist company operational activities to be more productive. With the issuance of Sharia bonds will have influence on the increasingly available amount of funds that can be used by companies to run investments. The greater the company revenue, the more effective the bank operational activities. Whereas the higher the Capital Adequacy Ratio (CAR), the better the condition of the bank. In the other words, CAR is the ratio of the bank performance to measure the capital adequacy of the bank to support assets that contain or generate risk, for example loans granted. Because of this it can influence public confidence towards banks, where public trust is the basic capital for the survival of this financial institution. The ideal level of Capital Adequacy Ratio (CAR) will be very beneficial for banks and can improve society trust as fund owner, so that society will have more desire to save their fund in banks. So that by the increase of sharia bond issuance, the bigger the CAR, then can increase the Return On Asset (ROA) that also



becomes bigger, in this term, bank finance performance can be increased and better.

The result of this research is in accordance with the research (Archela Syifa Sagala 2014 ) and (Archie Marlon and Adler Manurung 2014 ) stated that there is influence of sharia bonds issuance and Capital Adequacy Ratio (CAR) towards Return On Asset (ROA) simultaneously.

#### V. CONCLUSION

Based on the result of discussion that has been conducted in the research, it can be concluded that:

1. Based on the result of statistic calculation with partial test using t test, on variable of Sharia Bonds issuance has positive and significant influence towards *Return On Asset* (ROA)
2. Based on the result of statistic calculation with partial test using t test on variable of *Capital Adequacy Ratio* (CAR) has significant influence towards *Return On Asset* (ROA).
3. Based on the result of simultaneous test F test, it is found that the issuance of Sharia Bonds and *Capital Adequacy Ratio* (CAR) is jointly or simultaneously, has significant influence towards *Return On Asset* (ROA).

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# *Financial Development and the Cost of Equity Capital: Evidence from Indonesia*

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**Abstract**—The purpose of this research is to examine the effect of direct and indirect consequences of internet financial reporting, earning power, and investment opportunity set at the cost of equity capital as well as through earnings management as a mediating variable. The results of this research can provide input in minimizing capital costs by conducting financial reporting through the website, knowing earning power and investment opportunity set owned by a company in order to develop their business and avoid earnings management practices.

**Keywords**—internet, financial, earnings, capital

## I. INTRODUCTION

The investor's decision will invest the amount of capital into the company if investors get confidence about the company's performance, which will generate a refund (return) of benefits. Investor confidence indicates that investors are valuing the company has low risk. It affects the rate of return that is presupposed by investors [3] [11]. When investment higher risk, the investor will increase the rate of return which is affected to increase the cost of equity capital [9]. Increasing earnings management activity and effort to minimize the cost of equity capital had encouraged public attention on accurate information disclosure. The use of the internet as a media reporting will facilitate investors in assessing the company's performance [10]. Most stakeholders often paying attention to profit information without regard to how profit generated, which is creating opportunities for management to do earnings management practice. Investors assumed that a high earning power will guarantee to return on investment and give profit. The focus of the assessment of company performance is not only profit information in a financial report. Investors considered that the value of a company is also from investment grade to be issued in the future known as an investment opportunity set [12].

## II. LITERATURE REVIEW

### A. Agency Theory

In agency theory, the manager, as the parties have direct access to information companies, have asymmetrical information against external party companies such as creditors and investors. This gives

the opportunity to the manager to conduct an earnings management in order to mislead the owner as to the economic performance of companies [9] [11]. Reference [2] stated that increased transparency and disclosure will contribute to aligning the interests of managers and shareholders. Disclosures are a mechanism for controlling the performance of managers and reduce the occurrence of information asymmetry and monitor the cost of supplies and that will affect the cost of capital [13].

### B. Cost of Equity Capital

The cost of equity capital is the rate of return requested by a company that will satisfy all capital providers. In this study, to determine the cost of equity capital using the Ohlson Model (1995) which has been modified by [18].

### C. Earnings Management

Earnings management is an ability to manipulate available options and make the right choice to achieve the expected level of profit. In this research, earnings management is calculated using the specific model of accrual formula that is working capital accrual.

### D. Internet Financial Reporting

Internet financial reporting consists of four components are content, timeliness, technology utilization, and user support.

### E. Earnings Power

Earning power is the company's ability to generate profits over a certain period. Profitability ratio as an earning power measurement using Net Profit Margin and Return On Assets.

### F. Investment Opportunity Set

The investment opportunity set serves as a predictor of a company's growth measured by analysis of variable factors used are price-based proxies and investment-based proxies. Price-based proxies are based on the difference between assets and the value of the company. This proxy is very dependent on stock price, consisting of a ratio of market to book equity and ratio of stock price to earnings per share. Investment-based proxies show a high level of investment activity positively

related to the company's investment opportunity set, consisting of investment to sales ratio and capital to total asset ratio.

### III. HYPOTHESIS DEVELOPMENT

#### A. *The Direct and Indirect Relationship of Content on the Cost of Equity Capital*

Measurement of internet financial reporting with the content index will make financial reporting be transparent so that to encourage managers to reduce the earnings management practices. Ease of information obtained will make financial information more reliable for parties using financial reports [8]. Investor confidence in the information given by the company affects the estimation of risk and determination of the desired rate of return investors [3] [11]. Based on the description, the proposed hypothesis is:

H1c. Content affects the cost of equity capital through earnings management.

#### B. *The Direct and Indirect Relationship of Timeliness on the Cost of Equity Capital*

In order that the financial statements were relevant, then it must meet the criteria on time. If there is a delay in reporting, then the resulting performance information will lose its relevance [15]. The company was late in disclosing financial information allegedly doing management profit. Financial statements disclosure on time will make it easier for investors to obtain information that is relevant. Based on the description, the proposed hypothesis is:

H2c. Timeliness affects the cost of equity capital through earnings management.

#### C. *The Direct and Indirect Relationship of Technology Utilization on the Cost of Equity Capital*

The increase in technology utilization has a lot of changing data processing of accounting activities that were originally manually into automatic [4]. It will improve the performance of managers and ultimately affect earnings management practices and cost of equity capital. Based on the description, the proposed hypothesis is:

H3c. Technology utilization affects the cost of equity capital through earnings management.

#### D. *The Direct and Indirect Relationship of User Support on the Cost of Equity Capital*

The existence of user support then reduces the communication gap between users and providers of information. Decision making is done the manager would be more accurate so that planning is done the more exact will further improve managerial performance or it means that the characteristics of management accounting information affect managerial performance [4]. It will reduce earnings management practices with good managerial performance. Based on the description, the proposed hypothesis is:

H4c. User support affects the cost of equity capital through earnings management.

#### E. *The Direct and Indirect Relationship of Net Profit Margin on the Cost of Equity Capital*

The net profit margin ratio indicates a net profit with total sales, which can be obtained from any cent sale [16]. The higher net profit margin ratio indicates that the better companies generate profits so that the higher the portion of dividends which can also be paid by the company. Stock market investors need to know the company's ability to generate profits. Based on the description, the proposed hypothesis is:

H5a. Net Profit Margin affects the cost of equity capital.

H5b. Net Profit Margin affects earnings management.

H5c. Net Profit Margin affects the cost of equity capital through earnings management.

#### F. *The Direct and Indirect Relationship of Return on Asset on the Cost of Equity Capital*

Return on assets was used as a proxy indicator of earning power calculation where the return on assets is one of the financial ratios are often used by would-be financiers [14]. The higher income or profits of the company, this will gain an appreciation for investors that the company is capable of providing a positive benefit for shareholders of the company. The higher profitability of a large number of dividends distributed. It will affect the cost of equity capital of the company [3] [11]. Based on the description, the proposed hypothesis is:

H6a. Return on Asset affects the cost of equity capital.

H6b. Return on Asset affects earnings management.

H6c. Return on Asset affects the cost of equity capital through earnings management.

#### G. *The Direct and Indirect Relationship of the Market to Book Equity on the Cost of Equity Capital*

Market to book equity proxy showed that firms with higher growth rates will tend to be doing more earnings management. This can be caused by high growth firms have an incentive to maintain high growth rates by doing earnings management [6]. Reference [12] stated that the investment opportunity set exists for the company is a major factor, which determines the movement of stock prices and dividends issued by companies are part of the cost of equity capital. Based on the description, the proposed hypothesis is:

H7a. Market to Book Equity affects the cost of equity capital.

H7b. Market to Book Equity affects earnings management.

H7c. Market to Book Equity affects the cost of equity capital through earnings management.

*H. The Direct and Indirect Relationship of Price Earnings Ratio on the Cost of Equity Capital*

Price-earnings ratio describes how much earning power company-owned. The highest price-earnings ratio will increase investor confidence in the company's future [1]. These effects have required rate of return investors and an impact on the cost of equity capital of the company. Based on the description, the proposed hypothesis is:

H8a. Price Earnings Ratio affects the cost of equity capital.

H8b. Price Earnings Ratio affects earnings management.

H8c. Price Earnings Ratio affects the cost of equity capital through earnings management.

*I. The Direct and Indirect Relationship of Investment to Sales on the Cost of Equity Capital*

The ratio of investment to sales indicates the company's ability to generate sales from existing assets. The higher sales or revenue generated forms, then the greater rate of return that is shared. It will impact on the cost of equity capital borne by the company [11]. Based on the description, the proposed hypothesis is:

H9a. Investment to Sales affects the cost of equity capital.

H9b. Investment to Sales affects earnings management.

H9c. Investment to Sales affects the cost of equity capital through earnings management.

*J. The Direct and Indirect Relationship of Capital to the Total Asset on the Cost of Equity Capital*

The ratio of capital to total assets to link the presence of additional share capital flow company for earning assets. It is potentially an indicator of growing companies. The higher revenue generated forms, then the greater rate of return that is shared. It will impact on the cost of equity capital borne by the company [3].

Based on the description, the proposed hypothesis is:

H10a. Capital to Total Asset affects the cost of equity capital.

H10b. Capital to Total Asset affects earnings management.

H10c. Capital to Total Asset affects the cost of equity capital through earnings management.

*K. The Direct Relationship of Earnings Management on the Cost of Equity Capital*

Investors will expect that the company could provide confidence. They will receive a return over the funds, which are invested. In this case, the owner or investor could have been harmed by the existence of earnings management. This is because financial statements due to fraud management apocryphal, that have affected the cost of equity capital in financial statement presentation [17]. Based on the description, the proposed hypothesis is:

H11. Earnings management affects the cost of equity capital.

IV. RESEARCH METHODS

We use the following model of research:

$$COEC = \gamma_1. CONT + \gamma_2. TIME + \gamma_3. TECH + \gamma_4. USER + \gamma_5. NPM + \gamma_6. ROA + \gamma_7. MTBE + \gamma_8. PER + \gamma_9. INVOS + \gamma_{10}. CAPTA + \gamma_{11}. MBLA + COEC \epsilon_1$$

$$MBLA = \gamma_{12}. CONT + \gamma_{13}. TIME + \gamma_{14}. TECH + \gamma_{15}. USER + \gamma_{16}. NPM + \gamma_{17}. ROA + \gamma_{18}. MTBE + \gamma_{19}. PER + \gamma_{20}. INVOS + \gamma_{21}. CAPTA + \gamma_2 \epsilon_2$$

Where:

$$COEC = (\text{book value per share (t)} + \text{earnings per share (t+1)} + \text{price per share (t)}) / \text{price per share (t)}$$

TABLE I. VARIABLE IDENTIFICATION

Hypotheses	Independent variables	Mediation variables	Dependent variables	Path coefficient	t-value
H1c	Content	Earnings management	Cost of equity capital	0.036	0.22
H2c	Timeliness	Earnings management	Cost of equity capital	-0.021	-0.22
H3c	Technology utilization	Earnings management	Cost of equity capital	0.007	0.21
H4c	User support	Earnings management	Cost of equity capital	0.001	0.07
H5a	Net profit margin		Cost of equity capital	-1.143	-1.29
H5b	Net profit margin		Earnings management	0.213	2.52
H5c	Net profit margin	Earnings management	Cost of equity capital	0.027	0.22
H6a	Return on asset		Cost of equity capital	0.845	1.16
H6b	Return on asset		Earnings management	-0.192	-2.76
H6c	Return on asset	Earnings management	Cost of equity capital	-0.024	-0.22
H7a	Market to book equity		Cost of equity capital	0.001	0.85
H7b	Market to book equity		Earnings management	-0.000	-0.24
H7c	Market to book equity	Earnings management	Cost of equity capital	0.000	-0.16
H8a	Price earnings ratio		Cost of equity capital	1.039	4.16
H8b	Price earnings ratio		Earnings management	0.115	4.95
H8c	Price earnings ratio	Earnings management	Cost of equity capital	0.014	0.22
H9a	Investment to sales		Cost of equity capital	0.312	2.06
H9b	Investment to sales		Earnings management	-0.008	-0.56
H9c	Investment to sales	Earnings management	Cost of equity capital	-0.001	-0.21
H10a	Capital to total asset		Cost of equity capital	-0.499	-0.87
H10b	Capital to total asset		Earnings management	0.072	1.31
H10c	Capital to total asset	Earnings management	Cost of equity capital	0.009	0.22
H11	Earnings management		Cost of equity capital	0.125	0.22

MBLA = working capital accruals (t) / sales (t)

CONT = dummy variable, 2 for HTML and 1 for PDF, the maximum score is 50.

TIME = dummy variable, scale 0 to 3 for disclosure of press releases and stock prices, the maximum score is 17.

TECH = dummy variable, scale 1 to 4 for technology utilization, the maximum score is 18.

USER = dummy variable, scale 0 to 3 for a number of clicks to get financial information, search and navigation tools, consistency of web page design, the maximum score is 15.

NPM = net income after tax (t) / revenue (t)

ROA = earning after-tax / total assets

MTBE = (outstanding shares x share price) / total equity

PER = stock price / earnings per share

INVOS = total tangible fixed assets / net sales

CAPTA = change in fixed assets / total asset book value

The population of this research is a manufacturing company listed on the Indonesia Stock Exchange during the period from 2010 to 2015 are 56 companies x 6 years = 336 observation data. The data used in this study were analyzed using partial least squares and carried out with the help of software LISREL 9.2. Research data collection techniques using nonprobability sampling by using purposive sampling methods. This research uses the type of secondary data or data derived from financial and nonfinancial information published on the Indonesia Stock Exchange ([www.idx.co.id](http://www.idx.co.id)) or the company's website.

The data analysis methods in this study include descriptive statistical analysis, normality testing and path analysis. Assumptions of normality can be tested with Z statistical values for skewness and kurtosis. If Z value, good and/or significant (less than 0.05 or 5%), it can be said that data distribution is abnormal. Conversely, if Z value, good and/or insignificant (greater than 0.05 or 5%), it can be said that data distribution is normal. The test concluded normality expected the result is not significant [5].

Hypothesis tests are based on research objectives, which is to assess the influence of independent variables separately. The significance (two-tailed) in this study is 5% or 0.05. If the p-value is greater than  $\alpha$  (0.05),  $H_0$  is accepted and  $H_a$  is rejected. If the p-value is smaller or equal to  $\alpha$  (0.05),  $H_0$  is rejected and  $H_a$  is accepted.

Based on [7], assess the fit model by looking at values of chi-square test, RMSEA, CFI, and RMSR. The fit test indicates a fit model, then it can be concluded that the model used in this research can be used as an analytical basis of this research problem.

## V. RESULTS AND DISCUSSIONS

Normality assumption can be tested with statistical value z for skewness and kurtosis. The results show that

COEC, MBLA, CONT, TIME, TECH, USER, NPM, ROA, MTBE, PER, INVOS, CAPTA has the value of significance test of normality of 0.241; 0.326; 0.205; 0.568; 0.997; 0.999; 0.997; 0.997; 0.997; 0.997; 0.997; 0.997. The overall variables this research has a p-value Skewness and Kurtosis greater than 0.05.

In addition, fit model testing is also done to find a model that fits with the original data so it can determine the quality of model research. In table II, the goodness of fit test in this research has a chi-square of 0.0486. Size goodness of fit, chi-square has p-value 0.8256 can be said model in this research has a fit model.

In table I, t-value for research sample is 1.96 which are PER and INVOS on COEC; and CONT, TIME, NPM, ROA, PER on MBLA have t-value greater than 1.96. It can be inferred that PER and INVOS have a significant relationship on COEC as follows 4.16; 2.06. The results of this study support the research conducted by [12] which states that price-earnings ratio and investment to sales have a positive and significant effect on the cost of equity capital. CONT, TIME, NPM, ROA, PER have a significant relationship on MBLA as follows 2.20; -2.43; 2.52; -2.76; 4.95. The results of this study support the research conducted by [6] [8] [9] [14].

In figure 1, testing to analyze whether a mediation variable (earnings management) affects the cost of equity capital indicating the coefficient value of path MBLA-COEC is 0.22 with t-value < 1.96 (significance level 5%), the path is not significant. This means that hypotheses state that earnings management has a significant direct effect on the cost of equity capital is not supported. The earnings management hypothesis testing procedure as a mediation variable of the relationship between content and cost of equity capital is by two steps as follows.

TABLE II. GOODNESS OF FIT TEST

GOF	Acceptable level of compatibility	Index Model	Description
Chi-Square	The smaller the better (p-value $\geq$ 0.05)	0.0486 (p=0.8256)	Good
GFI	GFI $\geq$ 0.90 good fit 0.80 $\leq$ GFI $\leq$ 0.90 marginal fit	1.00	Good fit
RMSR	RMSR $\leq$ 0.05 good fit	0.054	Good fit
RMSEA	RMSEA $\leq$ 0.05 good fit	0.054	Good fit
AGFI	AGFI $\geq$ 0.90 good fit 0.80 $\leq$ AGFI $\leq$ 0.90 marginal fit	0.998	Good fit
RFI	RFI $\geq$ 0.90 good fit 0.80 $\leq$ RFI $\leq$ 0.90 marginal fit	0.996	Good fit
IFI	IFI $\geq$ 0.90 good fit 0.80 $\leq$ RFI $\leq$ 0.90 marginal fit	1.00	Good fit
CFI	CFI $\geq$ 0.90 good fit	1.00	Good fit
CN	CN $\geq$ 200 good	45769.99	Good

First, do an estimate of direct effect content on the cost of equity capital without inserting a mediating variable. This direct influence should be significant. This stage has been conducted when conducting H1a (0.33) is insignificant at  $< 1.96$  (significance level 5%) and H1b (2.20) is significant at  $> 1.96$  (significance level 5%), indicating that there is a significant direct effect. Second, do the estimation of indirect effect simultaneously with the triangle PLS-SEM model, namely CONT-COEC, CONT-MBLA, and MBLA-COEC. The requirements of the mediation effect that must be met are that path CONT-MBLA and MBLA-COEC must be significant. Based on these provisions, it can be concluded that H1c is rejected so that the content is not proven to affect the cost of equity capital through earnings management as a mediating variable.

From table I, hypotheses H2a, H3a, H4a, H5a, H6a, H7a, H10a, H11 rejected indicates there is no direct effect of timeliness, technology utilization, user support, net profit margin, return on asset, market to book equity, capital to total assets on the cost of equity capital. Hypothesis H8a and H9a are supported, indicating the direct effect of price-earnings ratio and investment to sales on the cost of equity capital. Hypothesis H3b, H4b, H7b, H9b, H10B was rejected indicating no direct effect of technology utilization, user support, market to book equity, investment to sales, capital to total asset on earnings management. Hypothesis H2b, H5b, H6b, H8b are supported that indicate a direct effect of timeliness, net profit margin, return on asset, price-earnings ratio on earnings management.

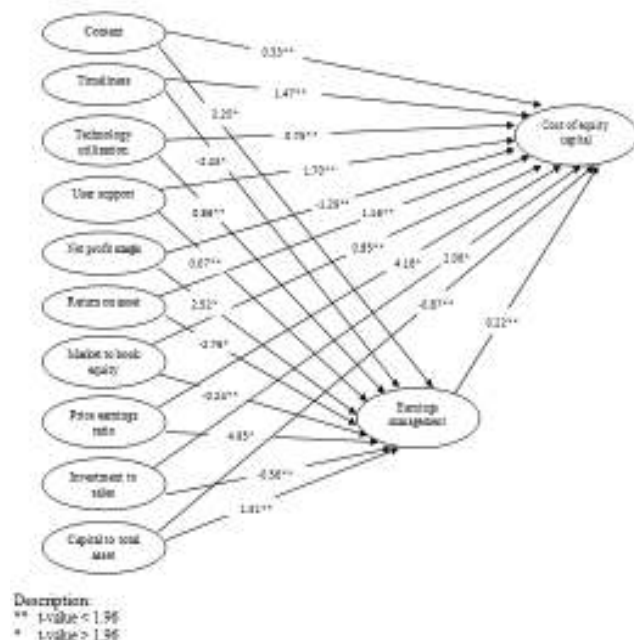


Figure 1. Research Model

For a test of indirect effect, hypothesis H2c (path TIME-MBLA-COEC) is TIME-MBLA (-2.43) with  $t$ -value  $> 1.96$  (significance level 5%), the path is significant and MBLA-COEC (0.22) with  $t$ -value  $< 1.96$ , the path is not significant. H2c states timeliness

has an indirect effect on the cost of equity capital through earnings management is not supported.

Hypothesis H3c (TECH-MBLA-COEC) is TECH-MBLA (0.86) with  $t$ -value  $< 1.96$  (significance level 5%), the path is not significant and MBLA-COEC (0.22) with  $t$ -value  $< 1.96$ , the path is not significant. H3c states technology utilization has an indirect effect on the cost of equity capital through earnings management is not supported. Hypothesis H4c (USER-MBLA-COEC) is USER-MBLA (0.07) with  $t$ -value  $< 1.96$  (significance level 5%), the path is not significant and MBLA-COEC (0.22) with  $t$ -value  $< 1.96$ , the path is not significant. H4C states user support has an indirect effect on the cost of equity capital through earnings management is not supported.

Hypothesis H5c (NPM-MBLA-COEC) is NPM-MBLA (2.52) with  $t$ -value  $> 1.96$  (significance level 5%), the path was significant and MBLA-COEC (0.22) with  $t$ -value  $< 1.96$ , the path is not significant. H5c states net profit margin has an indirect effect on the cost of equity capital through earnings management is not supported. Hypothesis H6c (ROA-MBLA-COEC) is ROA-MBLA (2.76) with  $t$ -value  $> 1.96$  (significance level 5%), the path is significant and MBLA-COEC (0.22) with  $t$ -value  $< 1.96$ , the path is not significant. H6C states return on asset has an indirect effect on the cost of equity capital through earnings management is not supported.

Hypothesis H7c (MTBE-MBLA-COEC) is MTBE-MBLA (-0.24) with  $t$ -value  $< 1.96$  (significance level 5%), the path is not significant and MBLA-COEC (0.22) with  $t$ -value  $< 1.96$ , the path is not significant. H7c states market to book equity has an indirect effect on the cost of equity capital through earnings management is not supported. Hypothesis H8c (PER-MBLA-COEC) is PER-MBLA (4.95) with  $t$ -value  $> 1.96$  (significance level 5%), the path is significant and MBLA-COEC (0.22) with  $t$ -value  $< 1.96$ , the path is not significant. H8c states price earnings ratio has an indirect effect on the cost of equity capital through earnings management is not supported.

Hypothesis H9c (INVOS-MBLA-COEC) is INVOS-MBLA (-0.56) with  $t$ -value  $< 1.96$  (significance level 5%), the path is not significant and MBLA-COEC (0.22) with  $t$ -value  $< 1.96$ , the path is not significant. H9c states investment to sales has an indirect effect on the cost of equity capital through earnings management is not supported. Hypothesis H10c (CAPTA-MBLA-COEC) is CAPTA-MBLA (1.31) with  $t$ -value  $< 1.96$  (significance level 5%), the path is not significant and MBLA-COEC (0.22) with  $t$ -value  $< 1.96$ , the path is not significant. H10c states capital to total asset has an indirect effect on the cost of equity capital through earnings management is not supported.

## VI. CONCLUSION

Based on the analysis and testing results shows that:  
(1) Price-earnings ratio and investment to sales have a direct effect on the cost of equity capital of 4.16; 2.06,  
(2) Content, timeliness, technology utilization, user

support, net profit margin, return on asset, market to book equity, capital to total asset, and earnings management has no direct effect on cost of equity capital, (3) Content, timeliness, net profit margin, return on asset, and price-earnings ratio have a direct effect on earnings management of 2.20; -2.43; 2.52; -2.76; 4.95, (4) Technology utilization, user support, market to book equity, investment to sales, and capital to total asset has no direct effect on earnings management, (5) Content, timeliness, technology utilization, user support, net profit margin, return on asset, market to book equity, price-earnings ratio, investment to sales and capital to total asset have no indirect effect on the cost of equity capital through earnings management.

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# *The Organization Resources and Performance: The Influence of Human Capital on Creative SMEs Sharia-Based*

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**Abstract**—This study focuses on creative sharia-based Small and Medium Enterprises (SMEs) in Riau Province as no studies have been previously investigated the issue on human capital in sharia-based SMEs. Sharia-based SMEs is a new phenomenon in Indonesia. The study aims to investigate the influence of human capital towards organizations resources and performance of creative sharia based SMEs in Pekanbaru Riau. The samples undertaken 40 owners of creative SMEs sharia based which were selected based on purposive sampling technique. The data was employed using Structural Equation Modelling (SEM) with Wrap PLS approach. The results of the analysis showed that human capital has a significant influence towards the organization resources and the performance of creative SMEs sharia based. It is also demonstrated that the organization resources does not significantly influence the performance of creative sharia based SMEs. This research recommends creative SMEs sharia based to consider the human capital aspect in building the organization resources and improving the performance.

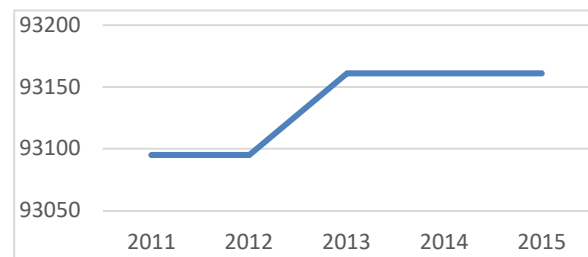
**Keywords**—human capital, the organization resource, performance, creative SMEs sharia based.

## I. INTRODUCTION

The development of Small and Medium Enterprises (SMEs) in Indonesia shows the trend that in the beginning they increase, however a half of them cannot survive until they shut down their business or move to another business. Started from monetary crisis that occurred in 1999, there were many big companies included industry, commerce, and service became stagnant and collapsed. The consequence of that crisis, the government was active in doing improvement and development on economic sectors by taking SMEs into account. White paper reported, it is necessary to provide supporting service from the management and work together with the organization that supports SMEs. (*White Paper on SMEs in Japan 2016*, n.d.)

As the labor intensive business, SMES must innovate and have high creativity to continue producing prominent products and services. There is a strong empirical evidence that confirms the importance of Small and Medium Enterprises in developing the economy (Buli, 2017). The following is the data of SMEs development in Pekanbaru.

Graph 1. The Data of SMEs Development in Riau Province in 2011-2015



Based on Figure 1, the development of the number of SMEs in Pekanbaru for five years only experience one increase from 2012 to 2013. In last few years, many SMEs shut their business down, even many of them did not survive for five years (detikfinance, 2013). For them who have courage and enough capital, they will try to survive and develop.

One of the factors that propel the survival and the development of SMES is human resources. Human resources of SMES usually come from the members of the family. De Massis mentions the division of family ownership negatively affects the performance (De Massis, Kotlar, Campopiano, & Cassia, 2015). Different from Lafuente Research which shows that the proportion of family members who work in the business emerges as the determinant component. Ployhart in his research, human resources as individual capacity can be measured based on the knowledge, skill, ability, and other individual's characteristics that can be accessed for relevant purposes through efforts (Ployhart, Nyberg, Reilly, & Maltarich, 2014).

This research wants to prove that human resources have effect towards organizational resources and performance simultaneously. According to Lawler, business partner approach places human resources as the part of additional value from an organization until it contributes at the business performance by effectively managing what is important from the capital of most of

the organization which is the human resources. To adapt with the demands of the global market that always changes, human resources becomes more necessary to reach the limit between the organizational function thoroughly and the dynamic environment where it runs (Lawler III & Boudreau, 2015).

This research focused on shariah-based creative SMES which is a new phenomenon in Indonesia, in line with the development of shariah banking, shariah stock and other shariah service. The snapshot of shariah-based creative SMES climate in Pekanbaru nowadays, seen from the opportunity of the empowerment from time to time, from place to place, and from sector to sector shows the expectation on the group of works to support the growth of fair economic system. A deeper study on human resources at SMEs to reach good organizational resources and to improve business performance is needed.

The data used in this research were primary data obtained through field survey. The samples used were 40 owners of shariah-based creative economy SMES in Pekanbaru City. The data were processed inferentially by using Structural Equation Modelling (SEM) with Wrap PLS approach. Shariah-based Creative SMEs is the business at the small and medium business to support the economy of many people and has important role in developing local and national economy.

## Literature Review

### A. Creative SMEs

Creative economy is a concept in the new economic era which its main support is information and the creativity of the human resources that have idea and knowledge as the main production factor in economy activity (Merina, 2017). Because of the importance of creative economy, the government forms a special Creative Economic Board (PERPRES\_NO\_72\_2015, 2015).

Creative economy is an economy based on the creation of values as a result of ideas. Howkins conclude that an economy would rely on an idea and a thought to create a better product in the future (John Howkins, 2013)

### B. Shariah-based Economy

For micro business, small, and medium with shariah-based if correlated between the definition of "shariah" word according to the main dictionary of Indonesian language is the law of religion which determines the regulations of human life, the relationship between human and Allah SWT, the relationship between human and other humans around them based on Al-Qur'an and Hadist. Dr. Umar bin Sulaiman Al-Asyqar revealed a more detailed definition that Shari'a is the laws that Allah established in The Quran through the way of The Prophet Muhammad in his Sunnah. (Al-Madhkhal ila Asy-Shari'ah wa Al-Fiqh Al-Islami,4).

With the definition of that shariah, SMES of shariah-based can be defined as the activity of society productive economy with small and medium scale managed commercially, and fulfill the provisions of the requirements determined and its management uses shariah principles. In other words, it does not disobey shariah regulations such as *maisir*, *gharar*, and *riba*, for example its finance through shariah bank or shariah micro finance institution, and its guarantee with shariah insurance. In line with its shariah operational principles, then the products of finance that can be provided by the shariah bank and the institution of shariah micro finance to the candidate of customer based on the shariah principles.

### C. Human Capital and Performance

The empirical study showed that the management as the human resources that consist of international experience, industrial knowledge, and CEO experience, and financial knowledge influence the performance (Volonté & Gantenbein, 2016). The characteristics of human resources are the skills and the knowledge carried by the individual director to the process of taking decision such as, the knowledge about industry, the experience as the CEO, the experience in the field of finance, firing CEO, influence them in taking decision (Johnson, Schnatterly, & Hill, 2013). The research by Ceng Tsai showed that the competence of employee also influence the performance.

The leaders of human resources state that by improving the skill, the ability, the quality of the new employee, it explains and determines the target, and improve the involvement of the employee, it can pay all the company investments (Boudreau & Cascio, 2017). It is strengthened by the findings which showed that to measure the human capital must consider the management of the company and the development of technical skills (Demartini & Paoloni, 2011). The literature study reveals that human capital from the director has important effect towards the result of the company (Johnson et al., 2013). The employee competence and good performance are mediated by the commitment of the organization (Cheng Tsai, Min Wang, & Chen Yuan, 2015).

Human resources focus on the management practical effectivity on human capital and other improvement process. The role of Human Capital is to help the task of administration. At the business company, human resources can add the value of the organizational performance effectively which are the important capital for many companies. The human capital is the strongest component when playing the strategic role, utilizing the information technology, owning the metric and the real analysis, and integrating the talent and business strategy (Lawler III & Boudreau, 2015). Our estimation showed that human capital is 4-5 times more important than the company ability. The manager must emphasizes on choosing the talent than train the workers to improve their innovational performance (Bhaskarabhatla, Hegde, &

Peeters, 2017), and the talent or interest determines the CEO choice (Miller, Xu, & Mehrotra, 2015).

The other empirical finding showed that human capital is important to explain the growth of the small company work. Beside that, the result showed that the active involvement of the entrepreneur in managerial task improves the intensity of human capital, and this leads to the level of higher work growth (Lafuente & Rabetino, 2011).

The efficiency of human capital has significant effect towards the company performance. The finding of this research is important to make better decision related to strategic asset placement which is the human capital (Rahim, Atan, & Kamaluddin, 2017). The human resources management often considers the main performance is determined from the operational improvement. On the contrary, some experts' opinion who learn the competitive excellence view the performance result firmly correlate with the contenders' result (Ployhart et al., 2014).

In evaluating the employee which is frequently used by SMES are professional experience, competence, and responsibility feeling, and the level of commitment to the company, the knowledge, the ability, and the accuracy. This survey reveals that work experience has the highest intensity followed by knowledge, ability, and competence (Marin, 2015). Because of the importance of the human capital, (Mäenpää & Voutilainen, 2012) research proposes the insurance as an important approach for the risk management of human resources. The important role of human capital can influence internasionalization (Cerrato & Piva, 2012).

#### *D. Organizational Resources and Performance*

(Boudreau & Cascio, 2017) states that to advance and to influence the organization, Human Capital Analytics (HCA) is necessary. The management must be careful in planning and providing the resources of the organization (Sengupta, Yavas, & Babakus, 2015). The research by Gillet (Gillet, Fouquereau, Huyghebaert, & Colombat, 2015) showed that through organizational resources, the variable of task changes, and ambiguity of work have direct effect and indirect effect towards the satisfaction of the psychological needs. The findings by Truyens, strategic management is necessary and the right planning on the organizational resources in prestigious sport (Truyens, De Bosscher, & Sotiriadou, 2016).

The global trend in the management of human resources give the latest findings about what makes Human Resources succeed and how it can add the value for the organization nowadays (Lawler III & Boudreau, 2015).

## II. METHODE

This research used quantitative method with unit analysis the doers of shariah-based creative UMKM in Pekanbaru City. The variables of the research consisted of Human Capital (X1), organizational resources (Y1), and performance (Y2). The type of data used in this research was primary data which was the collection of information obtained through direct observation and taking the data need in accordance with the research in the form of interview, and spreading the questionnaires to the doers of shariah-based creative SMEs in Pekanbaru City. The technique of data collection used in this research was survey to obtain the primary data from a number of respondents by using the interview. In this research, the populations were all practitioners of Shariah-based Creative SMEs existed in Pekanbaru City. The number of the population was unknown because secondary data were not available at the institution existed in Pekanbaru, until the number of samples were determined based on expert provision in the amount of 40 respondents. The technique of taking the samples were done through Purposive Sampling with criteria of SMEs labelled themselves as Shariah business and included into creative economy.

## III. RESULT AND DISCUSSION

According to the practitioners of Shariah UMKM in the amount of 50% had adequate knowledge. They also think that they already are expert in managing their business, but there are still the practitioners that feel they still have low ability in managing the business. The commerce brand from this product has been known by the society. There is no practitioner of Shariah SMEs who disagree. The second points states that this product has good reputation/image among the consumers, absolutely agree in the amount of 70%, meanwhile none of them disagree.

Outer model related to the test of validity and reliability of the research instruments. The data analysis (inferential) was done based on the data obtained from the questionnaires. The data analysis was done through the instrument test of the variable used such as validity test and reliability test whether it already was suitable or not, and statistic test to know the level of significance and suitability from the variables.

In order to do the data analysis collected through the questionnaires in the field, then quantitative method was used through SME WrapPLS approach. The following is the output result of SEM with WrapPLS.

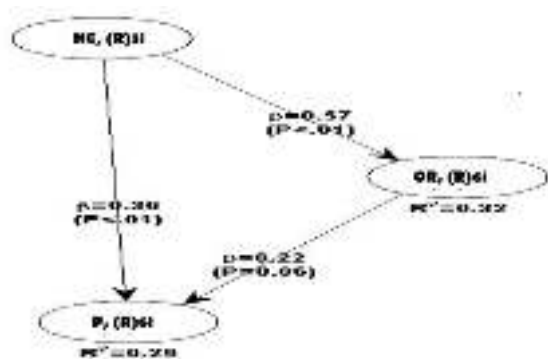


Figure 2. Research Model

The result of inferential analysis shows the direct effect of Human Capital towards Organizational Resources and Performance each in the amount of 0,57 and 0,36 are significant ( $P < 0,01$ ). In line with the research by Ployhart, human capital resources as the individuals' capacity can be measured based on the knowledge, skill, ability and other individual characteristics that can improve the business performance (Ployhart et al., 2014). Meanwhile the organizational resources do not have significant effect towards performance marked with the value of  $P = 0,06$  or  $P > 0,001$ . P value for Average Path Coefficient (APC) and Average R-Square (ARS) in the amount of 0,002 which means it is significant. Goodness of fit model has fulfilled the criteria with APC value and ARS value sequentially in the amount of 0,385 and 0,304 and significant. The AFIV value in the amount of 1,707 also has fulfilled the criteria.

WrapPLS output is the result of analysis based on the data that had been standardized (standardized data), until it can be interpreted the bigger the channel coefficient means the effect will be getting stronger (Solimun, 2017).

TABLE 1. Output Laten Variable

	HC	OR	P
R-Squared		0.322	0.285
Composite reliab	0.980	0.840	0.844
Cronbach's alpha	0.969	0.769	0.775
Avr.var.extrac (AVE)	0.941	0.471	0.483
Full Collin. VIF	1.640	1.491	1.403
Q-squared		0.314	0.323

Based on the output at table 1, the value of R-squared at variable Business Performance in the amount of 0,285 which means the contribution of variable Human Capital, Organizational Resources towards Performance in the amount of 28,5% and the remaining 71,5% influenced by the other variables outside this research and error. The value of composite

reliability and the value of cronbach's alpha  $> 0,60$  which means all research variables had fulfilled the reliability requirements. Meanwhile the value of AVE at variable Organizational Resources and Performance  $> 0,5$  until it still did not fulfill convergent validity. All variables were free from Full Collinearity VIF showed by the value of  $< 3,3$  which means free from vertical collinearity, lateral, and common method bias. Q squared at this model shows a good model because it has bigger value than zero.

TABLE 2. Laten Variable Correlations

	HC	OR	P
HC	0.970	0.547	0.505
OR	0.547	0.686	0.425
P	0.505	0.425	0.695

Human Capital Validity had been fulfilled because the root of AVE in the amount of 0,970 bigger than 0,547 and 0,505. Organizational Resources Validity is also fulfilled because the root AVE in the amount of 0,686 bigger than 0,547 and 0,425. Performance validity had also been fulfilled because the root of AVE in the amount of 0,695 bigger than 0,505 and 0,425.

#### V. CONCLUSION

Human capital is the main factor in improving human resources and business performance, until the ability indicator, the talent or interest, and the knowledge must be developed sustainably. Those indicators can be improved through experiences at the school, and interaction with the working environment. This can improve the performance of the practitioners of the Shariah-based creative economy UMKM.

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# *The Effect of Financing to Deposit Ratio (FDR), Non Performing Financing (Npf), Profitability and Operational Cost of Operational Income (Bopo) on the Mudharabah Financing of Sharia Commercial Banks In Indonesia*

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**Abstract** — This study aims to (1) Test and analyze the effect of FDR on Mudharabah financing. (2) Test and analyze the effect of NPF on Mudharabah financing. (3) Test and analyze the effect of ROA on Mudharabah financing. (4) Test and analyze the effect of BOPO on Mudharabah financing. (5) Test and analyze FDR, NPF, ROA, BOPO on Mudharabah financing. The sampling technique used was purposive sampling. In this research it was obtained a sample of 10 Sharia Commercial Banks in Indonesia. The data analysis technique used was multiple linear regression while the hypothesis testing used was t-statistics to test the partial regression coefficients and F statistics. In addition, classic assumption tests were also performed which include normality test, multicollinearity test, heteroscedasticity test and autocorrelation test. The results of this study indicate that (1) FDR variable has no effect on Mudharabah financing. (2) NPF variable has no effect on Mudharabah financing. (3) ROA variable influences on Mudharabah financing. (4) BOPO variable influences Mudharabah financing. (5) Variable FDR, NPF, ROA, and BOPO simultaneously influence Mudharabah financing variables.

**Keywords:** FDR, NPF, ROA, BOPO, Mudharabah Financing

## I. INTRODUCTION

The development of the sharia banking system in Indonesia is carried out within the framework of a dual-banking system within the framework of the Indonesian Banking Architecture (API) to present alternative banking services that are increasingly complete to the people of Indonesia. The development of Islamic banking has increased sharply because the majority of the population in Indonesia is Muslim. In addition, also because in conventional banking there are activities that are

prohibited in Islamic law such as receiving and paying interest (usury). The development of sharia banking can be seen from the increase in the number of banks or offices that use sharia principles and an increase in the number of assets under management.

The characteristics of the sharia banking system that operates are based on the principle of profit sharing that provides an alternative banking system that is mutually beneficial to the community and banks, as well as highlighting aspects of fairness in transactions, ethical investment, promoting the values of togetherness and brotherhood in production, and avoiding speculative activities in financial transactions by providing a variety of banking products and services. With a more varied financial scheme, Islamic banking is a credible alternative to the banking system that can be sought after by all classes of Indonesian people without exception.

There are various types of financing at the Sharia Bank which are generally divided into three principles, namely the principle of profit sharing, rent or services, and the principle of buying and selling using contracts such as murabahah, salam, istisna. Until now, sharia banking is still dominated by the principle of buying and selling, especially with the murabaha contract. Murabaha is a sharia banking financing product that is carried out by taking the form of buying and selling (ba'i or sale). The dominance of murabaha financing compared to other types of financing is caused by several factors. In terms of supply of Syaria'h Bank, murabaha financing is considered to be more minimal risk compared to the type of profit sharing financing. In addition, the pre-determined return also makes it easier for banks to predict the benefits to be gained.

Funds distribution activities at conventional banks are known as loans. The provision of loans by banks consists of various types depending on the ability of the bank that distributes them. This is different from sharia banks that

do not recognize the term credit or loans, but in sharia banks there is a term of financing. Financing is an activity of an sharia bank in channeling funds to parties other than banks based on sharia principles. Fund distribution in the form of financing is based on the trust given by the owner of the fund to the user of the fund. The owner of the fund believes in the recipient of the funds, that the funds in the form of financing provided will definitely be paid. The recipient of the financing gets the trust of the financier, so that the recipient of the financing is obliged to return the financing he has received in accordance with the period agreed upon in the financing agreement. H. R. Daeng Naja (2011). The still low portion of profit sharing financing or the dominance of non-share financing, especially murabaha in sharia bank financing portfolios turned out to be a global phenomenon, included in Indonesia. This happened because there were several factors that could influence the amount of mudharabah financing. According to (Meydinawathi, 2007) said that in addition to the funds available in (DPK), the supply of bank credit is also influenced by the bank's perception of the debtor's business prospects and the condition of the banking itself, such as capital (CAR), the number of non performing financing (NPF), and *Financing to Deposit Ratio* (FDR). Suseno and Piter A (2003) in (Meydinawati, 2007) apply that the profitability factor or the level of profit reflected in *Return on Assets* (ROA) and BOPO also influences bank credit.

**Financing Composition at Sharia Commercial Banks in 2014-2018 (In Billion Rupiahs)**

Type of Agreement	2014	2015	2016	2017	2018
Mudharabah	5.930	6.841	7.715	10.506	10.389
Musyarakah	9.058	13.356	24.369	41.096	60.997

Source: OJK Statistical Data

The phenomenon of low profit-sharing based financing is an important issue that needs to be discussed and find the right solution. Low profit-sharing based financing tends to be a multi-dimensional problem that has occurred for a long time and tends not to change. The implication of the high non-profit financing is the formation of public perception that Islamic banks are almost no different from conventional banks (Ascarya and Yumanita, 2005).

**II. METHOD**

The approach of this research used associative research with quantitative data types. Location of the study was conducted at commercial banks in Indonesia, with the official website of Bank Indonesia. In addition, the study population was a public Sharia Bank in Indonesia registered with Bank Indonesia. The population was 13 companies. Observations were made in early 2014-2018. The sample selection in this study was carried out using

the Purposive Sampling method, which is taking samples in accordance with the research objectives.

**III. RESEARCH FINDINGS**

**Normality Test**

**Multicollinearity Test**

Model	Collinearity Statistics	
	Tolerance	VIF
1 (Constant)		
FDR (X1)	.958	1.044
NPF (X2)	.965	1.036
ROA (X3)	.880	1.136
BOPO (X4)	.875	1.143

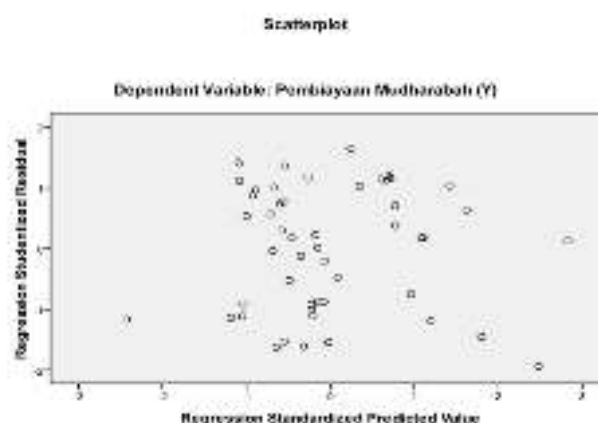
Based on the table above, the VIF value of FDR is 1.044, the VIF value of NPF is 1.036, the VIF value of ROA is 1.136 and the VIF value of BOPO is 1.143. It is known that all VIF values < 10. This means that there is no multicollinearity.

**Autocorrelation Test**

Model	Durbin-Watson
1	1.638

Statistical values from the Durbin-Watson test that are smaller than 1 or greater than 3 indicate the occurrence of autocorrelation. Based on Table 4.8, the value of the Durbin-Watson statistics is 1.638. Note that because the Durbin-Watson statistical value is located **between 1 and 3, which is 1 < 1,638 < 3**, the non-autocorrelation assumption is fulfilled. In other words, no autocorrelation symptoms occur.

**Heteroscedasticity Test**



Note that based on the picture above, there is no such clear pattern, and the points spread **above and below the number 0** on the Y axis, which can be said that there is no heteroscedasticity.



### Descriptive Statistical Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
Mudharabah Financing (Y)	50	10.41	98.81	17.9898	25.23928
FDR (X1)	50	70.87	424.923	85.2307	18.68607
NPF (X2)	50	.00	43.99	5.4336	7.54123
ROA (X3)	50	-10.77	5.50	.8440	2.84567
BOPO (X4)	50	68.7	199.97	106.2356	36.66969
Valid N (listwise)	50				

### Multiple Linear Regression Analysis

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-9.003	4.294		-2.097	.042
FDR (X1)	.520	.601	.112	.865	.392
NPF (X2)	.179	.192	.119	.928	.358
ROA (X3)	.431	.186	.312	2.316	.025
BOPO(X4)	1.778	.820	.293	2.169	.035

Based on the table above, obtained the multiple linear regression equation as follows.

$$Y = -9.003 + 0.520X_1 + 0.179X_2 + 0.431X_3 + 1.778X_4 + 0.928$$

### t-test

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-9.003	4.294		-2.097	.042
FDR (X1)	.520	.601	.112	.865	.392
NPF (X2)	.179	.192	.119	.928	.358
ROA (X3)	.431	.186	.312	2.316	.025
BOPO (X4)	1.778	.820	.293	2.169	.035

Based on the t test results in Table 4.11 the results obtained are as described below:

#### 1. FDR Variable (X1)

It is known that coefficient value of FDR is 0.520. The known statistical value of t (t arithmetic) is  $|0.865| < t \text{ table } |2.01|$  with the Sig of the FDR variable is  $0.392 > 0.05$ , then the FDR has no significant effect on mudharabah financing.

#### 2. NPF Variable (X2)

It is known that the coefficient of NPF is 0.179. The known statistical value of t (t arithmetic) is  $|0.928| < t \text{ table } |2.01|$  with the Sig of the NPF variable is  $0.358 > 0.05$ , then the NPF has no significant effect on mudharabah financing.

#### 3. ROA Variable (X3)

It is known that coefficient value of ROA is 0.431. The known statistical value of t (t arithmetic) is  $|2.316| > t \text{ table } |2.01|$  with the Sig

of the ROA variable is  $0.025 < 0.05$ , then ROA has a significant effect on mudharabah financing.

#### 4. Variable BOPO (X4)

It is known that the coefficient value of BOPO is 1.778. The known statistical value of t (t arithmetic) is  $|2.169| > t \text{ table } |2.01|$  the Sig of the BOPO variable is  $0.035 < 0.05$ , then the BOPO has a significant effect on mudharabah financing.

### F test

#### ANOVA<sup>b</sup>

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	41.723	4	10.431	4.445	.004 <sup>a</sup>
Residual	105.600	45	2.347		
Total	147.323	49			

a. Predictors: (Constant), BOPO (X4), NPF (X2), FDR (X1), ROA (X3)

b. Dependent Variable: Mudharabah Financing (Y)

### Coefficient of Determination Analysis (R<sup>2</sup>)

## IV. DISCUSSION

### 1. The effect of Financing to Deposit Ratio (FDR) on Mudharabah Financing

Testing the effect of the FDR variable on mudharabah financing by using the statistical test t obtained coefficient value which is  $0.865 < t \text{ table } 2.01$  with a significance of  $0.392 > 0.05$ . It means that this value is not significant at the 0.05 significance level. It shows that FDR has no significant effect on mudharabah financing. As for the FDR ratio decreasing every year does not affect mudharabah financing. In this study the results of t-test calculations indicate that the FDR variable has no effect on mudharabah financing. It means that the hypothesis stating that FDR has a positive effect and significant effect on mudharabah financing is not accepted.

### 2. The effect of (NPF) on Mudharabah Financing

Testing the effect of the NPF variable on mudharabah financing by using the t statistical test obtained a coefficient value of  $0.928 < t \text{ table } 2.01$  with a significance of  $0.358 > 0.05$ . This value is not significant at the 0.05 significance level which indicates that the NPF has no significant effect on financing mudharabah. Non-performing financing (NPF) is the risk of non-payment of financing channeled by Sharia commercial banks. If the NPF

has increased, murabahah financing channeled has decreased, and vice versa, that is if the NPF has decreased then the mudharabah financing channeled has increased. A high NPF level results in banks are experiencing difficulties and decreases in the soundness of banks. Therefore banks are expected to keep the NPF range within a reasonable level set by BI at a minimum of 5%. If the NPF level is above 5%, the bank should be more careful and reduce the disbursed financing. The caution of the bank in channeling financing makes the customer's demand go down because the customer feels the analysis process is taking too long.

### 3. The Effect of (ROA) on Mudharabah Financing

Testing the effect of the ROA variable on mudharabah financing by using the statistical test t obtained a coefficient value of  $2.316 > 2.01$  with a significance of 0.025. This value is significant at the 0.05 significance level which shows that ROA has a positive and significant effect on mudharabah financing. This means that the higher the ROA, the more mudharabah financing increases. ROA has a positive and significant impact on mudharabah financing, indicating that ROA in Sharia Commercial Banks has increased every year. Return on Assets (ROA) is a measure of the ability of bank management in obtaining overall profits. If the ROA of a bank is greater, then the greater also the level of profit achieved by the bank and the better the bank's position in terms of asset security.

### 4. The Effect of (BOPO) on Mudharabah Financing

From the testing effect of Operational Revenue Expense (BOPO) variable on mudharabah financing using the statistical test t, a significant value of  $2.169 > t$  table 2.01 was obtained with Sig from the variable BOPO  $0.035 < 0.05$ . Thus, BOPO has a significant influence on mudharabah financing. The results of this study are not in accordance with the theory which states that the smaller the BOPO or the bank's operational burden on income, will result in a higher level of bank efficiency as indicated by increased mudharabah financing. This is caused by the inconsistency between the increase or decrease in BOPO to the amount of mudharabah financing every month.

### 5. The effect of FDR, NPF, ROA, BOPO on mudharabah financing

Based on the F test it can be seen the F value of the table with  $df_1 = 4$ ,  $df_2 = 45$  and a significance level of 5% or 0.05 is 2.578. It is known that the calculated F value is  $4.445 > F$  table is 2.578 and the Sig value is  $0.004 < 0.05$ . Thus, FDR, NPF, ROA and BOPO together or simultaneously have a significant effect on mudharabah financing. That is because the high mudharabah financing each

year so that increasing funds in the bank's capital structure will certainly help the company's operational activities so that it is more productive. Mudharabah financing will have an impact on the increasingly available amount of funds that companies can use to carry out financing.

## V. CONCLUSION

### Conclusion

Based on data analysis and discussion of research results it can be concluded that:

1. Based on the results of simultaneous tests using the F test, it shows that the independent variables namely FDR (Deposits for Deposits Ratio), NPF (Non Performing Ratio), ROA (Return on Assets) and CAR (Capital Adequacy Ratio), simultaneously have a significant effect on mudharabah.
2. Based on the results of testing this research partially, it can be explained as follows:
  - a. Financing to Deposit Ratio (FDR) does not significantly influence mudharabah financing to the public of Bank Syariah Indonesia in the 2014-2018 period.
  - b. The Non Performing Ratio (NPF) variable has no significant effect on mudharabah financing to the public of Bank Syariah Indonesia in the 2014-2018 period.
  - c. Variable Return on Assets (ROA) significantly influences Sharia mudharabah commercial bank financing in Indonesia for the 2014-2018 period.
  - d. Operational Cost Variables Operational Revenues (BOPO) significantly influences mudharabah financing on the public Bank Syariah Indonesia in the 2014-2018 period.

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# *The Effect of Internal Control and Total Quality Management on Organizational Performance*

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**Abstract**—The study discovers the effect of internal control and Total Quality Management (TQM) on organizational performance. To achieve the objectives of the study, a theoretical framework was developed and some hypotheses were proposed. Data were collected by the questionnaire instrument. The unit of analysis is state-owned enterprises in Padang city. The study utilized primary data which is obtained through the questionnaire. Total sampling is used in this study. 90 questionnaires were returned as a final sample. Data were analyzed by Multiple Regression Analysis performed by SPSS 23 software. The result shows that Internal Control has a positive and significant effect on organizational performance. Total Quality Management has a positive and significant effect on organizational performance. Based on the findings of the research, the researchers suggest a number of relevant recommendations related to improving awareness about the importance of internal control system components, especially indicators of activity monitoring, while for TQM practices, process improvement is the most important thing that can improve organizational performance.

**Keywords**—Internal Control, Total Quality Management, Organizational Performance

## I. INTRODUCTION

Performance becomes one of the centers of attention in the business world. A lot of research is done related to performance. Performance is a condition that must be known and informed to stakeholders to know the level of achievement of the organization. Organizational performance is based on how effectively to achieve the objective through effective and efficient utilization of resources [5]. Managers must be able to utilize management tools to achieve organizational goals despite limited resources in the organization. Employees with all the competencies (character, knowledge, and ability) are key elements of the organization to achieve good performance. In an effort to solve this very complex problem, the organization must improve its performance through the improvement of its employees' performance.

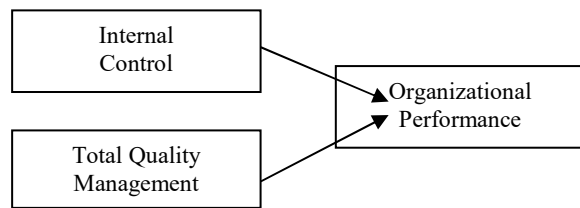
Companies must improve the performance of their company through internal control [13]. Internal control is intended so that the organization carries out its activities in accordance with the planned strategy. Internal control is also a tool to reduce the use of

resources that are not effective and efficient in the company's operations. Internal control plays a role because it provides protection for the organization against which weaknesses are human and to reduce the possibility of errors and actions that are not in accordance with the rules. Internal control can provide only reasonable assurance regarding the achievement of an organization's objectives. Implementing a proper system will help the organization's operation become more effective and efficient [14]. Weak internal controls will cause errors and fraud in the company. Conversely, if the company's internal control is strong, then the possibility of errors and fraud can be minimized. Management and application of good internal controls, a company will be easier to achieve its objectives.

Some evidence suggests that TQM does increase performance. The application of TQM allows every member of the organization to improve its quality. Every member of the organization involved in achieving the goals and vision of the company will be able to influence satisfaction with his work and this will affect individual performance and overall organizational performance. The application of TQM is intended for continuous development, maintenance and repairs in all company departments. Quality products are one way to add value to customers. However, TQM is an approach to make organizations more advanced and effective in creating quality products and reducing costs.

There is a lot of literature that examines the relationship between internal control and organizational performance in various countries as well as industries (for example, [2]; [11]; [12]; [6]). They founded internal control have a significant effect on organizational performance. But there is no literature on State-owned firms in Padang city. Hence, this research is important to do.

The theoretical framework was determined by reviewing literature; so that model of [1]; [15]; [8] for TQM and organizational performance. The model of [2]; [11]; [12]; [6] for internal control and organizational performance. According to previous research and the definitions presented above, the following conceptual models are presented to test the effect of internal control and total quality management on organizational performance, as described in Figure 1 below:



**Figure 1: the conceptual model**

The conceptual model above generates two hypotheses will be tested in the study. therefore, the hypotheses could be formulated as follows:

- H<sub>1</sub>: Internal Control has significant effect on organizational performance
- H<sub>2</sub>: Total Quality Management has significant effect on organizational performance

## II. METHODS

This study uses quantitative approach. The quantitative approach is explaining phenomena by collecting numerical data that are analyzed using mathematically based methods (in particular statistics) [7]. The quantitative approach is used when one begins with a theory (or hypothesis) and test for confirmation or disconfirmation of that hypothesis [9]. The data used in this study were obtained from a questionnaire method. Respondents of this study all the managers of state-owned enterprises in Padang City. They are financial manager, operation manager, the human resource manager, and marketing manager. The information about companies was obtained from the Statistical Bureau Center of West Sumatera Province, Indonesia. The population of this study consisted of branch state-owned enterprise in Padang city. There were 30 state-owned enterprises (BPS West Sumatera, 2018). The population was selected to be sampled (total sampling). As many 30 units of state-owned enterprises were surveyed. A number of 98 questionnaires were collected from 120 distributed until the end of the survey.

At the present model, internal Control and TQM are endogenous variables. Organizational performance is endogenous variables. The major material to collect data is questionnaire based on which five dimensions for internal control: control environment, risk management, control activities, information and communication, and monitoring activities. Twelve dimensions were used for TQM: executive commitment, adopting philosophy, closer to the customer, closer to supplier, benchmarking, training, open organization, employee empowerment, zero-defects mentality, flexible manufacturing, process improvement, and measurement [10]. Seven dimensions were used to measure organizational performance: effectiveness, efficiency and utilization of resources, productivity, quality, quality of work-life, innovation, profitability and budget compliance [3].

In order to determine the degree with which participants agree with statements, a five answer Likert

Scale consisting of 5) Strongly agree 4) Agree 3) Neutral 2) Disagree 1) Strongly disagree were used in the answer section. The survey data was analyzed using SPSS software.

The validity instrument tested by Pearson Product Moment Correlation. The instrument has high validity if the correlation value of each indicator to total correlation more than 0.30 or  $r\text{-value} > 0.30$  [4]. The instrument was tested for reliability with Cronbach's Alpha. The reliability criteria if Cronbach's Alpha  $> 0.6$ .

The data analysis uses both descriptive statistics analysis and multiple regression analysis. The descriptive statistical analysis aims to describe respondent demographics i.e. age, sex, education, position, and salary. Multiple regression analysis used to predict the value of variable based on the value of two or more other variables.

## III. RESULTS AND DISCUSSION

Respondents of this research have quite different characteristics. Diversity can be seen from the personal data of respondents including sex, education, position, and salary. The majority of respondent who participated in this study as male gender (64.95%), aged between 40 to 45 years (38.14%), having level education bachelor degree (77.55%), having position within company as a human resource manager (26,81%) and having salary IDR 6,001,000 to 7,000,000 (31.95%).

The average value (mean) of the internal control variable was in high category (4.12), monitoring activities as the highest indicator (4.23), and control environment as the lowest indicator (3.98). Variable TQM implementation variable was in high category (4.24), process improvement as the highest indicator (4.35), and executive commitment as the lowest indicator (3.98). Variable of Organizational performances was in high category (4.13), productivity as the highest indicator (4.25), and effectiveness as the lowest indicator (3.93).

The conceptual model illustrated in figure 1 has two hypothesized relationship among the variables internal control, TQM, and organizational performances. Table 3 and Table 4 display resulting from the multiple regression analysis using SPSS for windows.

**Table 1. Coefficient of Determination Test Result**  
Model Summary<sup>b</sup>

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.767 <sup>a</sup>	.588	.576	4.777

a. Predictors: (Constant), Internal\_Control\_X1,TQM\_X2

b. Dependent Variable: Organizational\_Performance\_Y

The results of testing the coefficient of determination show that organizational performance is influenced by internal control variables and total

quality management by 57,6%. The rest is influenced by other variables outside the research framework.

**Table 2. Multiple Regression Test Result**  
Coefficients<sup>a</sup>

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	2.715	6.371		.426	.671
Internal Control_X1	.848	.333	.383	2.574	.013
TQM_X2	.439	.160	.412	2.736	.008

a. Dependent Variable: Organization\_Performance\_Y

The results of the multiple regression analysis are also presented in table 4 indicating support for all the hypotheses. Hypothesis 1 stated internal control have significant effect on organizational performance, which is statically significant at prob. < 0.05 (t-statistic = 2.574). The statistical significance of hypotheses 1 confirms the implementation internal control improve organizational performance. This research similar with [2]; [11]; [12]; [6] that showed the higher the internal control system applicability, the higher the applicability of organization effectiveness. Internal controls help the financial sector in presenting it's a strong and stable outlook. It helps in monitoring the assets and maintaining the reliability of the company's account.

Hypothesis 2 stated Total Quality Management (TQM) have significant effect on organizational performance, which is statically significant at prob < 0.05 (t-statistic = 2.736). The statistical significance of hypotheses 2 confirms the implementation TQM improve organizational performance. This research similar with [1]; [15]; [8]. This can be interpreted as an increase/decrease in the emphasis on TQM by businesses results in an increase/decrease in their performance. If TQM practices are omplemented properly, it produces variety benefits such as understanding customer's needs, improved customer satisfaction, improved interbal communication, better problem solving and fewer errors.

The result shows that organizational performance is more influenced by TQM than internal control. TQM practice from a theoretical perspective, it will enhance organizational performance. This finding lends further support to the frequently suggested management practices and strategies for achieving improved organizational performance in TQM firms. More specifically, our finding provides further empirical support for prior study by [8]; [1]

#### IV. CONCLUSION

The aim of this research discovers the effect of internal control and TQM on organizational performance at state-owned enterprise in Padang city, West Sumatra Province, Indonesia. Internal control and

TQM have positive and significant effect toward organizational performance. TQM best explanation in improving organizational performance dimensions such as open organization, employee empowerment, zero-defect mentality, flexible manufacturing, process improvement and measurement.

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# The Strategic Planning Formulation in Public Organization

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**Abstract**— The competition of investment destination among the free trade zones has encouraged the agencies and managers to be more creative and innovative in providing attraction for foreign investment to come into the region. The main objectives of a free trade zones were boosting foreign investment, creating jobs, transferring technology, and increasing foreign exchange flows. It might become an indicators for the success of the FTZ if the management can booster its function as an agent of change for the domestic economic growth. In order to achieve the target, it need a strategic planning mechanism from the manager to anticipate all changes that occur in the external environment and evaluate the implementation of activities and programs that have been prepared with other stakeholders. This study identifies several variables that support the strategic planning process and formulates it into a model that can help organizations managing FTZ to achieve effectiveness and organizational performance. These variables are goal setting, stakeholder involvement, resources and budget allocation, external environment, and performance measurement. By using the content analysis method of published scientific articles, this study has successfully formulated a strategic planning process model that can help organizations achieving their ultimate goals.

**Keywords**—free trade zone, strategic planning, organization performance

## I. INTRODUCTION

The rapidly changing of global economic environment should be addressed by managers of free trade zone and special economic zones and local governments by making clearer strategic planning in the context of achieving improved regional performance and increasing regional competitiveness.

There is a logical thought that the free trade zones is likely to succeed and develop if the zones located or close to international trade routes and also provides seaports, airports and railroads that are connected to global shipping lines.

According to [1], currently 3,500 FTZ locations are operating in 135 countries (mostly in developing countries), employing more than 66 million workers, mostly in the manufacturing sector. The largest FTZ are in China, Singapore and the United Arab Emirates. For example, the Shanghai FTZ was inaugurated in 2013 and has an area of 11 square kilo meter and contains 4,600 companies including 280 foreign companies.

The concept of free trade zone began to play an important role in international trade since the early

1970s, where many countries have adopted the concept as a policy instrument in promoting foreign investment, expanding exports, spurring technology transfer, opening jobs, and facilitating economic liberalization in the country. Study from [2] and [3] concluded that FTZ is an instrument for developing countries to expand and modernize the economy through additional capital formation and foreign investment, technology transfer, job creation and economic growth.

Referring to these reasons, prior study by [4] found many developing countries that adopted the FTZ concept have not been able to achieve growth as expected, as the success of this concept when applied in Singapore, Hong Kong, Mauritius, Panama, Taiwan, Korea, Malaysia, and the Philippines. The FTZ is not always produce the economic impact as expected, in fact many countries fail to obtain benefits due to several factors such as the lack of strategic location, inadequate infrastructure, ineffective management and wrong policy strategies.

A study conducted by [5] concluded that the FTZ scheme is not the only instrument to increase export and economic growth. There are several other instruments that can be developed by a country in spurring growth in the context of economic liberalization including preparing a good management system and implementing policies and regulations that are right for business actors in the region.

In achieve economic growth and foster contribution of FTZ to the country, the management should preparing performance planning and measurement to deal with more complex governance and improve services to the public [6].

Study by [7] and [8] emphasized the need for a strategy to optimize the region's competitive advantage as an investment destination to achieve regional performance along with the objectives of FTZ. As FTZ can be more effective in dealing with rapidly changing environmental dynamics, the strategies must be flexible and able to adapt [9], and require integrated approaches to ensure organizations can learn effectively and be able to respond to internal and external changes.

Implementing a clear and directed strategy is a systematic approach to change management, by positioning the organization through strategic planning [10][11], responding to the management of emerging problems, and implementing the strategy [9] to help



increase competitive advantage over competitors and achieve superior performance [12].

According to [13], the failure of the management of special economic zones is mainly due to the initial planning factors, ineffective regulations, and institutional frameworks that have not been able to keep abreast of regional developments.

For more than 50 years, according to [14], strategic planning has been a standard feature in management thinking and practice in the business world and more than 25 years has been the standard practice for a large number of public and non-profit organizations. The main benefit of strategic planning is to increase strategic thinking, action, and learning [15].

Strategic planning makes the organization more proactive than reactive in preparing future plans, helping companies formulate better strategies by adopting a systematic, logical and rational approach to making strategic choices.

Strategic planning helps leaders from public and non-profit organizations to think and act strategically [14], [16]. The purpose of strategic planning is to maintain a balance between the organization and its business environment in the long run [17].

The purpose of this study is to develop a strategic planning model in the FTZ management agency by formulating the implementation steps in the strategic planning process. This model was developed through a literature review and then used content analysis to analyze several planning models identified from the literatures. In order to develop the model, this study analyzes the behavior of the free trade zone management bodies in implementing their strategic planning by looking at the best practices used in the planning model.

## II. LITERATURE REVIEW

### Free Trade Zones

The definition of free zones can be found in the Kyoto Convention - World Custom Organization which explains free zones as part of an agreed state area where goods introduced are generally considered to be outside the Customs territory. Therefore, according to the explanation, each type of special economic zone can basically be called a Free Zone [13][18].

Furthermore, [19]–[21] put together the term economic zones covering several related concepts, including free trade zones, free ports, foreign trade zones, export processing zones, special economic zones, free export zones, trade and economic cooperation zones, economic processing zones (economic processing zones), and free zones.

According to [18], FTZ is also often referred to SEZ, which is defined as a tax-free area where goods are stored, processed, assembled / processed, and distributed as finished goods for re-export as tax-free finished goods.

Despite the many variations in names and forms, they can be broadly defined as 'geographical areas that are restricted within the national boundaries of a country where business rules differ from those that apply

nationally. These different rules mainly relate to investment conditions, international trade and customs, taxation, and a regulated business environment in which the zone is a business environment intended to be more liberal from a policy perspective and more effective from an administrative perspective than other national regions.

In general terms, according to [18], FTZ is managed through a legal regulation from the government in which the area is located. Most free trade zones are located with several advantages such as proximity to transportation facilities, infrastructure and water sources.

### Strategic Planning

Strategy, according to [22] is the direct and scope of the organization's work in the long run through the configuration of its resources in changing external environments to meet market needs and stakeholder expectations. Strategy can be a tool that offers significant assistance in dealing with environmental turbulence.

Strategies also help provide long-term direction for organizations, in the form of perspectives for several activities over time that can help organizations achieve performance and at the same time be able to review the long-term implications for organizational success [23]. It similar with [12], the rules of strategy by emphasizing the purpose of strategy is to help competitive advantage over competitors.

Study of [24] define strategic planning as a systematic process so that organizations build commitment to stakeholders, to prioritize essential missions and responses to the environment. Strategic planning provides a reference to the allocation and acquisition of resources to achieve organizational priorities.

According to [25], strategic planning as an explicit process for determining the company's long-term goals, procedures for improving and evaluating alternative strategies, and systems for monitoring the results of the plans being implemented. Strategic planning provides an effort to strengthen companies related to how to deal with competitors in an effective and efficient manner [26].

Strategic planning involves the allocation of resources, priorities, and actions needed to achieve strategic objectives [27]. According to [28], strategic planning is focused and serious on the final outcome, a method used to position an organization through prioritizing resource use through goal identification, in an effort to carry out direction and development within a certain time period.

He felt that every management decision taken on a strategic plan, then the middle-lower level management would implement strategic planning through operational plans.

Strategic planning is often conceived as a system whereby managers go about making, implementing, and controlling important decisions across functions and levels in the firm. For example, any strategic planning

system must address four fundamental questions: (1) Where are we going? (mission); (2) How do we get there? (strategies); (3) What is our blueprint for action? (budgets); and (4) How do we know if we are on track? (control).

This concept approach helps organizations to understand the objectives of strategic planning by preparing appropriate strategies to achieve future targets.

### III. METHODOLOGY

The study uses a Content Analysis methodology designed to develop a strategic planning model for the FTZ management agency. Content analysis is defined as an analysis of the contents of the entire communication material and evaluating key symbols and themes by ensuring the main theme's intentions and possible effects. This method empirically can be accepted, predicted and explored. Through methodology, content analysis allows researchers to plan, execute, communicate, and evaluate their analysis [29].

In this study, this analysis was conducted by analyzing published scientific articles about the strategic planning process in companies, government and non-profit organizations. Articles are selected based on relevance to the topic studied from the period of publication. Articles are read for understanding and analyzed using descriptive analysis, then cycle coding, namely classification, integration, and conceptual with the aim of segregating, grouping, and linking again to consolidate intentions and explanations [30].

### IV. RESULT AND DISCUSSION

This section will analyze published scientific articles which serve as models in the strategic planning process through the Content Analysis method. The results of the article analysis are divided into two levels of the coding process used as a strategic planning model and developed from a literature review to be proposed as a model in this article.

#### *First Level - Data Coding*

At first level, strategic planning model developed from literature review were used to analyze the model developed from tested articles. The elements that appear are listed to compared with the elements in the proposed model, as attached in Table 1.

TABLE 1. THE ELEMENT CONTENT ANALYSIS OF STRATEGIC PLANNING

Author s	Goal Settinn g	Stake Invol v	Budge t & Resc. Alloc.	Externa l Enviro	Perfor m Measur.
[31]	√			√	
[32]			√		
[33]		√			
[34]		√			
[35]	√				
[36]					√
[37]			√		
[38]		√	√		

[39]	√		√	√	
[40]			√		√

#### *Second Level - Data Coding*

The coding process at the second level involves in-depth analysis of elements of the strategic planning model developed from the literature analyzed in this article. This analysis is based on the categories developed in the table 1.

##### 1. Goal setting

Study from [31] [15], [41], [42] emphasized the importance of preparing a strategic plan with clear and measurable goals and results. Also [35] found the importance of strategic planning prepared after sector-by-sector analysis and public testing. As [39] conclude that the main objective of the strategic planning process is to achieve greater government focus in developing specific targets and expected outcomes. Meanwhile according to [43], strategic planning cooperation and participation of organizational members contribute to achieving successful performance.

However, [44] asserts managers and executives not to trapped in a linear goal-driven framework when develop strategic planning. This condition can make the goals, budget, and list of organizational activities no longer as a strategic planning [42].

##### 2. Stakeholder involvement

The research of [45] and [15] concludes a significant relationship between stakeholder involvement in the formulation of strategic planning so that it contributes to achieving better organizational performance.

The participation of stakeholders in organizational decision making provides many benefits for the organization, especially when major changes are implemented in the organization [46]. Public sector research shows that ranging from employees to low-level employees and management level, in decision making it helps to take consensus in difficult conditions [46], building interpersonal trust in organizations [47], and increasing employee job satisfaction [48].

Research of [33] found the effectiveness of strategic planning will occur if through the participation of all elements in the organization. Whereas [34] said stakeholder involvement in strategic planning was seen as important by the manager of Metro Ekurhuleni City. Likewise [38] found stakeholder involvement encourages managers to ensure that strategic and operational directions are well delivered.

##### 3. Budget and Resource Allocation

Financial support, especially finance, has an important role in the strategic planning process and its implementation [37]. Study of [32] also emphasizes that planning plays an important role in determining the financial resource allocation process proposed by each unit in the organization. In addition, performance data are also closely related to strategic targets and objectives playing an important role in determining the allocation of organizational financial resources.

An indication of the importance of resource allocation, especially finance, to achieve organizational goals [38]. Study of [37] asserts that planning is closely linked to fiscal resources and annual regional budgets and results in efficient financial planning [39]. Strategic planning has a strong influence on the budget allocation proposed by the unit / department, and regional leaders consider strategic objectives when reviewing the annual budget [15].

#### 4. External Environment

The external environment variables including the political conditions of external stakeholders who interact with and influenced on organizations [31]. Other researchers such as [49], [50], [51] support Hendric's conclusions and the importance of understanding environmental variables that can influence strategic planning.

External environmental variables broadly consist of technological, political, legal, economic, demographic, ecological, and cultural conditions [51]. Budgeting mechanisms, competing for priorities, public opinion, the electoral cycle, and the political system are additional external factors that can affect the organization's size, scope of work, objectives, and planning.

Relevant with the conclusion of [14] and [52] reminded leaders of public organizations not to underestimate external environmental variables because if it not anticipated, it can change the organization and strategic plans.

#### 5. Performance Measurement

Some literature recommends strategic planning including quantitative and qualitative matrices to measure the performance of work programs in progress towards achieving goals and results. With the help of the performance matrix, decision makers can test the organization's activities and objectives.

Study of [31] found a quantitative performance matrix that could measure resource allocation, program achievements, budget expenditures, and organizational financial reserves. He considered the qualitative and quantitative performance metrics as a reflection of the work of the organization. Performance appraisal can be carried out to evaluate programs and find out the extent of achieving targets and the importance of strategic planning to assess performance [32] [6][36].

As in [53] defined success in managing and monitoring performance in public organizations is closely related to the success or failure of other management processes. The author finds the integration of strategic plans and performance with the objectives to be achieved and accurately measures the progress of the implementation of the plan.

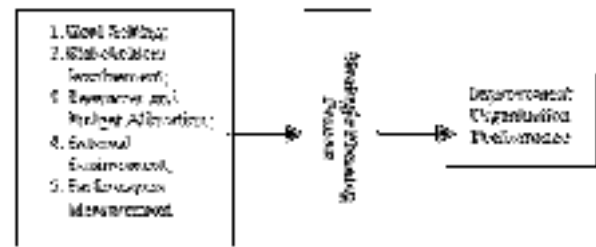


FIGURE 1. FORMULATION MODEL OF STRATEGIC PLANNING

Source: Developed by author

## V. CONCLUSION AND LIMITATION

The purpose of this study is to develop a strategic planning model for the Free Trade Zone Management Agency in Indonesia. This study uses a content analysis method by identifying scientific articles that are relevant to the model and strategic planning process in the context of public and government organizations.

Literature reviews confirmed that management of the FTZ Agency should consider to conduct strategic planning process through several action occur in this study. These action are goal setting, stakeholders involvement, budget and resources allocation, external environment, and performance measurement.

The competition and changing environment among the zones encourage the organization to simultaneously improving the strategic goals to achieving better performance.

This study proposed the strategic planning formulation model to improve organizational effectiveness that can be implemented in the Free Trade Zone Management Agency in Indonesia.

Surveys and interviews with the leaders of the Free Trade Zone Management Agency in Batam, Bintan, Karimun, and Sabang, will provide an overview of the current situation and strategic planning practice within the organization. Future research can proposed to test the implementation of strategic planning by comparing current conditions.

The model proposed in this study at the implementation and practical level will require a lot of resources. This means that organizations must devote resources to do planning process. The organization should consider the mechanism to periodically assess its strategic plan before start to work, making decision, and allocate available resources.

Finally, as conclude by [54], research must explore a number of theoretical and empirical issues in order to advance the knowledge and practice of public strategic planning. In particular, contingent models for public strategic planning must be developed and tested.

These models should specify key situational factors governing use; provide specific advice on how to formulate and implement strategies in different situations; be explicitly political; indicate how to deal with plural, ambiguous, or conflicting goals or

objectives; link content and process; indicate how collaboration as well as competition is to be handled; and specify roles for the strategic planner.

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# Improve Community Satisfaction and Trust in the Public Service Mal of Banyuwangi District

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**Abstract**— This study aims to determine the effect of service quality and service innovation on community satisfaction and trust in Banyuwangi Regency Public Service Mall. The population of this research is all the people who carry out the service process at the Banyuwangi Regency Public Service Mall totaling 125 people. The sampling technique uses simple random sampling, namely taking members of the sample from the population randomly regardless of the strata in the population. The answers to the questionnaire respondents were processed using the SPSS 16.0 software application. Data analysis in this study using SEM-PLS with WarpPLS 5.0. The results of the study show. service quality with a coefficient of 0.440 affecting community satisfaction. Service quality with a coefficient coefficient of 0.242, affects public trust. Service innovation with a coefficient of 0.497, affects community satisfaction. Service innovation with a coefficient of 0.150, does not affect public trust. While community satisfaction with a coefficient of 0.734, has a positive and significant effect on public trust.

**Keywords**— *service quality, service innovation, satisfaction, trust.*

## I. INTRODUCTION

Public services are carried out by public service providers and implementers of public services. In accordance with Law Number 25 of 2009, the Public Service Provider is any state administering institution, corporation, independent institution established under the Law for public service activities, and other legal entities formed solely for public service activities. Implementers of public services are officials, employees, officers and every person who works in an organization tasked with carrying out public service actions. Law Number 25 of 2009 states that public services are activities in the context of fulfilling service needs in accordance with the laws and regulations for every citizen and resident for administrative goods, services, and / or services provided by the delivery of public services. Thus it can be concluded that public service is everything that is

done by public service providers to provide services that satisfy the public.

At present the services provided by the government to the people continue to experience renewal, both in terms of the paradigm and the format of the service. This happens along with the increasing demands of the community and changes in the government itself. Nevertheless, the updates seen from both sides have not been satisfactory, even the people are still positioned as a powerless and marginalized party in the service framework (Sinambela, 2011). Public Service is currently becoming an increasingly strategic policy issue because the improvement of public services in Indonesia now tends to "run on the spot" while the implications are very broad in the life of the economy, politics, socio-culture and others. Improvement of public services is absolutely necessary so that the poor image of the community to the government can be improved. By improving the quality of public services that are getting better, it can affect people's satisfaction so that public trust in the government can be rebuilt. Therefore, quality and quality services are the main concern of public and private organizations. Providing maximum service has become an obligation for an organization both in the government and private sector (Sinambela, 2011).

Service can basically be defined as the activity of a person, group and / or organization both directly and indirectly to meet needs (Pasolong, 2007). Public services are all service activities carried out by public service providers as an effort to fulfill public needs and the implementation of statutory provisions. In providing public services, government officials are responsible for providing the best service to the community in order to create community welfare. The community has the right to get the best service from the government because the community has provided funds in the form of payment of taxes, levies and various other levies (Mahmudi, 2007). Public service institutions can come from the government and the private sector. The government as one of the service

providers to the community must continue to improve its performance so that the community feels satisfied with the services provided and finally believes in the institution.

The Banyuwangi District Public Service Mall was formed to follow up the Republic of Indonesia Minister of Administrative Reform and Bureaucratic Reform Regulation Number 23 of 2017 concerning the Implementation of Public Service Malls and Regent Regulation Number 59 of 2017. The Public Service Mall hereinafter referred to as MPP is the place for public service activities or activities for goods, services and / or administrative services. This MPP is an expansion of the functions of integrated services both central and regional, as well as the services of BUMN / BUMD in order to provide services that are fast, easy, affordable, safe and comfortable. In general MPP has the task of organizing integrated licensing services to the community in Banyuwangi Regency. The Public Service Mall serves 199 types of services to the community under one roof. The services provided include population administration, various types of business permits, BPJS Kesehatan, BPJS Employment, PDAMs, service licenses related to vehicles, extension of SIM, to payments for regional retribution, marriage, hajj, land services and so on.

TABLE I. NUMBER OF COMPLAINTS IN THE REGIONAL GOVERNMENT OF BANYUWANGI REGENCY

No	Year	Complaints Media		Amount of Complaints
		Website	Sms	
1	2015	842	710	1552
2	2016	371	1373	1744
3	2017	353	942	1295
4	2018	184	685	869

Source: MPP Banyuwangi 2019

In table 1. shows that there are still many complaints from the community that received services from MPP in Banyuwangi Regency. The MPP of Banyuwangi Regency is demanded to continue to give confidence to the community for the services provided to improve over time. With service quality, service innovation and increasing satisfaction, it is expected to reduce complaints against public services from the existing MPP in Banyuwangi Regency. Thus public trust must be maintained.

Public trust in public service providers must always be maintained and fostered so that trust is inherent in the hearts of the people who use the services of these institutions. People who have trusted

public service institutions will use the other interests. Trust is someone's willingness to rely on other people where someone has confidence in the other person. There are several components of trust which are divided into four (Wicaksono, Kumadji, and Mawardi 2015) including:

1. Credibility, namely that all parties involved can be trusted, both in speech and in action, in accordance with the promises that have been given.
2. Reliability, which is something that can be relied upon. This means that the institution must be an institution that can be relied on by customers to fulfill everything needed. Likewise, on the contrary, the institution places great expectations on customers that these customers will continue to use existing products or services.
3. Intimacy, which is an emotional value created between the institution and the customer. That there is a strong basis of trust between various parties is expected to be able to create closeness.
4. Orientation, which is an emotional value created because trust arises because the service provider already cares about complaints or confusion that the customer has.

Consumer trust is all the knowledge that consumers have and conclusions about objects, attributes and benefits (Mowen & Minor, 2001). The trust of consumers or the public related to public services must be maintained by all parties who provide public services. Many factors influence public trust in service institutions both government institutions and private institutions. These factors include: service quality, service innovation and community satisfaction.

Service quality is the overall nature of a product or service that influences its ability to satisfy expressed or implied needs (Kotler, 2007). Service quality consists of everything that is free from deficiencies and also consists of the features of a service product. The specialty of this product can also be called product innovation, where there is added value in the product that makes it easier for the community to obtain services quickly and precisely. Service quality is a service that can be a service or product that will be provided to customers or consumers (Qomariah, 2016). Products in the form of services are services that will be provided to service customers. The quality of this service can be in the form of all services provided to customers in the form of existing facilities, responsiveness of service providers, reliability of services provided, guarantee of services provided and attention of service providers (Tjiptono, 2007). 2007).

Research on the relationship between quality of service and trust has been done. Research (Mulyawan & Rinawati, 2016), (Maskur, Qomariah, & Nursaidah, 2016), (Sutrisno, Cahyono, & Qomariah, 2017), (Sofiati, Qomariah, & Hermawan, 2018), (Verriana & Anshori, 2017), stating that there are influences positive variable quality of service to customer loyalty. Research (Afandi & Setyowati, 2019),

(Natalia, Setiawan, & Puspaningrum, 2017) which showed that service quality had no effect on trust.

The next factor that can also influence public trust related to providing services to the community is product / service innovation. Innovation is an idea, idea, motorcycle taxi, and practice that is based and accepted as a new thing by a person or a certain group to be applied or adopted (Everest, 1983). The concept of innovation can be in the form of innovation in products, innovation in the process of producing products, and innovation in service companies (Dhewanto, 2015). Ideas and ideas that are owned by someone who are then put into practice and implemented can be called an innovation from someone. The characteristics of innovation are distinctive, new, planned and purposeful. Products or services from the results of innovation must have characteristics that can differentiate from other products or services. Products derived from innovation must be new and planned and have a purpose for what the product / service was created. Service innovation means innovation in the service sector carried out by service providers so that the products or services offered to consumers experience changes. The results of the study (Yuliana & Hidayat, 2018), (Penjaitan, 2019) stated that product innovation can increase loyalty. Furthermore the results of the study from (Zebua & Barata, 2015) stated that innovation does not affect trust or loyalty.

Customer satisfaction factors also need to be considered in an effort to increase trust that can have an impact on customer loyalty. Customers who believe in a product then they will make a repeat purchase and will recommend products or services to other users. Customer satisfaction is at the same level as one after comparing the performance or the thing that is considered to be low with expectations (Kotler, 2007). Satisfaction is a comparison between services received and expected services (Qomariah 2016). Satisfaction is the response or response given by consumers after fulfilling their needs for a product or service, so that consumers get a sense of comfort and pleasure because their expectations have been fulfilled (Tjiptono & Candra, 2012). If the service received by the customer is better than expected, the customer will feel satisfied with the product or service they consume. Satisfaction is the response or response given by consumers after fulfilling their needs for a product or service, so that consumers get a sense of comfort and pleasure because their expectations have been fulfilled. Customers who trust the service provider then they will provide information and recommend these service providers to other parties. Thus a trusting customer means that the customer is actually loyal to the product / service it receives. Research related to satisfaction and trust / loyalty has been done a lot. Research (Qomariah, 2012), (Mulyawan & Rinawati, 2016), (Maskur et al., 2016), (Maskur et al., 2016), (Safitri, Rahayu, & Indrawati, 2016), (Natalia et al., 2017) ,(Verriana & Anshori,

2017), (Sutrisno et al., 2017), (Rahman, 2019), (Afandi & Setyowati, 2019) stated that satisfaction effect to loyalty/trust.

Customer satisfaction can be improved by good service quality. Quality of service is any activity or action offered by one party to another party that is invisible or intangible that does not cause change in ownership (Kotler, 2007). In the quality of service that needs attention is the reality and expectations received by the customer. If the customer feels that the reality of the service provided exceeds expectations, the customer will feel satisfaction with the service he received (Lupiyoadi, 2013). Service quality is the expected level of excellence and control over the level of excellence of consumer desires (Tjiptono & Candra, 2012). Satisfaction is a person's feeling towards perceived service quality because it exceeds what is expected (Qomariah, 2016). Customer satisfaction is an evaluation after making a purchase where expectations are at least the same as or exceeding the performance of the service it receives (Tjiptono & Candra, 2012). Research that connects service quality and customer satisfaction has been done a lot. Research (Subagiyo, 2015), (Mulyawan & Rinawati, 2016), (Safitri et al., 2016), (Sutrisno et al., 2017), (Verriana & Anshori, 2017), (Anggriana, Qomariah, & Santoso, 2017), (Setyawati, Rifai, & Sasmito, 2018), (Afandi & Setyowati, 2019), (Rahman, 2019) stated that good service quality can increase customer satisfaction. Research (Qomariah 2012) states that service quality has no impact on customer satisfaction.

Product or service innovation factors can also make customers satisfied with the product or service offered to customers. Product / service innovation is the development of products / services from existing products (Kotler, 2007). This product innovation is very important to be developed by the company in order to increase sales. Products that have long been circulating in the market need innovation. Consumers often experience saturation of a product or service. If it is associated with customer satisfaction, this product innovation can increase customer satisfaction. If the customer feels dissatisfied with a product or service, the product / service provider needs to evaluate whether the product / service offered needs to be innovated or not. Research on the relationship of product / service innovation has not been done much. Research (Antanegoro, Surya, and Sanusi 2017) proves that product innovation and service innovation influence customer satisfaction. The better product and service innovation is carried out, the higher customer satisfaction will be. Based on the background and previous research, the purpose of this study is to determine the effect of service quality and service innovation on community satisfaction at the Banyuwangi District Public Service Mall and to determine the effect of service quality, service innovation and community satisfaction on community trust in the District Public Service Mall Banyuwangi.



Based on the formulation of the problem, theory and previous research, the research hypotheses that can be arranged are as:

H1: Quality of service affects the community satisfaction at the Banyuwangi District Public Service Mall

H2: Quality of service affects community trust in Banyuwangi District Public Service Mall

H3: Service Innovation influences community satisfaction at Banyuwangi District Public Service Mall

H4: Service Innovation has a positive and significant effect on Community Trust in Banyuwangi District Public Service Mall

H5: Community Satisfaction influences community trust in Banyuwangi District Public Service Mall

## II. RESEARCH METHODS

This research is an associative research that aims to determine the relationship between two or more variables (Ghozali, 2005). This study uses a quantitative approach, which emphasizes the existence of variables as research objects and must be defined in the form of operationalization of each variable. The population of this research is the people who carry out the service process at the Banyuwangi District Public Service Mall. In this study, the sampling technique used was probability sampling, which is a sampling technique that provides equal opportunities for each population element to be selected as a sample member (Ferdinand, 2006). The sampling method used is simple random sampling, namely taking sample members from the population is carried out randomly without regard to strata that exist in that population (Ghozali, 2005). The number of questionnaires distributed was 100 and returned were 83 questionnaires. The number of respondents in this study was 83 people.

Validity test is used to measure the validity of a measuring instrument. Reliability test is used to measure the reliability of a measuring instrument used (Ferdinand, 2006). To determine the effect of exogenous variables on endogenous variables used SEM-PLS analysis with WarpPLS 5.0. This research uses SEM technique, so the evaluation is carried out on two models, namely the outer model and the inner model. The outer model determines the specification of the relationship between latent constructs and their indicators.

## III. RESULTS AND DISCUSSION

### A. Descriptive Statistics Analysis Results

The calculation results show that of the 83 respondents, as many as 50.6% or as many as 42 people consisted of men and 49.4% or as many as 41 people consisted of women, which means that the highest number of respondents was of the sex of men

Based on the calculation results, it is known that of 83 respondents, 2.4% or as many as 2 people consisted of respondents with an elementary school education background, 4.8% or as many as 4 people consisting of respondents with a secondary school education background First (SMP) and 33.7% or as many as 28 people consisting of respondents with a high school education background (SMA), amounting to 20.5% or as many as 17 people consisting of respondents with a diploma education background and by 32% or as many as 32 people consisted of respondents with a Bachelor's educational background, which means that the highest number of respondents was from a Bachelor's educational background.

Based on the calculation results it is known that from 83 respondents, amounting to 62.7% or as many as 52 people consisting of respondents with an age range of 20-29 years, amounting to 31.3% or as many as 26 people consisting of respondents with an age range of 30-39 years, as much as 3.6% or as many as 3 people consisting of respondents with an age range of 40-49 years and as much as 2.4% or as many as 2 people consisting of respondents with an age above 49 years, which means that the largest number of respondents are youth or from the age range 20-29 years old.

Based on the calculation it can be seen that from 83 respondents, amounting to 77.1% or as many as 64 people consisting of respondents with self-employed work, amounting to 15.7% or as many as 13 people consisting of respondents with civil servant employment, amounted to 3.6% or as many as 3 people consisted of respondents with farmer jobs and 3.6% or as many as 3 people consisted of respondents with other work (students, midwives and nurses), which means that the largest number of respondents were respondents with self-employed work.

Based on the calculation of descriptive statistics it can be seen that from 83 respondents there are four service areas with the most respondents namely 28.9% or as many as 24 people consisting of respondents doing service processes in the population field, amounting to 28.9% or as many as 24 people consisting of respondents who carry out service processes in the health sector, amounting to 18.1% or as many as 15 people consisting of respondents doing service processes in the field of general licensing and by 10.8% or as many as 9 people consisting of respondents doing service processes in the labor field . As for the rest scattered in other service areas (environment, industry and trade, taxes, housing and settlements, as well as immigration), which means that the highest number of respondents are respondents who carry out service processes in the area of population and health.

Based on calculations it can be seen that of 83 respondents, amounting to 26.5% or as many as 22 people consisting of respondents with the number of arrivals as much as 1 time, amounting to 34.9% or as many as 29 people consisting of respondents with the

number of arrivals as much as 2 times, amounting to

Criteria	Variable	X1	X2	Y1	Y2
Path coefficients	X1				
	X2				
	Y1	0.440	0.497		
	Y2	0.242	0.150	0.734	
p-values	X1				
	X2				
	Y1	<0.001	<0.001		
	Y2	0.010	0.078	<0.001	

18 , 1% or as many as 15 people consisting of respondents with the number of arrivals as much as 3 times, amounting to 7.2% or as many as 6 people consisting of respondents with the number of arrivals as much as 4 times and amounting to 13.3% or as many as 11 people consisting of respondents with the number arrivals more than 4 times, which means that the highest number of respondents is the respondent with the number of arrivals as much as 2 times.

#### B. Validity Test Results and Measurement Test Reliability

The results of statistical calculations show that the results of the validity test show that all items of the statement / research instrument are valid because the r count is greater than r critical (0.30). While the reliability test results can be concluded that all research variables are reliable because the Cronbach's Alpha value of 0.60. This is as said (Ferdinand 2006) which states that the instrument validity provisions are valid if r arithmetic is greater than r critical (0.30) and the reliability of a variable construct is said to be good if it has an Alpha Cronbach's value of 0.60.

#### C. Hypothesis Testing

Hypothesis testing is used to explain the direction of the relationship between the independent variable and the dependent variable. This test is done by path analysis of the model that has been made. SEM techniques can simultaneously test complex structural models, so that the path analysis results can be seen in one regression analysis. The results of correlation between constructs are measured by looking at the path coefficients and their level of significance which are then compared with the research hypothesis. To see the results of hypothesis testing simultaneously or together it can be seen the value of the path coefficients and p-values in the total effects of the results of simultaneously processing variable data.

A hypothesis can be accepted or must be rejected statistically can be calculated through the level of significance. The level of significance used in this study was 5%. If the significance level chosen is 5%, then the significance level or 0.05 confidence level to reject a hypothesis. The standard used as a basis for decision making is p-value  $\leq$  0.05, the hypothesis is accepted and if p-value  $>$  0.05, the hypothesis is rejected. The results of correlation between constructs are measured by looking at the

path coefficients and their level of significance which are then compared with the research hypothesis.

The results of data processing from WarpPLS obtained a research model that can describe the influence between variables. The following is a picture of the results of research on the effect sizes that have been obtained based on data processing.

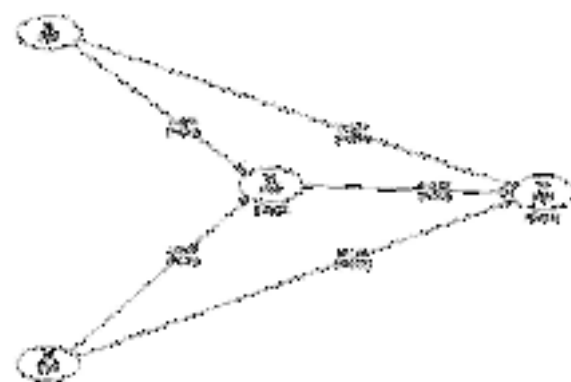
Source: Data processed 2019

TABLE II. DIRECT EFFECT

## IV. DISCUSSION

### A. Effect of Service Quality on Community Satisfaction

The results showed that service quality had a positive and significant effect on community satisfaction. In this study it can be seen from the value



of the path coefficient that is quite large, which shows that the better the quality of service, the better the community satisfaction, with a value of 0.440, meaning that the variable quality of service has an influence on the satisfaction of the people who perform the service process at the Public Service Mall.

This shows that the quality of service affects the level of community satisfaction. This means that the services provided to the community will affect the level of community satisfaction. If the services provided are good then the community will feel satisfied and vice versa if the services provided are not good then the community feels dissatisfied.

Research (Subagiyo, 2015), (Mulyawan & Rinawati, 2016), (Safitri et al., 2016), (Sutrisno et al., 2017), (Verriana & Anshori, 2017), (Anggriana et al., 2017), (Setyawati et al., 2018), (Afandi & Setyowati, 2019), (Rahman, 2019) stated that good service quality can increase customer satisfaction. Research (Qomariah, 2012) states that service quality has no impact on customer satisfaction.

### B. Effect of Service Quality on Community Trust

The results showed that service quality had a positive and significant effect on public trust. In this study it can be seen from the value of the path coefficient which is a value of 0.242, which shows that good service quality will increase the trust of the

people who carry out the service process at the Public Service Mall.

This shows that the quality of service can influence the level of public trust. Every institution that provides services to the community must provide the best service. The best services provided to this community need to be properly maintained so that people will continue to trust and will continue to use the services of these institutions. Therefore, institutions or organizations that provide these services are required to maintain public trust while continuing to provide the best service. Research (Mulyawan & Rinawati, 2016), (Maskur et al., 2016), (Sutrisno et al., 2017), (Sofiati et al., 2018), (Verriana & Anshori, 2017), stating that there are influences positive variable quality of service to customer loyalty/trust. Research (Afandi & Setyowati, 2019), (Natalia et al., 2017) which showed that service quality had no effect on trust.

#### *C. Effect of Service Innovation on Community Satisfaction*

Based on the results of the study found that service innovation has a positive and significant effect on people's satisfaction. In this research, it can be seen from the value of the path coefficient that is high in value, with a value of 0.497, which shows that good service innovation will increase public satisfaction with the services provided by service providers at Public Service Malls.

This shows that the community will be happy to accept service innovations made by service providers. Product / service innovations must continue to be made so that people who receive services get something new. Service providers must innovate products / services so that the products / services provided are still utilized by the community. Product / service innovations continue to be made by taking into account developments in information technology and innovation of products / services produced by competing companies. The public will continue to look for new products / services that can provide satisfaction. Research (Antanegoro, Surya, and Sanusi 2017) proves that product innovation and service innovation influence customer satisfaction. The better product and service innovation is carried out, the higher customer satisfaction will be.

#### *D. Effect of Service Innovation on Community Trust*

Based on the results of the study, it was found that service innovation had a positive effect on people's trust but was not significant. In this study, it can be seen from the path coefficient value of 0.150, which shows that good service innovation can increase public confidence in the service process at the Public Service Mall. Therefore local governments or service providers must look for other efforts besides service innovation, which can significantly influence directly to increase public trust.

This shows that service innovation influences the level of public trust. The results of this study can certainly be interpreted that the community tends to

still not trust what the service provider has done. Product / service innovations should indeed continue to be made in line with the development of the age that will continue to go far ahead. As an institution providing services must continue to innovate to create services that can provide satisfaction to the community. Satisfied people will trust the institution and will continue to use the institution to meet the needs of community services. The results of the study (Yuliana & Hidayat, 2018), (Penjaitan, 2019) stated that product innovation can increase loyalty. Furthermore the results of the study from (Zebua & Barata, 2015) stated that innovation does not affect trust or loyalty.

#### *E. Effect Community Satisfaction on Community Trust*

Based on the results of the study, it was found that community satisfaction had a positive and significant effect on community trust. In this study, it can be seen from the value of the path coefficient that is very high value, with a value of 0.734, which indicates that high community satisfaction will increase public confidence in the services provided by service providers at the Public Service Mall.

This shows that in order to increase public trust, it is necessary to increase community satisfaction with the services provided. As an institution that provides services to the community, it is necessary to pay attention to the satisfaction of service users. Satisfied service users will provide good information and recommend to other parties to use their services. Research (Qomariah, 2012), (Mulyawan & Rinawati, 2016), (Maskur et al., 2016), (Maskur et al., 2016), (Safitri et al., 2016), (Natalia et al., 2017), (Verriana & Anshori, 2017), (Sutrisno et al., 2017), (Rahman, 2019), (Afandi & Setyowati, 2019) stated that satisfaction effect to loyalty/trust.

## V. CONCLUSIONS AND RECOMMENDATIONS

Quality of service has a positive and significant effect on community satisfaction. So, the better the quality of service, the more influence the high community satisfaction. Institutions providing products / services must continue to provide the best service to their customers so that customers who use these services are satisfied.

Quality of service has a positive and significant effect on public trust. So, the better the quality of service, the more influential the high public trust. The quality of service received by customers must continue to be improved. Good service quality will increase customer satisfaction. Customers who are satisfied they will make a repeat purchase and will inform other customers well. Providing good information about the product / service to other customers means that the customer already believes in the product / service.

Service innovation has a positive and significant effect on people's satisfaction. So, the better the

service innovation, the more influence the high community satisfaction. Product / service innovation must always be carried out by every organization that produces products / services. Product / service innovation needs to be done in line with technological developments and consumer desires that are constantly changing. Institutions that continue to innovate on products / services that are marketed will make consumers feel satisfied.

Service innovation has no significant effect on public trust. Although service innovation has no direct effect on public trust, service providers must continue to innovate products / services offered to the public. The ineffectiveness of service innovation on people's trust may be influenced by factors other than innovation.

Community satisfaction has a positive and significant effect on community trust. So, the better and higher the level of community satisfaction, the more influential the high level of community trust. Service providers must continue to improve customer satisfaction, because with customers feeling satisfied, customers will provide good information and will recommend these service providers to other users.

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# **EDUCATION**

# *The Effect of Using E-Mar Application with Android Based System on Students' Maritime English at Maritime Program of Politeknik Negeri Bengkalis*

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**Abstract**— The purpose of the study is to investigate significant differences of students' ability in learning English for Maritime by using E-Mar Application. E-Mar Application is one of application which is made and used with android based system. The aspects in E-Mar Application contains of materials to be memorized is glossaries of Maritime. Those are studied about terminology of Spelling Letters in Maritime, Ship Organization, Types of Ship and Main Parts of Ship. The study of the research is a quasi-experimental research where pretest and posttest design are given in this research. The sample of this research is the second semester students of Maritime Department at Politeknik Negeri Bengkalis. There are experimental class (Nautical) and control class (Port and Shipping Management) by totaling 44 students. The data collected by using E-Mar Application in learning Maritime English. The result of this research showed that there is significant effect on implementing the treatment of E-Mar Application with Android based System on students' learning Maritime English for Experimental Group where students' mean score of experimental class is 82.78 who were taught by E-Mar Application and students in control class is 63.54 who were taught by conventional teaching. E-Mar Application is a good alternative to help students in learning Maritime English.

**Keywords:** Effect, E-Mar Application, Maritime English

## I. INTRODUCTION

Indonesia, as known as a country with a lot of natural resources potential, especially in maritime field is the largest archipelagic country in the world. It is consisting of 17,499 islands with a long coastline of 81,000 km and its waters consist of territorial sea, archipelagic waters and inland waters covering 2.7

million km or 70% of the territory of Indonesia. There are also so many people in Indonesia works at sea, not only as a fisherman but also as seafarers. To support their skill in Maritime, so many seafarers in Indonesia are still weak in using English. They need to have many competence in maritime to be a great seafarers. One of them is English for Maritime as one of English for Specific Purposes (ESP) subject. ESP focuses the learner's attention on the language and communication requirements in a particular professional field. Maritime English is to satisfy the need of seafarers. Therefore it has its own characteristics. Indonesia has many Maritime schools. To support them, the government builds Maritime School to add the mount of professional seafarers in this country.

English for Specific Purposes (ESP) program needs to be developed for there is a need for language courses in which certain contents, skills, motivations and processes are identified and integrated into specialized courses. ESP prepares the learners to use English in academic (students of different fields), professionals (people of different professions such as doctors, engineers, nurses, and seafarers, or workplace setting (technicians for example). One of the specialized courses that meet the needs of specific skills is Maritime English. [6]

One of the problems of this English for Maritime ability can be solved by using an application which called E-Mar Application. It has been studied at Maritime Program by using Android system. Understanding the materials need creative and innovative ways in order to make students be easy to memorize the words and pronounce them well. Students are not interested using old technique in this millennial era. Youth students need new technique to study by using digital tools such as android system. One technique to learn Maritime English is by using E-Mar Application with Android based System. This application helps students in studying glossaries. The lecturer tries to find the effect of E-Mar Application with Android based System. By using it, students are able to understand terminology of Spelling Letters in

Maritime, Ship Organization, Types of Ship and Main Parts of Ship in studying while playing Android. [1]

## II. LITERATURE REVIEW

### 2.1. Android System

Android is a mobile operating system developed by Google, based on the Linux kernel and designed primarily for touchscreen mobile devices such as smartphones and tablets. Android's user interface is mainly based on direct manipulation, using touch gestures that loosely correspond to real-world actions, such as swiping, tapping and pinching, to manipulate on-screen objects, along with a virtual keyboard for text input. In addition to touchscreen devices, Google has further developed Android TV for televisions, Android Auto for cars and Android Wear for wrist watches, each with a specialized user interface. Variants of Android are also used on notebooks, game consoles, digital cameras, and other electronics. Initially developed by Android Inc., which Google bought in 2005, Android was unveiled in 2007, along with the founding of the Open Handset Alliance – a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for mobile devices. Beginning with the first commercial Android device in September 2008, the operating system has gone through multiple major releases, with the current version being 7.0 "Nougat", released in August 2016. Android applications ("apps") can be downloaded from the Google Play store, which features over 2.7 million apps as of February 2017. Android has been the best-selling OS on tablets since 2013, and runs on the vast majority<sup>[a]</sup> of smartphones. In September 2015, Android had 1.4 billion monthly active users, and it has the largest installed base of any operating system [7]

### 2.2. English for Maritime

There are many aspects can be explained in English for Maritime. They are about shipping, ship types, ship construction, manning, seamanship, cargo work, navigation, main engines, auxiliary machinery, maintenance, safety abroad, communications at sea, etc. In this research, the writer needs to explain about Spelling Letters, Ship organization, types of ship, and main parts of a ship. Each topic contains of many glossaries and pictures.

Maritime English is a type of specialized language used by seafarers both in the sea and in port and by individual working in the shipping and shipbuilding industry. Tenkner in Daniele [4] explains it as “The entirety of all those means of the English language which, being used as a device for communication within the International maritime community, contribute to the safety navigation and the facilitation of the seaborne trade. Daniele [4] defines. The focus of research on Maritime English has so far been mostly confined to various aspects of language pedagogy. Since communication in the maritime sector typically involves exchanges between speakers of

different mother tongues sharing English as a common language, it is understandable that a lot of attention has to be given to language instruction, so as to train seafarers and the maritime community at large towards proficiency in English.

This need has become particularly pressing after the decision of the International Maritime Organization (IMO) in 1995 to adopt English as the official language of the sea, which has led to the publication of IMO's Standard Maritime Communication Phrases (SMCP). It only stands to reason, then, that a number of ELT textbooks, course books and other materials had to be developed to meet the demands of learners in the maritime field. [3]

### 2.3. E-Mar Application

According to Aprizawati and Safra [1] in their journal about E-Mar Application is the abbreviation of English for Maritime Application, the Application contents are:

a. Those pictures are main page of E-Mar application which has started from spelling letters of Maritime English. Choose spelling letters menu.



b. This menu contains of alphabet which has pronounced the meaning of A. for example A means Alpha. It consists of 26 alphabets. You can choose next to continue the letters. Choose the menu to go back to first page.



c. The picture is ship organization menu whether to find out whose job on that organization. To find the jobs, you can click “who are here”





Click next to choose department parts. It is the parts of organization on board. We will find how many departments are on board and who they are on board.



d. It is the menu of type of ship, this contains of many kinds of board.



e. Main of parts consists of parts on board.



### III. METHODOLOGY

The method that be used was Experimental research which was aimed to test an idea (or practice or procedure) to determine whether it was influenced an outcome or dependent variable. [2]. L.R Gay [5] said that An experiment is the quantitative approach that provides the greatest degree of control over the research procedures. This research used experimental design with nonequivalent control group which was an

appropriate one to this research in order to find out the significant effect of using E-Mar Application with Android based System to learn English for maritime of students at State Polytechnic of Bengkalis.

This research consists of two classes. One class is an experimental group which treated by E-Mar Application with Android based System and another one is as a control group taught by using non E-Mar Application with Android based System. For both experimental and control groups, pre-test and post-test administered to the students. Pre-test was given at the beginning of the teaching learning in order to identify the students' English for Maritime glossaries. Then, the experimental group was given a treatment by using E-Mar Application with Android based System and the control group using non E-Mar Application with Android based System. During the treatment, the writer accompanied by an observer, and at last, both groups was given post-test at the end of the teaching learning processes in order to determine the effect of using E-Mar Application with Android based System to learn Maritime English of students at State Polytechnic of Bengkalis. The model of the research design is illustrated as follows:

**TABLE .I The Research Design**

Group	Pre-test	Treatment	Post-test
Experimental group	Test 1	X	Test 2
Control Group	Test 1	-	Test 2

Source: John W. Creswell [3]

### IV. FINDINGS AND DISCUSSION

In order to investigate the effect of using E-Mar Application with Android based System, the data was analyzed by using t-test formula. The researcher used Lilliefors testing for analyzing the normality testing at the level of significance 0.05. Variance Formula was used to test homogeneity testing. The data analysis can be seen from the table below:

**Table 1  
Result of t-test  
for experimental and control group**

Class	N	Mean	Standard Deviation	Minimum	Maximum
Experimental	27	82.78	5.4	67	83
Control	27	63.54	4.83	50	68

The table shows that the total students from each group was 27, the mean score of experimental group was 82.78, and mean score of control group was 63.54. Standard deviation from experimental group was 5.40,

while standard deviation from control group was 4.83. From the output above, it also can be seen that  $t_{\text{observed}} = 2.09$  compared to  $t_{\text{table}}$ . The level of significances 0.05 was 1.708. It can be concluded that  $2.09 > 1.708$  ( $t_{\text{observed}} > t_{\text{table}}$ ). Therefore, null hypothesis ( $H_0$ ) was rejected, while the alternative hypothesis ( $H_a$ ) was accepted. It means there was a significant effect of using E-Mar Application on students' grammar ability.

This finding was line with Aprizawati [1] statement that E-Mar application is assumed as a good media to teach the students in learning Maritime English. In this study, English for maritime application was created for using on android system. The E-Mar Learning was using b phone to make students or other user in the world are easy in learning it. This E-Mar learning consists of Spelling Letters, Types of Ship, Ship organization and Parts of Ship. The result was the using of E-Mar learning with android based system gives effective way of studying because it can motivate the students to learn Maritime English easily and practically.

## V. CONCLUSION

Based on the research finding above that was conducted students at the Maritime Program of State Polytechnic of Bengkalis, it can be concluded that students' who were taught by E-Mar Application had better Maritime English ability in learning than students' who were taught by Conventional Teaching. Students' mean score of experimental class (82.78) who were taught by E-Mar Application was higher than

students in control class (63.54) who were taught by conventional teaching. E-Mar Application is a good alternative to help students in learning Maritime English. This technique makes students be interested in learning Maritime English especially basic glossaries. It is suggested that this technique can be applied and recommended to use by English lecturer.

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# *Needs Analysis as a First Step Designing English for Specific Purposes Programs*

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**Abstract**--This paper is aimed to investigate the perceived English language needs of students at Faculty of Law in University of Riau as a solid base of a syllabus for an ESP program by determining the needs of the participants. Therefore, it should be based on a careful and systematic need analysis which includes the purpose to learn English, the learners, and the specific English language skill that becomes the target. Two groups of students of varying proficiency levels participated in the study. A need analysis questionnaire was administered to collect data that was analyzed by using SPSS. It was concluded that the extent of ESP needs perception held by the students was very high, about 85% of students thought ESP courses are useful and helpful for the future job. Plus, the English skill needed most was speaking skill and students with the higher English proficiency held significant difference from the lower on interest in English learning.

**Keywords**— *ESP, law, need analysis, interest, language skill.*

## I. INTRODUCTION

English has become popular recently in non-English speaking countries or where English as Foreign Language is taught. Trade, economy, and the increasing of international communication in many other fields has emerged English for Specific Purpose in this globalization era. For the previous years, the learning has been limited to general English such as special lexicon or sentence structures. This approach mostly ignores the learners' interest that causes low motivation on

learning process where it should be related to the learner's future job. As the result, it causes low performance in using English. Seeing this situation, higher education should design an ESP program that supports the university students to be able to compete in their future profession and career need.

Students in Indonesia learn English to fulfill the requirement of the school curriculum, to pass the examination, to complete the job qualification or to achieve certain position. In order to meet this demand, Indonesian government supports more educational institutions to offer ESP to meet the learner's career need (Kusni, 2013: 6). ESP learners are usually adults, who are familiar with the English language, since it has been offered at elementary, junior and senior high school. So it can be said that there is the basic knowledge or the fundamental background of general English or English for General Purpose (EGP).

In Faculty of Law Riau University, it is compulsory for the first year students to take English subject. It is a general English course which aims to increase the students' general proficiency. At university, the EGP should be replaced with ESP since EGP is a long existing practice in Indonesia's education. University students should learn ESP which is more specialized, more contextual and more advanced. Students learn English for a specific purpose, represented by studying subject matter, to gain and develop appropriate knowledge and skills through English. Chostelidou (2010;4511) suggests that ESP program should encompasses the learners' subject and academic needs. Moreover, Zhuoin

Sun (2010) emphasizes that the design of ESP program attracts the students' interest in language learning. It can be concluded that the teaching material is started from the needs of the students itself. ESP is very helpful to meet the globalization era by providing the students' future career needs because the proficiency related to their field of study.

English for Specific Purpose (ESP) focus on the specification of the goal and objectives, not to certain English jargon or register (Dudley-Evans and St John 1998, Hyland 2006, and Harding 2007). In addition, Hutchinson and Waters propose that ESP provides a detail and selective specification of goal which depend on certain discipline.

In order to deepen the understanding about ESP, here are some characteristics of English for Specific Purposes. Peter Strevens (1988, p.1-2) defines English for Specific Purposes by making a distinction between its absolute and its variable characteristics. He considers the absolute characteristics as the following:

- designed to meet specified needs of the learner;
- related in content (i.e. themes and topics) to particular disciplines, occupations and activities;
- centred on the language appropriate for those activities in syntax, lexis, discourse and semantics;
- in contrast with General English.

For the variable characteristics, Peter Strevens (cf.1988) defines as restriction to the language skills to be learned (reading only) and use no teaching methodology.

Therefore, "English for specific purposes is a term that refers to teaching or studying English for a particular career (like law, medicine) or for business in general". (International Teacher Training Organization, 2005). There is a specification of the reason for which English is learned. Pauline C. Robinson (1989) describes English for Specific Purpose as a type of ELT (English Language Teaching) and defines it as "Goal oriented language learning. " (Robinson,

Pauline C.ed. Hywel Coleman, 1989, p 398) which means the student has the specific goal that is going to be reached. Based on this explanation, we can connect it to various specific targets such as English for Law, English for Medicine, English for Business, English for Accountancy etc.

ESP is programmed on the basis of needs analysis which includes the reason to learn English, the learners, and the specific English language skill that becomes the target. These should be on the basis of the results of a careful and systematic needs analysis. The choice of goals or objectives, materials, contents and methods of teaching are also based on the target learners' needs. So, the main focus of teaching ESP is to the process of determining English skill and components related to the students' needs and their field of study. The determination of goals and objectives of the ESP courses based on the needs analysis is essential to decide why ESP course is being taught and what the learners need to get from it.

Choosing ESP materials refers to the goals and objectives derived from needs analysis. The ESP materials may mean development of new material, collection and adoption of various materials, or adaptation of existing ones. According to Graves (1996) and Tomlinson (2011), in order to select materials some issues such as their effectiveness to achieve the goals, their appropriateness, and their feasibility should be taken into account. The source of materials can be, according to McDonough (1984), taken from published materials (textbooks, journals, magazines), from real speech (lectures, broadcasts, seminars, conversations), specially written, or simplified and adapted ones.

## II. NEED ANALYSIS OF ESP

Needs analysis involves the assessment (Balint, 2010;26), it is the needs for which a learner or group of learners may require language (Ellis and Johnson, 1994). The selection of instructional materials should be based on a systematic analysis of the learners' needs for the target language. According to Nunan (1988), it is a process of gathering information about the

learners. Needs analysis is a complex process which is usually followed by syllabus design, selection of course materials, teaching/learning a course, and its evaluation (Bachman Palmer, 1996). Learners often find it difficult to define what language needs they have and cannot distinguish between needs, wants and lacks. Although these three concepts are interrelated, it is important for teachers to be aware of their encouragement on successful learning. Another stimulus for successful learning is adjusting the course to the changes in learners' needs. This implies the significance of ongoing needs analysis.

The conceptions of target needs and learning needs have been widely used in the literature. Target needs are understood as what the learner needs to do in the target situation; whereas learning needs are what the learner needs to do in order to learn. The analysis of target needs involves identifying the linguistic features of the target situation or learners necessities (what is English needed for), lacks (what learner does not know), and wants (what learner feels she/he needs) (Hutchinson & Waters, 1987: 55).

#### I. Research Questions

Research questions are illustrated on the basis of the purposes of the present study as follows:

1. What English language skills do the students perceive that they will need the most in their future work?
2. Do the perceived needs of ESP differ among students by gender?
3. Do the perceived needs of ESP differ among the variety of the students' English proficiency levels?

### III. RESEARCH METHODOLOGY

The study investigated the perspectives and perception on the needs of ESP courses among students in Faculty of Law in Riau University, Indonesia. There were two data that are used in this study. The data of first-semester students were gathered by using questionnaire and the English proficiency that is taken from the result of TOEFL test. The participants were the first-semester students of Faculty of Law. From five classes with

224 total of the students, there were two classes that became the sample classes which consist of 100 students. The questionnaire that was used is a Six-point Likert scales questionnaire by Balint (2010). The questionnaire was adapted to find out the needs of Indonesian college students from the language point of view. In order to be trustworthy, the researcher collected the data to get the reliability and validity of the questionnaire, the researcher distributed the questionnaire to non-sample class. The items of the questionnaire were analyzed by using SPSS. The Cronbach's alpha reliability of the instrument was .93. The validity test resulted 42 valid items of the questionnaire. Furthermore, the questionnaire was scrutinized by two English teachers to gain the content and face validity.

### IV. RESULT AND DISCUSSION

The result of the analysis of the first question was presented in Table 1. Table 1 describes about the interest of the students in learning English that are taken from the items of the questionnaire no 3, 4, 5, 6, 7, 8, 9, 10. Most of the students or more than 50% of the students were interested and very interested in learning English. Among the interest in learning English, item 3, 8 and 9 had the much highest percentages, 81%, 93% and 94% respectively, which concluded that most of the students all believed in having good English proficiency would be a good opportunity and a great help to their future career (Lee, 2016; 97)

TABLE 1. Statistic for the category of "Interest in learning English"

Item Number	Interest in Learning English	Percentage
3	I am interested in doing a study abroad program in an English-speaking country while I am a university student.	81%
4	I have a goal to get a job which requires English after graduating from university.	75%
5	I have a goal to work in an English-speaking country after graduating from university.	60%
6	I feel my current overall level of English ability is ...	58%
7	Learning English is a challenge that I enjoy	59%
8	I want to learn English to be more educated	93%
9	I believe learning English is important to get a good job after graduating from	94%

	university.	
10	If taking ESP courses were optional, I would choose...	85%

Notes:  
Option for Item number 10:1. to take them 2. to not take them

Table 2 presented findings about the importance of four English language skills which the students perceived. The mean scores of the perceived skills were 4.57, 4.65, 4.87, and 4.53 respectively regarding reading, listening, speaking, and writing. Speaking skill was concerned to be the most important skill but it also the skill that the students lack of. This finding correspond to what was revealed by Mohammed (2016;11) that speaking is found to be the most difficult skill.

TABLE 2. Descriptive statistic of mean scores of the perception on the importance of four English skills  
Descriptive Statistics

	N	Mean	Std. Deviation
Reading	100	4.57	.608
Listening	100	4.65	.716
Speaking	100	4.87	.714
Writing	100	4.53	.588
Valid N (listwise)	100		

Table 3 showed the findings for perceived needs of four English skills toward gender difference. The importance and needs of speaking was the most concerned skill between male and female students (mean = 4.86 and 4.87 respectively). The result of the independent sample t-test showed that there are no significant differences between males and females, which meant male and female students held similar viewpoints on the importance of each English skill.

TABLE 3. Descriptive statistic of mean scores of four English skills by gender difference

Male

	N	Mean	Std. Deviation
Reading	49	4.37	.612
Listening	49	4.40	.720
Speaking	49	4.86	.718
Writing	49	4.23	.593
Valid N (listwise)	49		

Female

	N	Mean	Std. Deviation
Reading	51	4.35	.598
Listening	51	4.42	.709
Speaking	51	4.87	.712
Writing	51	4.33	.572
Valid N (listwise)	51		

The interest in English learning, reading, listening, speaking and writing among different English proficiency level was illustrated in table 4. As

seen in the table, students at higher proficiency level (advanced) showed higher mean score for interest in English at 4.18 compared with elementary at 3.67. Moreover, the perceived needs or importance of four language skills showed the highest at the advanced level and the lowest at the elementary level. Students at elementary level held highest needs on speaking skill (M= 4.19) and lowest on listening (M= 3.87), at intermediate level (M=4.33 for speaking, M=4.08 for reading, at the upper intermediate level (M= 4.39 for listening, M=4.06 for writing), and at the advanced level (M=4.85 for listening, M= 4.50 for reading)

TABLE 4. Descriptive statistic of means by different English proficiency level

Proficiency	N	Interest in English	Reading	Listening	Speaking	Writing
Elementary	46	3.67	3.94	3.87	4.19	3.93
Intermediate	37	3.97	4.08	4.15	4.33	4.13
Upper Intermediate	15	4.12	4.13	4.39	4.13	4.06
Advanced	2	4.18	4.50	4.85	4.80	4.57
Total	100	3.98	4.16	4.31	4.36	4.17

## V. CONCLUSION

The purpose of the study was to measure the perceived needs of four English skills and interest in English learning from the students of Faculty of Law. The major findings showed the needs perception held by the students were at high level, indicating students realized that four English skills were all important and needed to be much improved to make them more skillful, to improve their opportunity in employment and their future job performances. Among four language skill needs, speaking skill was the most needed one, followed by listening. Students at higher proficiency level held more interest in English learning than those at lower level, which showed the importance of motivation and the inspiration in English learning. In terms of gender difference, there is no significant difference between male and female. It means that the perception of both genders is similar toward English learning. The findings of this study could be presented as a useful suggestion to English teachers or stakeholders that students think and perceive that the communication skills need to be much more improved. It can be seen from the real professional world which is starts from job interviews. The interviewers directly make judgments and considered the first impressions. Being proficient in the language can give a good first impression

which means higher chances of getting the position one is applying for.

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# *Investigating Learners' Ability on Pronouncing Ending –s/es on the Application Existed in Android*

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**Abstract**—This research was done to gain the information in investigating learners' ability in pronunciation on the application existed in the android. The limitation of the research was in pronouncing ending –s/es. The aim of the research was to investigate learners' ability in pronouncing ending –s/es existed in android. The method of this research was qualitative. The population and sample of this research was the fourth semester learners of STIBA Persada Bunda in academic year 2018/2019. There were 8 learners as population as well as sample in this research. The data collection technique was gained by asking the learners to choose 30 multiple choices of ending –s/es by matching the pronunciation on the application existed in android. The questions consisted of three parts of question; first was sounding /s/, second was sounding /z/, third was sounding /ɪz/. Then, after collecting the data, the researchers analyzed and investigated the test of each learner. The result of this research showed that the learners' ability in pronouncing ending –s/es is in "fairly good" level with score 56,67. Based on the result, it showed that the learners tend to answer ending –s/es with sounding /s/ because the learners were still confused lack of knowledge in understanding the theory of pronunciation ending –s/es.

**Keywords**—*application existed in android, pronunciation ending –s/es, classroom action research*

## I. INTRODUCTION

### A. Background

In learning English, there is aspect that should be understood in order to be good in speaking English, pronunciation. It is a must since the first foreign language in Indonesia as English language to be developed and learnt by others [1]. The most important point in learning English that needs the active skill, like speaking that related to the pronunciation. This pronunciation has to be developed based on the knowledge about phonetic and phonology [2] On the other words, the pronunciation proficiency can be seen of word by word. Nowadays, the growth of technology like android becomes popular to be involved in teaching –learning process in pronunciation matter.

In line with the above problem while teaching-learning process in pronunciation, so the

researchers need to do the research especially in pronouncing ending –s/es. It is interested to investigate the learners' ability in pronouncing ending –s/es. In short, the researchers wanted to do the research entitled "Investigating Learners' Ability in Pronouncing Ending –s/es on the Application Existed in Android".

Based on the background above, the formulation and the aim of the research can be formulated as follows. How is the learners' ability in pronouncing ending –s/es on the application existed in android? The aim of the research is to investigate the learners' ability in pronouncing ending –s/es on the application existed in android. The needs to conduct the study are to investigate learners' ability in pronouncing ending –s/es on the application in android in university level are:

1. as the information for the lecturer about the learners' ability in pronouncing ending –s/es,
2. as the information about the learners the difficulties level in to investigate learners' ability in pronouncing ending –s/es on the application existed in android, and
3. as the information for the following researchers in conducting the research about pronunciation matter.

In this point, the researchers tried to explain the brief explanation about the urgency of technology or android in teaching-learning process and pronunciation ending –s/es. The researchers used theories of pronunciation [9].

### B. The Urgency of Technology

There is information called *ICT* which stands for Information and Communication Technology, which told about the technology having the application related to share information and communication from individual or organization through time and dimension [3]. There are some 5 principles in using technology. The principles will give the opportunity to read, write and discuss, will make the learners more focus, will give the time, will give the learners made error and self-correctness; and will give the chances to explore their pronunciation [4].

However, there are some points that should be aware before doing the teaching-learning process using



technology. First it is better for the teacher to check the application before starting the class. Second, it should be make the regulation before doing this, like make sure the forbidden words are banned in that school. [11].

### C. Pronunciation Ending –s/es

The word 'pronunciation' refers to phonological terms like International Phonetic Association (IPA) transcription. It is needed since it is a tool used to phonetic transcription of alphabet in general. [5, 6]. In line with the previous statements, the word 'pronunciation' indicates the way or rules in spellings on vocal and consonant sounds [7].

In this research, the researchers did not focus on the transcription, however, the researchers focused on the pronunciation ending –s/es. The problem existed in pronouncing plurals, third-person verbs, and contractions that existed in pronunciations of ending –s/es in the ends of words. These are the rules to avoid the problem in pronouncing those plurals, third-person verbs, and contractions that can be seen as follows [8].

1. First, the ending –s/es forming the plural, the third-person, and contraction always sound like /s/ when the last sound in the base form is voiceless.
2. Second, the ending –s/es forming the plural, the third-person, and contraction always sound like /z/ when the last sound in the base form is voiced.
3. Third, the ending –s/es forming the plural, the third-person, and contraction always sound like /ɪz/ when the last sound in the base form is sibilant sounds.

These rules have to deal with the knowledge of phonological terms like voiceless, voiced, and sibilant sound. To know more about these terms in phonology, the learners should learn first about all sounds.

### D. Related Findings

In this part, the researchers took some related findings that was used technology in learning English. These were the related findings to emphasize this research that can be seen as follows.

1. The first related finding was about to know the way to develop an application android based. It was developed to support the pronunciation in higher education and to implement the application [9]. The result showed that all respondents were able to understand and apply the application well. The similarity of this previous research to this research was about the pronunciation related to application android based. The difference of this previous research to this research was not in designing an application but to use the application existed in android.
2. The second related finding was about teaching pronunciation in English. The result showed that the teachers English as Second language believed that the pronunciation ability should teach integrated to other skills of English [10]. The other result showed

that the teachers believed that focused on the pronunciation matter different to the curriculum distributed in school. The similarity of this previous research to this research focused on the pronunciation. The difference of this previous research to this research was not using an application however this research tried to analyze the pronunciation on the application existed in android.

3. The last related finding was about the Duolingo application applied in pronunciation [11]. The result showed that this application was effective to improve the learners' ability in pronunciation in basic level. The similarity of this previous research to this research focused on the pronunciation that was used application existed in android. The difference of this previous research to this research was not applying the Duolingo application as an action research however this research only tried to investigate the learners' ability in pronunciation on the application existed in android.

## II. METHOD OF THE RESEARCH

### A. Research Design

The researchers used descriptive design to investigate the learners' ability in pronouncing ending –s/es on the application in android. Gay (2011: 214) stated that the descriptive involves collecting data to test or to answer question concerning the aim of the research. The method of this research was qualitative method. In this research, the researchers scored then analyzed data by using formula to describe the learners' ability in pronouncing ending –s/es on the application in android.

### B. Population and Sample

As well as the sample, the population of this research was the fourth semester learners at STIBA Persada Bunda Pekanbaru in academic year 2018/2019. The population of this research was the sample of this study since the number of the learners below 100 persons, about 10 persons. According to Arikunto (2010:112) stated, if the population are less than 100 persons, the sample will be all population number.

### C. Setting of the Research

This research was conducted at STIBA Persada Bunda Pekanbaru on Jl. Diponegoro No. 42 Pekanbaru-Riau.

### D. Data Collection Technique

In this research, the researchers collected data by using test about pronunciation ending –s/es of multiple choices test consisting of 30 questions. The questions divided into three parts. First part was pronunciation

ending -s/es with sounding /s/. Second part was pronunciation ending -s/es with sounding /z/. Third part was pronunciation ending -s/es with sounding /ɪz/ taken from the book “English Pronunciation Made Simple” and combined the listening part in application in android, namely “Pronunciation”

*E. Data Analysis Technique*

The data collection technique was conducted by using these procedures. Firstly, the researchers numbered the error made by learners individually. Secondly, the researchers made a deep analysis of the questions of three parts. In this research the 30 questions were divided into three parts of question as mentioned above. Then, the result could be seen clearly by each component in pronouncing ending -s/es.

Formula below was used to investigate the learners’ ability in pronouncing ending -s/es on the application in android.

$$M = \frac{X}{N}$$

M = mean score  
X = correct answer  
N = Number of all items

Supranto in Fathira (2017: 85)

After the researcher calculated the learners score, then categorized the learners’ ability in pronouncing ending -s/es on the application in android by using the range classification below. These range classifications were used by STIBA Persada Bunda.

**Table 3.1 Range Classification of the Learners’ Score**

No.	Range	Level of Ability
1	80-100	Very Good
2	65-79	Good
3	55-64	Fairly Good
4	<55	Poor

Source: STIBA Persada Bunda

III. FINDINGS AND DISCUSSION

*A. Findings*

After the data were collected, the researchers found that the ability of fourth semester learners of STIBA Persada Bunda Pekanbaru in pronouncing ending -s/es on the application existed in android were 56,67 “Fairly Good” level. The table of calculation of mean score got by learners individually can be shown in the calculation below.

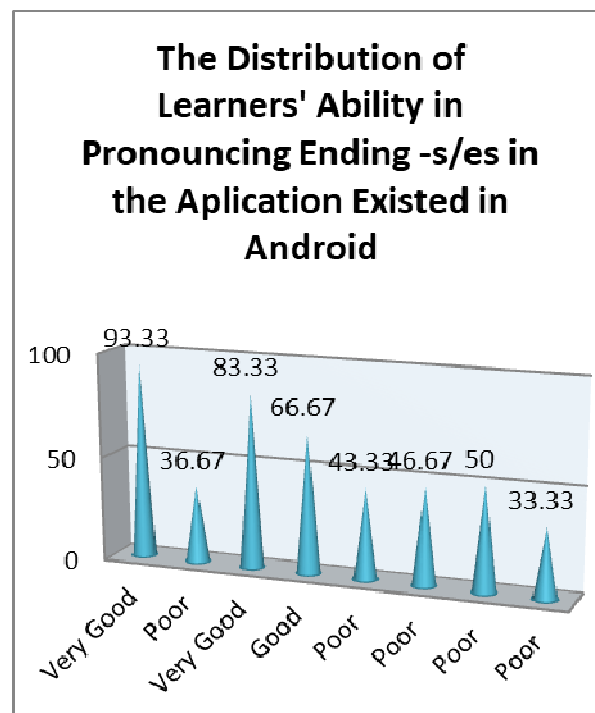
**Table 3.1 The Calculation of Mean Score and Level of Ability**

No.	Learner	Score Got Learner
1	Learner 1	93.33
2	Learner 2	36.67
3	Learner 3	83.33

4	Learner 4	66.67
5	Learner 5	43.33
6	Learner 6	46.67
7	Learner 7	50
8	Learner 8	33.33
		Mean Score 56.67 =
		“Fairly Good” level

From the Table above, most of the learners got below 55 mean score about 5 of 8 learners. Other learner got 66,67 mean score about 1 learner. The other learners got above 80 mean score about 2 of 8 learners. It can be concluded that most of learners are still lack of knowledge in pronouncing ending -s/es on the application existed in Android.

In order to get more information about the level of ability of the learners in pronouncing ending -s/es on the application existed in android can be seen in the following explanation. The calculation of level of learners’ ability showed that the most dominant score got by the learners was in “poor” level of category. However, there only 2 learners got “very good” level and only 1 learner got “good” level. To see the distribution of the learners’ ability in pronouncing ending -s/es on the application in android, it could be seen from the Figure below.



**Figure 3.1**  
**The Distribution of Learners’ Ability in Pronouncing Ending -s/es on the Application Existed in Android**

*B. Discussion*

In analyzing the data, the researchers computed the number of error made by learners

individually, after that, grouped the questions divided into 3 parts of questions. The first part of questions, numbers 1 until 10 questions were about pronunciation ending *-s/es* with sound */s/*. The second part of questions, numbers 11 until 20 questions were about pronunciation ending *-s/es* with sound */z/*. Then, the second part of questions, numbers 21 until 30 questions were about pronunciation ending *-s/es* with sound */ɪz/*. Then the result could be seen clearly by each part of question.

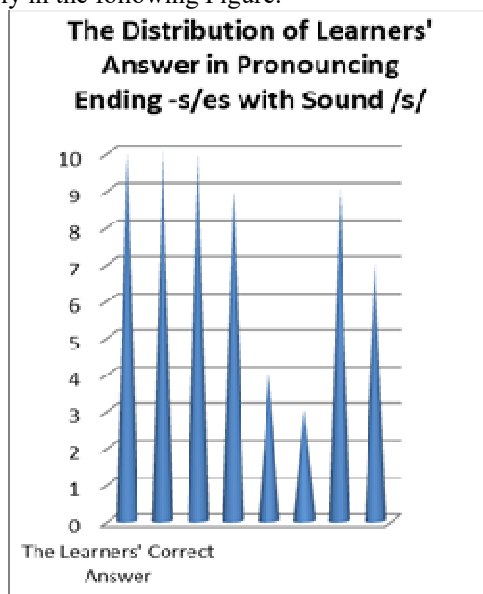
The distribution of the parts of questions and the sub topic of questions could be seen in the following Table.

**Table 3.2 The Distribution of the Questions**

Questions	Parts of Question	Sub Topic of Question
1 to 10	Pronouncing ending <i>-s/es</i> with <i>/s/</i>	Plurals, Third-person Verbs, Possessive, and Contraction
11 to 20	Pronouncing ending <i>-s/es</i> with <i>/z/</i>	Plurals, Third-person Verbs, Possessive, and Contraction
21 to 30	Pronouncing ending <i>-s/es</i> with <i>/ɪz/</i>	Plurals, Third-person Verbs, Possessive, and Contraction

*Pronouncing Ending -s/es with Sound /s/*

In this discussion, the researchers explained about the learners' ability in pronouncing ending *-s/es* with sound */s/* was categorized into "good" level. The mean score of learners' ability was 78. It can be seen clearly in the following Figure.

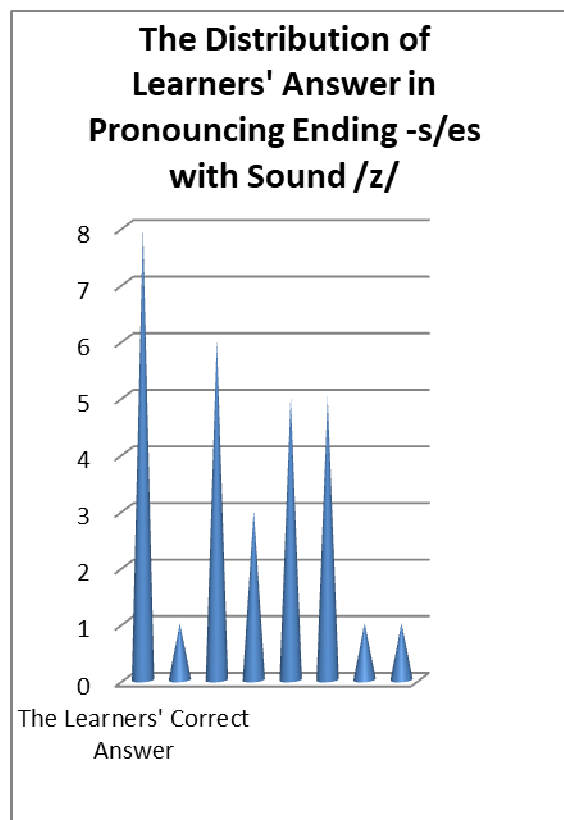


**Figure 3.1 The Distribution of Learners' Answer the Questions 1 until 10 in Pronouncing Ending *-s/es* with Sound */s/***

In this part of question many learners answered by choosing the pronunciation of ending *-s/es* with sound */s/* correctly. From the Figure 1 above, it can be explained that there are 3 learners got the highest score about 10 numbers of correct. There are 2 learners got higher score about 9 numbers of correct. There is only one learner got in high score about 7 numbers of correct. There is only one learner got lower score about 4 numbers of correct. There is only one learner got the lowest score about 3 numbers of correct.

*Pronouncing Ending -s/es with Sound /z/*

In this discussion, the researchers explained about the learners' ability in pronouncing ending *-s/es* with sound */z/* was categorized into "poor" level. The mean score of learners' ability was 38. It can be seen clearly in the following Figure. Most of learners did not know how to pronounce this part of question correctly. They tent to choose this pronunciation ending *-s/es* in option sounding */s/* not sounding */z/*.



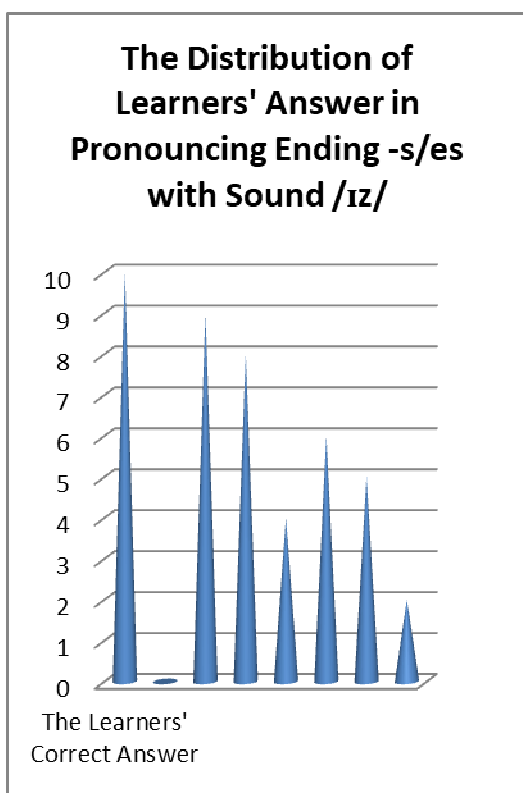
**Figure 3.2 The Distribution of Learners' Answer the Questions 11 until 20 in Pronouncing Ending *-s/es* with Sound */z/***

In this part of question, only a few learners answered by choosing the pronunciation of ending *-s/es* with sound */z/* correctly. From the Figure 1 above, it can be explained that there is only 1 learner got the highest score about 8 numbers of correct. There is only 1 learner got high score about 6 numbers of correct. There are 2 learners got in low score about 5 numbers

of correct. There is only one learner got lower score about 3 numbers of correct. There are 3 learners got the lowest score about 1 numbers of correct.

*Pronouncing ending –s/es with Sound /ɪz/*

In this discussion, the researchers explained about the learners’ ability in pronouncing ending –s/es with sound /ɪz/were categorized into “fairly good” level. The mean score of learners’ ability was 55. Only few learners choose this pronunciation ending –s/es in option sounding /ɪz/ in high numbers of correct. However, many learners also did not know how to pronounce this part of question correctly. They tent to choose this pronunciation ending –s/es in option sounding /s/ not sounding /ɪz/. It can be seen clearly in the following Figure.



**Figure 3.3 The Distribution of Learners’ Answer the Questions 21 until 30 in Pronouncing Ending –s/es with Sound /ɪz/**

In this part of question, there are several of numbers of correct got by learners. From the Figure 1 above, it can be explained that there is 1 learner got the highest score about 10 numbers of correct. There is 1 learner got higher score about 9 numbers of correct. There is 1 learner got high score about 8 numbers of correct. There is 1 learner got the average score about 6 numbers of correct. There is 1 learner got low score about 5 numbers of correct. There is 1 learner got the lower score about 4 numbers of correct. There is only one learner got the lower score about 2 number of correct. There is only one learner got the lowest score about 0 number of correct.

IV. CONCLUSION AND SUGGESTION

A. Conclusion

In accordance with the objective of the research question is to answer the question “How is the learners’ ability in pronouncing ending –s/es on the application existed n android?”. It can be concluded that 8 fourth semester learners of STIBA Pekanbaru could not good enough knowledge in pronouncing ending –s/es on the application existed in android. It is categorized into “fairly good” level. The learners’ ability in pronouncing ending –s/es with sound /s/ is “poor” for question that can be seen in the questions number 1 until 10. Then, the learners’ ability in pronouncing ending –s/es with sound /z/ is categorized into “fairly good” that can be seen in the questions number 11 until 20. Last, the learners’ ability in pronouncing ending –s/es with sound /ɪz/ that can be seen in the questions number 21 until 30.

B. Suggestions

After got the information of the learners’ ability in pronouncing ending –s/es on the application existed in android, it is important to suggest that the learners should read first the theory and practice more with the application given to the learners. The learners need to be familiar with linguistic terms such as phonological aspect since they learn English in Literature Department. In this case, the learners need to have some more application to make them remember and familiar with the correct sound of ending –s/es concept easily.

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# *Analysis Of Organizational Development In Islamic First School Integrated Dar El Iman Padang*

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**Abstract**—To get a better and growing school it is necessary to develop a good organization too. Development organizations are practices in establishing cooperation which is well between leaders and employees, teachers, and the parties are interested in achieving the purpose of the organization. An institution that managed to be seen from the increasing achievement of objectives from year to year. The results of the research that has been conducted by the authors note that the analysis of the development of the organization in SMP IT Dar El Iman done with some few technical developmet of the organization, namely the survey feedback, sensitivity training, team building, and alternative work. The conclusion that can be drawn from the research this is that the strategy of development of the organization in SMP IT Dar El Iman is already enough to go effectively.

**Keywords**—Analisys, Organizational Development

## I. Introduction

School as a formal education institution, has a responsibility in improving the quality of education. Schools not only as a place of education, will be but the school is also a place to prepare the child learners acquire skill, character, as well as a package complete the build and add knowledge child learners in the period ahead. School is one of the education systems that functions to help improve human resources. From the education received by the nation's children in school, it will be able to change the mindset and creativity to create a state and a good level of welfare and an increasing economy.

Therefore, to get a better and more developed school it is necessary to develop a good organization as well. Organizational development is the application of a systemic approach to functional, structural, technical and personal relationships within

the organization. With the development of a good organization in the school, the system or relationship that exists in the school will be renewed, so that stakeholders in the school will experience gradual changes towards the better. Their development and renewal of institutions of education both state and private sector in Indonesia is able to compete, but the competition from them the competencies are healthy in order to provide quality education that is best for a generation of young nation we are.

Based prasarvei and interview the researchers did in junior IT Darel Iman Padang showed that the institutions that had an increase towards the more better every year, things have seen from the increasing number of students each year the teachings , increasing school quality, relevance and effectiveness of the schools are improving . Development organizations are practices in esta blushing cooperation which is well between leaders and employees, teachers, and the parties are interested in achieving the purpose of the organization. An institution that managed to be seen from the increasing achievement of objectives from year to year .

Improvement of Darel Iman Middle School towards a better direction is inseparable from good organizational development too, while good organizational development is carried out with various strategies, namely by *Feed Back* survey , where the principal collects information by asking back to the staff of the teacher and employees, then with a *Sensitivity Training* where after the principal has dealt with any problems or constraints that exist in the school then the principal explains how to solve the problem, and finally *Team Building* , after the principal gives an explanation of how to solve the problem, the team is made to solve the problem that is. in this way there will be organizational

development. Based on the background of organizational development problems in Darel Iman Junior High School, related to the following three things, First, Survey Feedback, Second, Sensitivity Training, Third, Team Building. Of the three problems, the researchers focused research is on "Analysis of Development of Organizations in Schools Secondary First Darel Iman Padang".

## II. Theoretical basis

Organization is an institution which is managed by people who have a goal that is the same. Institutions have had to have the ability to achieve objectives and developments that clearly towards the much better from time to time. Sutarto (2000:26 ) said that the development of the organization is a circuit arrangement completing were done in planning and kept constantly in order to solve the various problems that arise as a change and adjust them selves to changes by applying the science of behavior were carried out by officials in the organization and them selves or with the help of from outside the organization. Furthermore Wibowo (2006 :53 ) explains that the development of the organization is a series of engineering science social which is designed to plan the change in the setting work with the goal to improve the development 's private individual and improve the effectiveness of the function of the organization .

Two concepts in the above explained that the development organization is activities that tersistematis and planned with good, and also executed with good. The leader becomes the tip of the spear in doing things that in the neighborhood organizations that dikendalikan. In the opinion of the matching, Child. J. (2005 : 40 ) said that the development of the organization is an attempt plan who made the level of the organization to improve the effectiveness and/or allow the organization to mencapai target strategic. Based on the case at the top, then that is the development of the organization in research this is an effort planned and sustained include the organization as a whole that is managed from the top to increase the efficiency, effectiveness and health organizations through the intervention planned on the processes that occur in the organization by using knowledge/knowledge behavior. Brown and Harvey in Amir (2017: 168) say Organizational development is a planned and comprehensive intervention, managed by management to improve the effectiveness and health of organizations that use behavioral science in the process. Normally development organization begins with diagnosing *the status quo* and the need level, the organization is careful . Development organizations conducted between disciplines ilmu-take the techniques of the science of behavior, especially sociology and psychology ( included theory learning, motivation, and personality), the

areas related that arise include the development of capacity, thinking the system, thinking complexity, epidemiological, clinical, and organizational learning.

### A. Strategy development organization

Anifah (2011: 15) says several techniques that can be used to make changes or organizational development (1) *Survey Feedback* , (2) *Sensitivity Training* , (3) *Team Building* , (4) *Management by Objectives*

### B. Organizational Development Process

Sondra (1995:108) said that the point of departure to begin organizing a program the change is to understand what that meant to the strategy change in total. With the words of others need an introduction that is right about the process of development of the organization as an instrument that is reliable in thinking, planning, and realize the changes. In conceptual, strategy changes a whole with the understanding that the organization use the services of a consultant. Organizational Development includes four main things, namely : (1) The consultation process. (2) The introduction and use of strategies Development Organizations (3) Make a form of intervention specified (4) The state of the coveted, has understandably Importance of Development Organizations

Amir (2017: 170) says the field of organizational development is a field that is quite rapidly developing . One of the reason is because the organization is designed to achieve multiple objectives and functions of which are expected to take place as long as possible. While it is, the changes are often synonymous with the assumption that less enjoyable for the employees . In essence, necessary efforts to specialized and development organizations can facilitate things are. In more specific, some of the causes of the changes can be presented as follows : (1) The level of competition. (2) The need to survive. (3) Needs to improve performance. From the aspect of interest, then there are a few destinations that can be designed organization that runs the development of the organization, namely : (1) Improving productivity (2) Improve the ability to respond to changes in the environment (3) Increase the position of competitive-especially since productivity (4) Increase the involvement and participation of employees (5) Enhance the spirit of the work of employees (6) Developing the skills of managerial and effectiveness of the strategies that the new

## III. Research methods

The research method used in this study is a qualitative or naturalistic research method. The choice of this method is based on the consideration that this study aims to describe the analysis of organizational development at Darel Iman Middle

School. Sugiyono (2013: 368) explains that the research qualitative is a method of research that is used to examine the object that is naturally where the researcher is an instrument of the key in the study. Furthermore, to provide instructions on the procedures that are passed in conducting qualitative research, namely : 1) determine the research topic, 2) go down the field to make observations and interviews, 3) collect documents based on research topics, 4) triangulation, 5) data analysis, and 6) compile research report. Research is implementation out in the School Secondary First Darel Iman Padang, which starts from the month of April 2019 until the month of November 2019. Consideration of that is very important in determining the location of the research is based on a location that is easily accessible and can be done repeatedly. In the case of this in a study at the School Secondary First Darel Iman Padang already meet the criteria in determining the location of which is flexible to get the results of the study are maximum. Informants research this is the first person the head of school, 1 the head of school, 2 the teacher, two people planning effort and one person committee. Overall the informants who took part in this study amounted to 7 people. Maleong (2005:75) said the informant research this is a person who provides information that is already familiar with the situation in fact and information that is delivered is not in doubt.

#### IV. Discussion

SMP Dar El Iman as one of the divisions that exist in the foundation of Dar El Iman in the city of Padang has implemented organizational development which generally walk to well, on techniques such as first *survey feedback*, where the *survey feedback* heads of schools do development organization with m engambil information is not with the questionnaire, m engadakan meeting in attracting information , m ewajibkan each member to convey the problems faced when meeting, egera find solutions to problems faced, the concept of kinship is upheld, Islamic values are always used in solving problems

Both *sensitivity training*, where the *sensitivity training* heads of schools do development organizations with less give training according to the needs , m endatangkan sources that vary in training , give flexibility to teachers to attend training that exist outside the organization , t raining interest would make teachers more active in training

Third , *team building*, where the *team building* the head of school do development organization with m emberikan training according to the needs , m endatangkan sources that vary in training , m emberikan flexibility to teachers to attend training that exist outside the organization , t raining interest would make teachers more active in training

To four, *management by objectives*, where the *management by objectives* heads of schools undertake the development of the organization by saying Objective clear long-term will make it easier to reach the target in the medium-term objectives and short , e valuation needs to be done to reach the target set , as a follow up to immediately problems in achieving the target . t arget yet achieved not abolished, but improved.

Pursuant to the description at the top , can be seen that the SMP IT Dar El Iman city of Padang in developing the organization has been using the strategy that is supposed to .

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# *Contribution Of Organizational Development And The Principal's Democratic Leadership Style To The Teachers' Performance In Public Elementary Schools (Sd Negeri) Of Nanggalo District, Padang*

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**Abstract**—This research aims to determine the contribution of organizational development and the school principals' democratic leadership style to the performance of Public Elementary School's (SD Negeri) Teachers in Nanggalo District, Padang City both separately and simultaneously. This research uses an *ex-post facto* approach. The populations of this research are 272 teachers, and taken as a sample are 86 teachers. Data analysis techniques used are partial correlation and multiple linear regression. Research findings show: (1) there is a contribution of organizational development on teachers' performance by 5.4% (2) there is a contribution of organizational development and the democratic leadership style of school principals on teachers' performance by 1.7%. (3) There is a contribution of organizational development and the democratic leadership style of school principals on teachers' performance by 6%. Based on these results, it can be concluded that there is a contribution of organizational development and democratic leadership style of school principals to the performance of Public

*Elementary School's Teachers in Nanggalo District, Padang City.*

**Keywords**—Organizational Development, Principal's Democratic Leadership Style, Teachers' Performance

## **Introduction**

Education plays an important role to develop students' knowledge in order to reach quality results. The level of science and technology achieved by a nation is usually used as a benchmark for the progress of the nation. In this era, the progress of a nation is largely determined by the progress of human resources who own and master the science and technology. Therefore, the preparation of human resources must be carried out seriously and well planned from an early age.

Teachers as the main actors in the process of *transfer of knowledge*, in the minds of researchers, can be used as variables that have the responsibility in shaping the abilities and mentality of their students. In an effort to produce quality students, the work productivity of the teachers can be used as a reflection of their performance. It can be seen from the

learning results of students and their behaviors, whether they are in accordance with applicable norms or not. In improving the work productivity of these teachers, it can be seen from their performance in completing each given obligation. Therefore, it is reasonable if the problems related to teachers' performance, both in terms of physical aspects and psychology, need special attention from the principal as their leader.

From the results of observations and initial information that conducted at the Public Elementary Schools (SD Negeri) of Nanggalo District, Padang City, researchers found symptoms of low teachers' performance, including: (1) some teachers are late in submitting learning programs (syllabus, lesson plans, annual programs, semester programs) from the set time, (2) there are still many teachers who cannot create new lesson plan, most of them only edit from the previous one, (3) some teachers deliver the learning material only from textbooks, (4) some teachers still come late for school, (5) there are still some teachers who leave the class for breakfast or chatting in the school canteen during teaching and learning process, (6) some teachers have not done *pre-test* and *post-test* on students as well as not conducting daily tests on time, and (7) some teachers have not been able to use the media and tools to support PBM such as projector and laptop.

In order for the tasks and responsibilities given can be carried out properly in accordance with predetermined standards, it needs to be supported by organizational development and good leadership style of the principal towards the teacher. Both of these independent variables are chosen for consideration to encourage individuals in the school to work well and actively so that they would be able to create a great performance. In contrary, the development of an unpleasant organization will prevent the implementation of works in the school, so that the performance result is not good. So, good organizational

development will affect teachers' performance.

The phenomenon from pre-survey that the researcher encountered are the low level of teachers' work accuracy and achievement, lack of responsibility in carrying out the tasks, lack of neatness and discipline, low skills, lack of teachers' initiative to create a conducive learning atmosphere, and no cooperation established from teacher to teacher.

Based on the above phenomenon, the writer feels interested to describe it into a scientific paper in the form of a thesis entitled "Contribution of Organizational Development and the Principal's Democratic Leadership Style to the Teachers' Performance in Public Elementary Schools (SD Negeri) of Nanggalo District, Padang". The research's objective is to find out: (1) The contribution of organizational development on teachers' performance (2) The contribution of democratic leadership style on teachers' performance, (3) The contribution of organizational development and democratic leadership style simultaneously on teachers' performance.

### Theory

Bernardin & Russel in Redan Werang (1998: 128) defines performance as: "*the record of outcomes produced on a specified job function or activity during a specified time period*". Thus, performance is defined as a record of the output produced by a particular job function or activity carried out within a certain time period.

In addition, Suriansyah (2014: 361) states that performance as a person's real behavior and the result of work achieved in carrying out the tasks assigned to them, driven by a motive to behave in accordance with the workloads they bear and based on the skills, experience, encouragement, and commitment of the employees. Dessler in Kristanto (2015: 88) states that performance is a comparison between work performances; that is the comparison between work results and expected

standards. From the above opinions, it can be concluded that the teachers' performance is the result and work performance in quantity achieved by a teacher in carrying out their duties in accordance with the responsibilities given to the teacher.

Professional teachers are required to have certain abilities. The teachers are person who are concerned with their actions in the classroom, how to communicate and interact with the school community itself. Sabandi (2013: 8) said that the development of sustainable teacher professionalism is important to improve the quality of learning, in line with the development of science, technology, as well as socio-economic, and community culture.

Robbins (2008: 353) said that organizational development is a set of interventions for planned change, built on democratic *humanistic* values, which seek to improve organizational effectiveness and employee welfare. Furthermore, Yuwono (2005: 260) said that *Organizational Development* (OD) is a planned effort, covering the entire organization, managed from above, to improve organizational effectiveness and health through planned interventions in organizations using behavioral science.

Rivai (2004: 460) said *organizational development* is a systematic application of behavioral science at various levels such as groups, intergroup and organizations in totally to make changes. Moreover, Minner in Muhyadi (2012: 175) states that organizational development is a process of data collection, diagnosis, action planning, intervention and change, and evaluation of the results which is applied to the whole organization and its components.

Rusdinal (2017: 673) said that basically, organizational development is a planned effort at the organizational level to increase effectiveness and enable the organization to achieve its strategic objectives. Rivai (2004: 462) explains that organizational development is complex and can take a year or more to design and implement it. Sometimes the process is not

clearly visible. Organizational development tries to change from the current conditions to what should be desired.

Effendy (2002: 58) states that leadership style is a way for a leader to carry out his activities in an effort to guide, direct, and control the thoughts, feelings and behavior of a person or a number of people to achieve a certain goal. Meanwhile, according to Winardi (2002: 78) leadership style is an approach that can be done to understand the success of a leadership.

Fiedler in Wahjosumidjo (2005: 32) states that the *leadership approach* is a flexible leadership style so that leaders can adjust their leadership styles immediately according to different situations. The situations are time, job demands, and the ability of subordinates, leaders, coworkers, ability and expectations of subordinates, organizational goals and expectations of subordinates.

White and Lippitt in Winardi (2002: 79) suggest three leadership styles, namely authoritarian, democratic and *laissez-faire*. These three leadership styles are based on the relationship between the party leader and the situation. Democratic leadership is characterized by the existence of a structure whose development uses a cooperative decision making approach. Under democratic leadership, subordinates tend to have high moral, can work together, prioritize the quality of work and can direct themselves (Rivai 15:2003).

### **Research Method**

This research uses quantitative non-experimental methods, descriptive and correlational that will uncover and find out the contribution between two variables by measuring the coefficient and significance. The purpose of correlational research is to investigate the relationship and contribution between hypothesized variables (Gay, (2000:30).

This research places research variables into two groups of independent variables and one dependent variable. As the independent variable is the organizational

development and democratic leadership style of the principal, while the dependent variable is the teachers' performance. In this research, the facts will be examined to see the extent of the relationship and contribution of organizational development and the democratic leadership style of school principals variables to the performance of public elementary school's (SD Negeri) teachers in Nanggalo District, Padang City.

According to Sugiyono (2013: 55) population is a generalization area consisting of objects/subjects that have certain qualities and characteristics determined by researchers to be studied and then draw conclusions. The population in this research are all 272 public elementary schools' teachers in Nanggalo District, Padang City based on data from the Education Board (Dinas Pendidikan) of Padang City.

The sample is determined by the *simple random sampling* technique. According to Sugiyono (2005: 93), *simple random sampling* is taking sample members from the population randomly regardless the degree that exist in that population. In *random sampling*, all individuals in the population, either individually or together, are given the same opportunity to be selected as sample members.

## Research Result

### 1. Teacher's Performance (Y)

Teachers' performance variable (Y) questionnaire consists of 37 items. The minimum score is 37 and the maximum score is 259. Based on respondents' answers, the lowest score is 187 and the highest score is 229. The results of data processing obtained an average score (*mean*) of 206.80. Mode is 199 and median is 207.00 and standard deviation is 9.422. The average score (mean), mode, and median value are not much different and do not exceed one standard deviation, this means that the teacher's performance distribution tends to be

normal. The score of professional teacher competency is: 22 respondents (25.58%) get average scores, 15 respondents (17.44%) get below average score, and 71 respondents (82.56 %) get above average scores. The difference in average score (mean), median and mode does not exceed one standard deviation, so the distribution of teachers' performance data tends to be normal.

The level of achievement of respondents' scores on teachers' performance variables obtained 89.90% are in the good category. From this data, it can be said that the performance of teachers in public elementary school (SD Negeri) Nanggalo district, Padang City, in general is in the good category.

### 2. Organizational Development (X<sub>1</sub>)

The organizational development variable (X<sub>1</sub>) questionnaire consisted of 37 items. The minimum score is 36 and the maximum score is 252. Based on respondents' answers, the lowest score is 185 and the highest score is 238. The results of data processing obtained an average score (mean) of 213.97. Mode is 211, median is 213.00, and standard deviation is 10,345. The average score (mean), mode, median value is not much different and does not exceed one standard deviation; this means that the distribution of organizational development tends to be normal.

Organizational development score is: 21 respondents (24.42%) get an average score, 20 respondents (23.27%) get below average score, and 66 respondents (76.73%) get above average score. Difference in average score (mean), median and mode does not exceed one standard deviation, and then the distribution of organizational development data tends to be normal.

### 3. Democratic Leadership Style (X<sub>2</sub>)

Democratic leadership style variable (X<sub>2</sub>) questionnaire consists of 40 items. The minimum score is 40 and the maximum score is 280. Based on

respondents' answers, the lowest score is 199 and the highest score is 250. The results of data processing obtained an average score (mean) of 226.35. Mode is 226, median is 227, and standard deviation is 10,398. The average score (mean), mode, median value is not much different and does not exceed one standard deviation; this means that the distribution of democratic leadership styles tends to be normal.

The score of democratic leadership style is: 21 respondents (24.42%) get average scores, 21 respondents (24.42%) get below average scores, and 65 respondents (75.58 %) get above average scores. Difference in average score (mean), median and mode does not exceed one standard deviation, and then the distribution of democratic leadership style data tends to be normal.

### **Discussing**

There are three hypotheses tested in this research, namely, (1) there is a contribution of organizational development on teachers' performance, (2) there is a contribution of the principal's democratic leadership style on teachers' performance, (3) there is a contribution of organizational development and the principal's democratic leadership style simultaneously on teachers' performance.

The first hypothesis tested in this study is that organizational development contributes to teachers' performance. A simple correlation analysis is used to determine the contribution of organizational development on teachers' performance. The calculation result of the correlation coefficient of organizational development with teachers' performance is 0.233, The regression equation explains that  $\hat{Y} = 161.48 + 0.212 X_1$ . Every improvement in organizational development of 1 scale will contribute to improving teacher's performance by 0.212 scales, while the score of implementing teacher's assignments already exists at 161.48 scales without organizational development. For example, if a teacher has an organizational

development score of 100 scales, the teacher's performance can be predicted at  $161,468 + 0.212 \times 100 = 182.68$ .

The second hypothesis tested in this research is the principal's democratic leadership style contributes to teachers' performance. To find out the principal's democratic leadership style contribute on teachers' performance, a simple correlation analysis is used. The calculation result of the correlation coefficient of the principal's democratic leadership style with teachers' performance is 0.130. The regression equation  $180 = 180.05 + 0.118 X_2$  explains that each improvement of 1 scale of the democratic leadership style will contribute to teacher's performance by 0.118 scales, while teachers' performance scores already exist at 180.05 scales without organizational development. For example, if a school principal has a score of democratic leadership style of 100 scales, the task implementation can be predicted at  $180.05 + 0.118 \times 100 = 191.85$ .

The third hypothesis tested in this research is the organizational development and school principals' democratic leadership style simultaneously contributing to teachers' performance. To test this hypothesis, a double correlation of organizational development and democratic leadership style is done together with teachers' performance of 0.245, The regression equation model  $\hat{Y} = 161.468 + 180.055 + 148.997$  explains that the  $X_1$  coefficient is 161.468, and the  $X_2$  coefficient is 180.055. It means that any improvement in organizational development ( $X_1$ ) of 1 scale will contribute to teachers' performance ( $Y$ ) of 161,468 scale, and the democratic leadership style achieves 180,055 of 1 scale will contribute to teachers' performance ( $Y$ ) of a constant of 148,997 scale without influence from both of these predictors.

Based on the test results above, it can be concluded that the third hypothesis which called "organizational development and the school principals' democratic leadership style simultaneously contribute to

teachers' performance" can be accepted at the 95% confidence level. Furthermore, it can be stated that there is a significant relationship between organizational development and the school principals' democratic leadership style that simultaneously contribute to the performance of teachers in public elementary school (SD Negeri) of Nanggalo District, Padang City by 6%.

### Conclusion

Organizational development contributed to the performance of teachers in Public Elementary Schools (SD Negeri) of Nanggalo District, Padang City by 5.4%. This means that organizational development contributes significantly to the performance of teachers in schools, the higher the organizational development, the better the performance of teachers in the school. If seen descriptively, the organizational development in this research is included in good category. For this reason, organizational development needs to be further improved so that teachers' performance becomes better.

The principal's democratic leadership style contributes to performance by 1.7%. This means that the principal's democratic leadership style contributes greatly to the performance of teachers in the school, the higher the democratic leadership style of the principal in carrying out their duties in the school, the better the teachers' performance. If seen descriptively, the principal's democratic leadership style in this research is included in a good category. For this reason, the school climate needs to be further improved, so that teachers' performance becomes better.

Organizational development and the principal's democratic leadership style both contribute significantly in improving teachers' performance by 6%. This means that the better the organizational development and democratic leadership style of school principals in carrying out their duties in schools, the better the performance of the teachers.

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# Improvement of Teacher Competence with Training in Using Trainer Arduino in SMK Multimekanik Masmur Pekanbaru

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**Abstract**—The problem found in this study is the level of teacher competence not in accordance with the readiness in facing the Industrial Revolution V 4.0. The purpose of this study is to improve teacher competence in SMK Multimekanik Masmur Pekanbaru by providing training in the use of Trainer Arduino. The method used in improving teacher competency is to provide seminars and training for Trainer Arduino and to be evaluated using Pretest and Posttest. The number of participants in this study was 15 people. From the treatment given, an increase in teacher competence was obtained by 24, 41%. The highest competency improvement in participants was 31.82%, while the lowest competency improvement was 15.63%

**Keywords**— *Teacher Competence, Training, Trainer Arduino*

## I. INTRODUCTION

Based on Law Number 14 of 2005 concerning Teachers and Lecturers, in article 10 paragraph (1) states that "Teacher competence referred to in Article 8 includes pedagogical competence, personality competency, social competence, and professional competence obtained through professional education" [1]. There are several indicators of the achievement of activities that will be used as a reference in seeing the improvement of teacher competency in this study. Indicators taken as a reference in improving teacher competence are pedagogical competencies and professional competencies. Pedagogical competence is the ability of understanding of students, the design and implementation of learning, evaluation of learning outcomes, and the development of students to actualize their various potentials. Professional competence is the mastery of extensive and in-depth learning material, which includes the mastery of curriculum material in school subjects and the scientific substance that houses the material, as well as mastery of the structure and methodology of the science.

The government has launched version 4.0 of the Industrial Revolution where everything has been based on automation by utilizing technology and the Internet of Think. Therefore, it is necessary for education sector especially in technology schools to accompany the

development of technology, especially leading to the Industrial Revolution version 4.0.

In welcoming the technological development accompanied by the insistence on the Industrial Revolution V 4.0, where the revolution V 4.0 allows higher productivity and efficiency of resources, teachers must equip themselves with wider learning material. Teachers must leave the conventional ways of learning, and provide the latest innovations. The expected innovation is the existence of methods or learning media that are expected to refer to the Industrial Revolution V.4.0.

Problems in this study were obtained based on interviews and observations conducted at several schools in Pekanbaru. From observations that have been carried out, the teacher's competence in responding to the industrial V 4.0 revolution has not been sufficient. This is influenced by teaching materials that are understood by teachers to be still sourced from old teaching materials. Besides the instructional media used by teachers are not in accordance with the Industrial Revolution approach V.4.0. Based on these problems, treatment can be given in the form of providing training in trainer Arduino to improve teacher competency.

Trainer Arduino is considered as a solution for increasing teacher competency because the use of Arduino is more widely used in industry. If we look at the curriculum at SMK especially Electronic Technology, microcontroller learning still uses the AVR type. On the other hand, in industries in Pekanbaru, the use of Arduino is more applied as a control.

In previous studies, self-development activities are part of the activities of Continuing Professional Development (PKB). There are three PKB activities, namely self-development, scientific publications, and innovative work. The research raised self-development because self-development is the basis for increasing competence before teachers make scientific publications and innovative work [2]. In addition, in other studies the lesson study program can be implemented because of the support of cooperation between teachers, school principals, and the role of coordinators in developing programs. For teachers, this program is very useful in



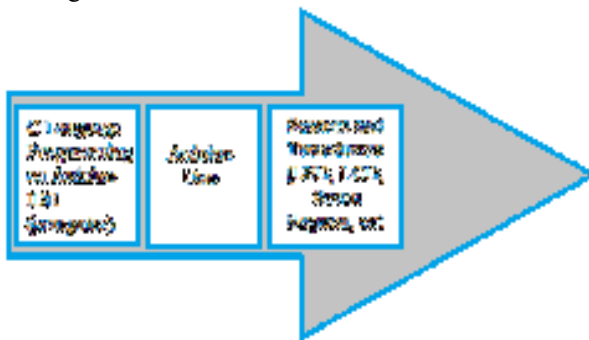
learning in the classroom, as well as being able to improve their competency [3].

The purpose of this research is to increase human resources in the world of electronic technology, increase student interest in electronics, training in introducing the development of microprocessors and microcontrollers, Introduction to Trainer Arduino, Introduction to teachers about electronic sensors that can be used in everyday life and improve the quality of graduates of the Electronics Technology school as well as improve teacher competency by providing training in trainer Arduino at the SMK Multimekanik Masmur Pekanbaru.

## II. DATA AND RESEARCH METHOD

### A. Trainer Arduino

Trainer Arduino is a learning media developed using an Arduino microcontroller. Trainer Arduino can be used in Basic Programming, Digital Systems, Sensors and Transducer subjects, and Microcontrollers. So far, the use of microcontrollers as learning media in schools in Pekanbaru still uses the AVR type. It is hoped that with this renewal, it can upgrade teacher competencies which have so far been based on conventional media in learning.



**Figure 1 Arduino Trainer Work System**

Trainer Arduino consists of several sensors and transducers. An important component of the trainer is the Uno Arduino Microcontroller. There are many types of Arduino depending on their size and use, namely Arduino Lilipad, Arduino Uno, Arduino Nano, Arduino Mini and others. What makes the difference in some types of Arduino is the ability of work power and storage. The workings of the trainer Arduino can be seen in Figure 1.

In the Trainer Arduino, the use of sensors and transducers becomes a reference as a learning medium. The user will learn programming using Language C [4]. In its application, sensors and transducers can work where the user modifies commands in the form of a programming language and sent to Arduino. Figure 2 is a form of Arduino Uno



**Figure 2 Arduino Uno**

Figure 2 is an Arduino type Uno that is widely used in the world of automation. Arduino Uno has 14 digital pins and 6 analog pins. On digital pins, there are 6 pins that can be used as PWM. Arduino Uno has an operating limit of 5 V.

In the trainer Arduino, Arduino can be connected to several sensors available, including LED, LDR, LCD, Seven Segment, Temperature sensor, timer sensor, Dot Matrix and humidity sensor. The trainer Arduino drawings used in the training can be seen in Figure 3:



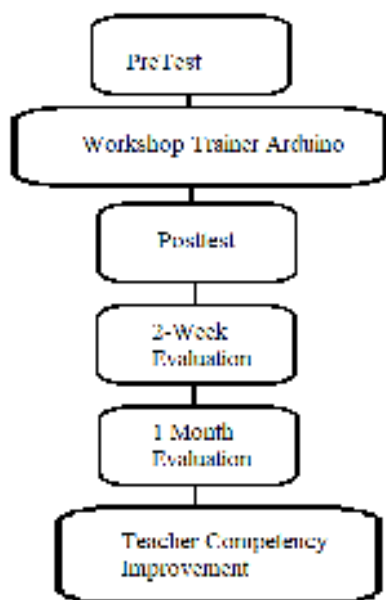
**Figure 3 Trainer Arduino**

Figure 3 is an example of Trainer Arduino used for teacher competency training at SMK Multi Mekanik Masmur.

No	Schedule of activities	Time
1	Microprocessor and Microcontroller	09.30 - 10.15
2	Application of Microcontrollers in Industry	10.15 – 11.00
3	Microcontroller against the Industrial Revolution V 4.0	11.00 – 11.45
4	Introduction to Arduino IDE	13.30 – 13.45
5	LED programming	13.45 - 14.05
6	LCD programming	14.05 - 14.25
7	Ultrasonic Sensor Programming	14.25 – 14.45
8	LDR Sensitive Programming	14.45 – 15.05
9	Temperature Sensor Programming	15.05 – 15.20
10	Water break	15.20 - 15.45
11	Seven Segment Programming	15.45 – 16.05
12	Combined multiple sensor programming	16.05 – 16.25

**B. Research Data**

The data taken in this study are the results of Pretest, Posttest, and evaluation given to participants. Pretest results were carried out before the training, while posttest and evaluation were carried out after the training of trainer Arduino. The roadmap in this study is as follows:



**Figure 4 Research Roadmap**

**C. Pretest**

Assessment with the pre-test procedure is in the form of question, which is posed before starting a lesson. The question asked is the material to be taught at the time (new material). Giving a pretest is usually done at the beginning of the opening lesson. The purpose to carry out a pretest in this study is to see the extent of participants' knowledge about the microcontroller, trainer arduino and

transducer sensors before being given treatment (training). Each participant was given a multiple choice question sheet consisting of 40 items. The questions consisted of 15 microcontroller questions, 5 Arduino IDE questions, 5 programming problems and 15 sensor and transducer questions

**Table 1 Training Schedules**

**D. Training on the use of trainer Arduino**

The training was held at the Computer Laboratory of SMK Multimekanik Masmur Pekanbaru. The training lasted for 1 day. The training was attended by 15 participants consisting of teachers and laboratory assistants. Participants came from Audio Video Engineering, Software Engineering, and Network Computer Engineering study programs.

The training started from 09.00 AM to 05.00 PM. Before the training began, participants were given a 30-minute Pretest to see the extent of the teacher's competence with Arduino type microcontrollers and transducer sensors. The material presented during the training can be seen in Table 1. After the training was given, the activity was closed with a posttest in the last session.

**E. Post-test**

Assessment with the post-test procedure is the form of questions given after the lesson/material has been submitted. In other words, a post test is a final evaluation when the material taught on that day has been given in which a teacher gives a post-test with the intention of whether students have understood about the material just given that day. Posttest aims to see the results of activities that have been carried out. The results of the post-test can provide information on whether the objectives of the activity have been achieved or not. In this study, the items used as posttest are the same as questions on pretest. Each participant was given a multiple choice question sheet consisting of 40 items. The questions consist of 15 microcontroller questions, 5 questions Arduino IDE, 5 programming questions and 15 sensor and transducer questions. The posttest is expected to see an increase in teacher competency after being given trainer Arduino training. After the training is carried out, the Arduino trainer and the jobsheet are submitted to the school to be studied independently.



**Figure 5 Training of Trainer Arduino Section**

*F. Evaluation 2 weeks after training*

Evaluation is done to see whether the teacher learns the trainer independently at school. The first action evaluation action took place 2 weeks after the training was given. Participants were given a question sheet to answer. The questions given are the same as the pretest or posttest questions. It is hoped that in this 2-week evaluation there would be an increase in teacher competence compared to the results of the tests in the previous posttest.

*G. Evaluation 1 Month after training*

One month post training evaluation aims to see how far the achievement of increasing teacher competence after 1 month after training. With trainers facilitated at school, it is expected that there would be a significant increase in teacher competence after one month of training

III. RESULTS AND DISCUSSION

The evaluation aims to see an increase in teacher competency based on the score of the pretest and posttest. The evaluation was also carried out 2 weeks and 1 month after the service activities were carried out. Evaluation is carried out to see whether the teacher learns independently by means of a trainer provided by the service team. The form of evaluation carried out is the same as evaluation during the pretest. The results of the pretest, posttest and evaluation can be seen in Table 2. From the table it can be seen that there is an increase in the teacher's pedagogical competencies found in the community service activities. To see the curve for increasing teacher competency, it can be seen in Figure 7

**Table 2 Value of Participants in Training of Arduino Trainer**

No	Name	Pre Test	Post test	2-Week Evaluation	1 Month Evaluation
1	Participant 1	52,5	72,5	75	77
2	Participant 2	67,5	75	77,5	80
3	Participant 3	65	77,5	80	80
4	Participant 4	65	70	75	77,5
5	Participant 5	60	75	77,5	80
6	Participant 6	57,5	70	72,5	80
7	Participant 7	70	80	80	85
8	Participant 8	75	85	90	95
9	Participant 9	60	80	80	87,5
10	Participant 10	55	65	67,5	75
11	Participant 11	52,5	65	67,5	75
12	Participant 12	65	75	80	85
13	Participant 13	62,5	85	85	90

14	Participant 14	65	80	80	85
15	Participant 15	70	85	92,5	95



**Figure 6 Graph of Teacher Competency Improvement**

Figure 7 shows information on increasing teacher competence during the activity. The blue curve is the result of pre-test before the training was carried out. The brown curve is the result of post-test after workshop on trainer Arduino was carried out. The grey curve is the result of activity evaluation done 2 weeks after the workshop.

The yellow curve is the evaluation result of community service, 1 month after the activity.

Participants who gained maximum competency improvement at the time of the Posttest were participants 8, 13 and 15, while participants who received the lowest competency improvement were participants 10 and 11.

To see the percentage increase in overall teacher competency, the following formula can be used:

$$\text{Percentage Increase} = \frac{\text{Final Score} - \text{Initial Score}}{\text{Initial Score}} \times 100$$

In general, a significant increase in competence occurred between the pretest and posttest. When compared with the increase in 2 weeks or one month after the activity, the percentage increase in competence from pretest to posttest is 17, 25%. Teacher competency improvement from post-test to 2-week evaluation is an increase with the smallest percentage of 3.36%, while the percentage increase from 2 weeks evaluation to 1 month evaluation is 5.41%. From the results of the evaluation after the training, it can be concluded that the teacher has a low competency increase if given independent learning.

To see the percentage of teacher competency improvement in the trainer arduino training and workshop activities as a whole, the value used is the pretest value and the evaluation value of 1 month. The selection of 1-month evaluation scores is taken as a reference in seeing the improvement in teacher competencies aimed at seeing whether the teacher continues to study independently in school.

Using the formula above, a percentage increase in teacher competency can be calculated. The final value is the evaluation value 1 month after the activity. While the initial value is the pretest value before the activity is carried out. It is expected from the results of these calculations, described the percentage increase in teacher competence, especially in the use of microcontrollers. The percentage increase can be seen in Table 3.

**Table 3 Percentage of Teacher Competency Improvement**

No	Name	PreTest	1 Month Evaluation	% Increase
1	Participant 1	52,5	77	31,82
2	Participant 2	67,5	80	15,63
3	Participant 3	65	80	18,75
4	Participant 4	65	77,5	16,13
5	Participant 5	60	80	25,00
6	Participant 6	57,5	80	28,13
7	Participant 7	70	85	17,65
8	Participant 8	75	95	21,05
9	Participant 9	60	87,5	31,43
10	Participant 10	55	75	26,67
11	Participant 11	52,5	75	30,00
12	Participant 12	65	85	23,53
13	Participant 13	62,5	90	30,56
14	Participant 14	65	85	23,53
15	Participant 15	70	95	26,32
Average Increase				24,41

Based on the table a significant increase in participant 1 where there was an increase in competence of 31.82%. The ncrease with the smallest percentage in participant 2 is 15.63%. The average increase in teacher competency in these service activities is 24.41%. For more details, you can see the curve in Figure 8.



**Figure 7 Percentage of Teacher Competency Improvement**

#### IV. CONCLUSION

The conclusion that can be drawn is that the provision of Trainer Arduino training is considered successful in increasing the competency of SMK Multimekanik Pekanbaru teachers. The percentage increase in teacher competency was 24.41%. Trainer Arduino training can upgrade teacher competencies in preparing for the Industrial Revolution V 4.0. Good training can improve teacher competence optimally when compared to independent learning teachers.

Suggestions that can be taken from this study are to provide regular training to teachers as much as possible. With good and structured training according to the needs of the times, it can improve teacher pedagogical competence.

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# Validity of the Expert System based VIT Model (*Vocational Interest Test*)

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**Abstract**— The purpose of this study was to produce a valid expert system-based VIT (*Vocational Interest Test*) model. Recruitment or student admission plays an important role for the success of a vocational education. Therefore, using a valid student admission tool is important which will result good and quality students, and this can be seen in the admission process through the right means and tools. The novelty of the product developed was to be able to calibrate vocational interest instruments developed from Holland's theory with information technology and knowledge based system. This research product is in accordance with the Vocational Education Spectrum which consists of 9 Areas of Expertise, 48 Expertise Programs and 142 Expert Competencies that are in line with 21st Century Competencies to produce a vocational interest test model and a vocational interest software based on innovative expert system and in supporting the right decision making (Decision Support System). The type of research used is Research and Development (R & D) using the Four-D (4D) model. To produce valid products, expert validity is used. Based on the data analysis, the results of the study were obtained: (a) Book of Vocational Interest Test model, (b) Vocational Interest Test Software Product, (c) Application Usage Handbook, (d) Vocational Interest Test Socialization Handbook that has fulfilled the valid terms and conditions .

**Keywords**— *Vocational Interest Test (VIT), Expert System, Holland's Theory, Vocational High School, Selection System*

## I. INTRODUCTION (*HEADING 1*)

Education is an important aspect in human life. Therefore, education is needed in accordance with the change of era that requires individuals to be able to develop their own potential based on the expertise that is needed later for both the students themselves and the community. Vocational school that is also called vocational education is oriented to the demand of industrial markets that require skilled workforce. The basic principle of developing vocational education

refers to one of the founders of vocational education, *Father of Vocational Education in the United State*, an intellectual from the United States named Charles Allen Prosser as cited in Roynaldo, D and Martinez, JR (2007: 73) who explain 16 principles or characters of vocational education which the government is trying to do now by reducing public education and increasing vocational high schools (SMK). The reason of such policy is because there are many unemployees from secondary education due to the lack of skills of the graduates and the incompatibility of the needs of the industrial market with the expertise of each secondary school graduate. This condition makes unemployment rate increase.

Vocational education in Indonesia is at the level of secondary education called Vocational High School. Types of vocational education are arranged in the spectrum of vocational education consisting of 9 Areas of Expertise, 48 Skills Programs and 142 Skill Competencies as outlined in the Decree of the Director General of Primary and Secondary Education, number: 4678 / D / MK / 2016 dated September 2, 2016. The government program, through the Minister of Education and Culture, targeted a ratio of vocational and general secondary education to be 70:30, 70% of vocational schools and 30% of high schools until 2014. This target was not reached until the deadline and then dropped to 60:40 until 2014, but the target cannot be reached until now.

Vocational education is an education that prepares students to enter the workforce. Paryono, Southeast Asian Minister of Organization Regional Center for Vocational and Technical Education and Training (SEAMEO VOTTECH) Brunei Darussalam explained that vocational education must have education where the point is not only ready for work, but must have adjustments such as training and providing general knowledge. Vocational education is not a stand-alone



discipline, but is influenced by the surrounding scientific disciplines, such as industry and economics. Vocational education should affect industrial and economic development. The relationship between vocational and technical education can be seen in Figure 1.



Figure 1. Relationship between Vocational and Technical Education and Surrounding Factors (Source: World Bank 2012)

The figure above must be strong, because if the relationship is weak there will be a high rate of unemployment, inefficient and the migration of workers to other places (brain drain). Vocational graduates from the beginning are prepared to enter the workforce so that after graduation the students will immediately work or become entrepreneurs. The phenomenon is many vocational high school graduates are unproductive, and this fact is reinforced by the data provided by BPS in Catalog No. 57 of February 2015. The data of Open Unemployment Rate (TPT) according to education in August 2014 for Vocational High School education occupies the highest position that is 11.24 percent, followed by High School TPT at 9.55 percent, while the lowest TPT is at the lower elementary school level, which is 3.04 percent. This data is explained in Table 1.

Table 1. Open Unemployment Rate (TPT) according to the Highest Education Graduates Year 2012-2

Tingkat Pengangguran Terbuka (TPT) Menurut Pendidikan Tertinggi yang Ditamatkan 2012-2014 (persen)						
Pendidikan tertinggi yang Ditamatkan	2012 (*)		2013 (**)		2014 (**)	
	(1)	(2)	(3)	(4)	(5)	(6)
1. SD ke bawah	3,59	3,55	3,84	3,68	3,04	
2. Sekolah Menengah Pertama	7,80	8,21	7,50	7,44	7,15	
3. Sekolah Menengah Atas	6,69	6,65	6,71	6,11	5,55	
4. Sekolah Menengah Kejuruan	9,37	7,72	11,21	7,21	11,24	
5. Diploma (DIP)	6,23	5,72	5,35	5,67	4,11	
6. Universitas	5,81	5,00	5,39	5,31	3,89	
Jumlah	6,11	5,88	6,17	5,70	5,44	

This data shows the gap between government expectations and the fact. Vocational schools are supposed to prepare students to enter the workforce but it turns out that graduates of vocational schools are the

highest contributors to unemployment in Indonesia. The initial survey conducted in February 2015 in several vocational schools in the city of Payakumbuh, both for State Vocational Schools and Private Vocational Schools, showed that the process of new student admission did not place students in specialization or majors in accordance with their abilities, interests and talents.

In the admission selection process, the students were only tested in which the committee gave selection questions from certain subjects. This is identified to be the main cause of students' lack of competence which results in their unpreparedness to face the demands of the work world which in turn has an impact on high unemployment in our country. If not anticipated quickly, this situation will cause major problems for Indonesian people. The basic concept of this theory is also explained by Holland (in Anggalih, 2013) in which majors relate to the type of personality of each human being. Holland further explained that each type of personality is a product of interaction whose characteristics come from various cultural influences, peers, biological heredity, parents, social class, culture, and physical environment. An individual will prefer several activities that are appropriate to his personality type. This also applies in learning in which someone will choose some learning activities that are appropriate to his/her personality type.

The phenomenon occurring today is majors often cause problems because majors in vocational schools are related to important and complex public affairs. Public interest is important because majors mean the deployment of one's life direction such as specialization and the type of work someone has, the values he adheres to and the personality that he carries. Public interest is also complex because it involves intelligence and human ability to learn, as well as concerning social class competition since majors are seen as laying the position of students and their families in society, even concerning emotional control in the sense of acceptance of parents and students if students do not enter the majors they want.

Vocational students are graduates of Junior High Schools (SMP) and Madrasah Tsanawiyah (MTs) and package B. They will choose a level of further education that suits their interests and desires. From the initial observations in February 2015 in several schools in the Payakumbuh City, the authors saw the phenomenon that many students who did not enter the department of interest are now working in the field which is not in accordance with their expertise after graduating from school. This can be caused by several factors, namely: (1) the majors system which only considers the report card value with the stipulation of the average standard value determined by the school through the Headmaster's decision letter; (2) students themselves have never been mapped for the description of their interest based on a measuring instrument that is able to express their interests and preferences for work which can estimate the environment of their

interactions to determine their interests and preferences. On the one hand this department allows students to have a greater choice of majors in higher education than other majors, in addition to many jobs that only accept students from science majors, so that unconsciously is also followed by social prestige in the sense that students and their families are classified as smart people (Satria, 2011).

The reality is that every human being was born unique with different talents and personalities. In school, the differences of each student must be considered because it can determine both the poor and bad student achievement. Snow (in Anggalih, 2013) found that individual differences between students in schools include differences in cognitive abilities, achievement motivation, interests and creativity. Due to the existence of these individual differences, the function of education is not only in the teaching and learning process, but also counseling guidance, selection and placement of students in accordance with the individual capacity, the design of appropriate teaching systems and teaching strategies that are based on individual characteristics.

If students make a mistake in choosing a major, learning achievement will be low and cause uncertainty in self-actualization. Furthermore, students do not understand the reason for choosing the major, where to go after graduation and what their goals are (Wicaksono, 2009). Majors in high school are not only determined by academic ability but also must be supported by interest factors, because the characteristics of a science require the same characteristics of the person who studies it. Each personality type has a repertoire of attitudes and skills characteristics to overcome environmental problems and tasks. In order to overcome this problem, Vocational Schools must be able to change their learning patterns starting from the beginning when students enter school. The basis is that when we say that students have an interest in a particular topic or activity, our intention is that they consider the topic or activity interesting and challenging. In other words, interest is a form of intrinsic motivation. Students who pursue a task that interests them experience significant positive effects such as pleasure, excitement, and joy (Hidi, Renninger, & Krapp, 2004; Schiefele, 1998).

Students who are interested in a particular topic devote more attention to the topic and become more cognitively involved in it (M.A. McDaniel, Waddill, Finstad & Bourg, 2000; Hidi & Renninger, 2006). They also tend to study it in a more meaningful, organized and detailed manner, for example by linking it with prior knowledge, forming visual images, giving examples, linking ideas, drawing conclusions, and identifying their application (Pintrich & Schrauben, 1992; Renninger, Hidi & Krapp, 1992; Schraw & Lehman, 2001; Tobias, 1994). Moreover, students who are interested in what they learn are more likely to experience conceptual change when it makes sense (Andre & Windschitl, 2003; Linnenbrink & Pintrich,

2003). Even students who are interested in what they learn show high academic performance and are more likely to remember the subject matter in the long run (Garner, Brown, Sanders, & Menke, 1992; Hidi & Harackiewicz, 2000).

In fact, determining the majors of interest in accordance with their talents, interests and personalities is something difficult for students. This is due to their lack of knowledge about the major. This becomes worse by the unavailability of jobs with their specialization. Vocational schools as a vocational education institution that should prepare their students with the competencies they will carry in entering the workforce have not been able to place students in choosing specialization according to their abilities, personality, interests, and talents. In fact, the quality of resources greatly influences the change and progress of Indonesia in the future although Indonesia's human resources are still in the category (Medium Human Development) which was initiated by the United Nation Development Program. A country will develop and advance, if it is in line with the development and progress of the quality of its human resources (Firdaus, Ahmad Yaris et al, 2013). This can be seen in Figure 2 of the Human Development Index published on October 5, 2009.

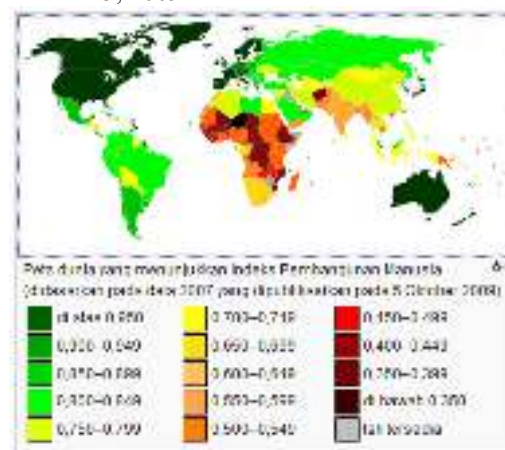


Figure 2. Human Development Index (Source: UN Human Development Report 2010)

Based on the description of the problems described above, it is important to develop a model of vocational interest test for Junior High School students before the students choose specialization or what major they will take while attending Vocational High School. The model of interest measurement tool used today is the Rothwell Miller Interest Blank (RMIB). The weakness of the Rothwell Miller Interest Blank (RMIB) is that it only provides a general description of one's interest without seeing whether someone can or cannot, such as someone who is interested in singing but actually his singing ability is still lacking.

Another drawback is the Rothwell Miller Interest Blank (RMIB) model only classifies jobs in twelve

categories, while the current type of work is very large and there are several types of work that need other categories. Based on this, the researcher needs to develop a model of measuring the vocational interest test for junior high school students, which in addition to determining interest is also supported by emotional maturity and big effort. This is important so that students can be placed according to specialization of competence or majors that match their abilities, interests and talents. Furthermore, the students can develop the potential that is in them when they enter the community later. The aim is to decrease unemployment rate in vocational schools graduates by testing in the beginning before students determine the chosen specialization.

Vocational interest will also affect job readiness, so it is very important to develop an assessment model that can measure the vocational interest of a student based on an effective, creative and innovative expert system so that vocational schools as a school that prepares professional middle-manpower to enter the workforce are able to put students in accordance with their vocational interests in meeting the needs and desires of stakeholders.

## II. THEORETICAL FRAMEWORK

### A. *Definition of Vocational Interest*

Interest is the cause of the driving force that compels someone to pay attention to certain situations or activities and not others, or interest as a result of effective experience that is influenced by the presence of someone or an object, or because of participating in an activity (Dyimyati in Arif, 2015).

The definition of interests according to Tidjan (in Arif, 2015) is a psychological symptom that shows concentration of attention to an object because of feelings of pleasure. From this definition, interest can be interpreted as a concentration of attention or reaction to an object such as certain objects or certain situations which are preceded by a feeling of pleasure towards the object. The vocational interest referred to in this study is the interest of Junior High School students in choosing or planning vocational training related to their profession or occupation based on their abilities and interests. Holland and Nichols (in Yudhi Satria, 2011) found that someone will leave a field because he has no interest, and he will look for fields that are in line with his interests and talents. In their research they document with a comprehensive assessment and provide an objective and subjective picture of learning.

Holland in Arif (2015) views career or vocational selection as an expression or extension of personality into the world of work, which is followed by identification of certain occupational stereotypes. Holland further views self-oriented capital as the key to

individual occupational choices. Individuals strive to obtain a career or position with the aim of carrying out their potentials, stating their attitudes and values, taking part in them, and avoiding various roles and problems that are not desired and agreed upon. Determining the career of a large group of careers or jobs requires someone to make a selection or assessment of his career or job. This degree of career choice is determined to what extent the individual is fit in choosing the job he wants to enter later.

### B. *Vocational Interest Theory*

The success of the TPF (Talents Compass Psychological Fingerprints) fingerprint system in applying the Holland Vocational Interest theory accurately and becoming the first fingerprint system implementer in the world that has successfully applied this theory, has received a positive response from tens of thousands of TPF clients. Through this application, clients can see their work interests (vocational interest), career levels, career trends and the desired work environment. For clients who are in the stage of determining study majors in high school or university, this application allows them to see courses that are appropriate to their personality. As a result, the TPF fingerprint system is now proven to be an important instrument in the recruitment and promotion process of employees in the industrial world and the process of study majors in the world of education.

The Vocational Interest Theory developed by John Holland (in Phillips & Jome, 2005) has until now been recognized as the most widely used and popular theory in Vocational Psychology (Phillips & Jome, 2005). In general, this theory refers to the understanding that a person's job choice (vocational choice) has a strong correlation to personality and work environment (person-environment fit). In short, Holland believes that both individuals and the work environment can both be characterized into six types, namely Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. These six types are then placed in RIASEC hexagonal models that are interrelated with each other. With the following conditions: the contiguous nature shows the closeness of the personality and work environment, and the nature of the diagonal opposite shows both opposition in personality and in terms of work environment preferences.

### C. *Basic Personality Theory of Holland*

Personality is an important element in achieving one's success. Experts have formulated a variety of personality theories with various assumptions and different individual environmental backgrounds. The concept of personality that emphasizes the interaction between the environment and individuals that is most often used is Holland's personality theory (Sharf, 2010). Many studies of Holland's theory have been used by researchers especially in studying the phenomenon of career selection that supports individual success. Holland's main theory focus is on the understanding of



vocational behavior to produce practical ways of helping people both youth, adult and even elderly in determining their careers both in education and the world of work (Louis, 2010).

The concept of interest regarding work and occupation is the result of a combination of one's life history and overall personality, so that certain interests eventually become a personality trait in the form of self-expression in the field of work, academic studies, core hobbies, various recreational activities and many other favorites. In short, it can be said that vocational interest is the most important personality aspect. That is why interest inventory is seen as a personality test. Indications of interest are a person's preference for certain activities, while dislike becomes contraindicated. Holland himself developed several tests that can help people know themselves, such as: The Vocational Preference Inventory in 1977 and Self-Directed Search in 1979 (Arif, 2015).

#### *D. Century Competence*

According to the Ministry of Education and Culture, the characteristics of the 21st century are the availability of information anywhere and anytime, the implementation of machine usage (computing), the ability to reach all routine work (automation), and the ability to do anywhere and anywhere (communication). Shifting the development of education towards ICT is one of the 21st century education management strategies including institutional governance and human resources. (Soderstrom, From, Lovqvist, & Tornquist, 2011) <https://pgsd.binus.ac.id/2017/08/08/pendidikan-abad-21/> accessed February 4, 2018. 21th Century Readiness is a readiness to welcome the 21st century. UNESCO created four pillars of learning to welcome the 21st century, namely:

1. *Learning to know*
2. *Learning to do*
3. *Learning to be*
4. *Learning to live together*

The education that builds 21th Century Learning partnership competencies is the 21st century learning framework that requires students to have the skills, knowledge, and abilities in the fields of technology, media and information, learning skills, innovation, and life skills. In facing the 21st century people are required to learn more, in different ways and approaches.

The new 21st century learning concept that leads to the development of creative problem solving skills needs to be a focus of development of Technical and Vocational Education Training (TVET) learning strategies so that the future impact of TVET learning is clear and relevant to the development of technology, science, and culture in Indonesia. An effective TVET learning strategy is an actual world-based, contextual work-based, competency-based, comfortable, safe, easy and cheap learning contextual learning strategy. TVET is expected to play a role to produce knowledgeable and skillful and productive workers.

The need to be involved in problem solving as well as critical and creative thinking is at the core of learning and innovation (Trilling & Fadel, 2009, p 50). The 21st century education system emphasizes and develops these competencies explicitly through curriculum changes, which aim to prepare students to be able to solve complex problems related to competitive and globally connected life. The 21st century competences are:

1. Critical Thinking, the ability to design and manage projects, solve problems and make effective decisions using various tools and resources (Fullland, 2013, p. 9). Critical thinking is needed by students to obtain, process, interpret, rationalize, and critically analyze information in decision making in a timely manner. Digital tools and sources can support critical thinking processes.
2. Communication, effectively communicating verbally, in writing and with various digital tools and also the ability to listen (Fullland, 2013, p. 9).
3. Collaboration  
The ability to work with teams, learn and contribute to learning, social networking skills, empathy and collaboration with others. (Fullland, 2013, p 9).
4. Creativity and Innovation.

Creativity is important for social development, the ability to compete in business, and the ability to generate economic growth. Creativity is a new concept, idea, or product that meets the needs of the world. Innovation contains elements of creativity and is often described as the realization of new ideas in order to be able to make a useful contribution to certain fields (Fullland, 2013). The 21st century competencies have measurable benefits for many people and areas of life and are therefore very important for all students. These competencies can be identified on the basis that they make measurements contributing to the attainment of education, relationships, employment, health and welfare, and do it for all individuals (Rychen, 2003, p 66-67).

### III. RESEARCH METHODOLOGY

The research methodology used is Research and Development with ADDIE (Analysis, Design, Development, Implementation and Evaluation) development procedures. The flow of research and development procedures with the Four D's framework contains stages with the following activities:

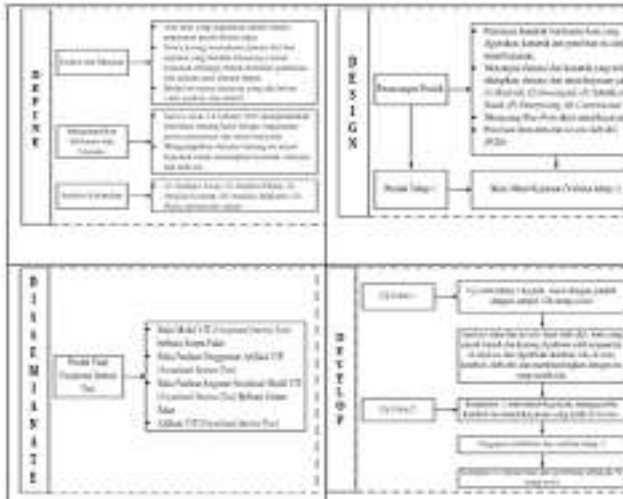


Figure 3. Four D's Research and Development Procedures

IV. RESULTS

A. The Result of Expert System-based VIT (Vocational Interest Test) Model Validity

Based on the validation results of the validator or experts that:

- a. The results of the validity of the Book of Expert System-based VIT (Vocational Interest Test) Model from the validator are: 1) Component Aspects have an average score of 0.78 with valid categories, 2) Construction Aspects of the Model have an average score of 0.76 with valid categories, 3) The Overall Aspect has a score of 0.80 with a valid category.



Figure 4. The Chart of Expert System-based VIT Model Book Validation

- b. The validity test results on the Expert System Based VIT (Vocational Interest Test) Book of Socialization from the validator are: 1) Component Aspects have an average score of 0.81 with valid categories, 2) The Book Construction Aspect has an average score of 0.79 with valid categories, 3) The Overall Aspect has a score of 0.75 with a valid category.



Figure 5. The Chart of Expert System-based VIT Model Socialization Book

- d. The results of the validity of the Instructions for Use of VIT (Vocational Interest Test) from the validator are: 1) Component Aspects have an average score of 0.77 with valid categories, 2) The Aspect of Book Construction has an average score of 0.81 with valid categories, 3) Overall Aspects has a score of 0.75 with a valid category.

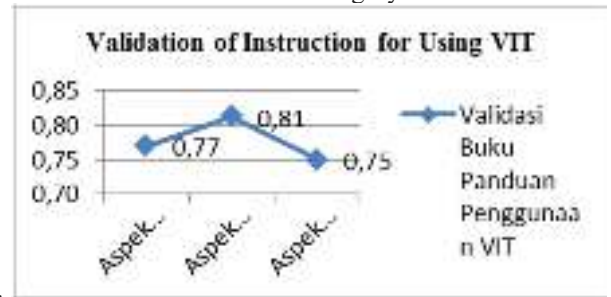


Figure 6. The Chart of Validation of Instructions for Using VIT Application

- e. The results of the validity of the VIT (Vocational Interest Test) application of the validator are: 1) The VIT-Use (Policy) aspect has an average score of 0.80 with a valid category, 2) The VIT-Readlines aspect has an average score of 0.78 with a valid category, 3) Capability aspect has an average score of 0.81 with a valid category, 4) VIT-Impact aspects have an average score of 0.80 with valid categories and 5) Overall aspects have a score of 0.85 with a valid category.

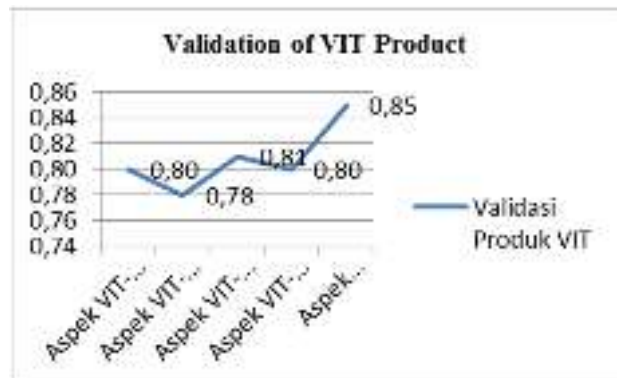


Figure 7. The Chart of VIT Application Validation

- f. Validity test results on the Language Aspects of the product of this study include: 1) Book 1: VIT model (Vocational Interest Test) has an average score of 0.80 with a valid category, 2) Book 2: Book VIT (Vocational Interest Test) has an average score 0.82 with a valid category, 3) Book 3: The VIT Application Guide (Vocational Interest Test) has an average score of 0.78 with a valid category.

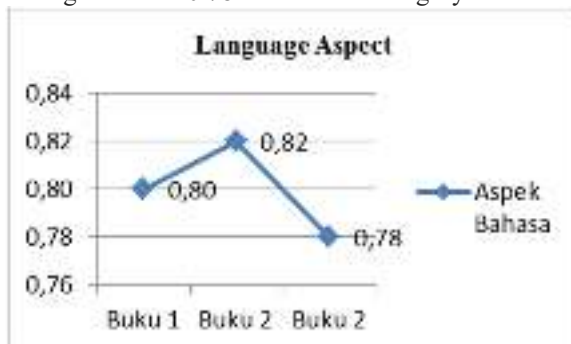


Figure 8. The Chart of Language Aspect Validation

## V. CONCLUSION

Based on the method of research product development and discussion that refers to the purpose of this study, it can be concluded as follows:

1. Research has produced a Vocational Interest Test (VIT) model to determine vocational interests of prospective Vocational High School students.
2. A Vocational Interest Test (VIT) model is produced to determine the vocational interest of prospective vocational students that are valid, practical and effective.

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## **PROMOTING HIGHER EDUCATION THROUGH SOCIAL MEDIA**

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### **Abstract**

The main objective of this study was to analyze the use of social media in promoting higher education. Specifically analyzing the influence of brand satisfaction and trust in brand attachments that have been communicated through social media “Instagram”. The population in this study were all stakeholders of the Muhammadiyah University of Surakarta who had become @umsurakarta followers. The sampling technique was purposive sampling by selecting respondents according to predetermined criteria. The data collection method used is through a field study in the form of a questionnaire. Data analysis used multiple regression. The results indicated that brand satisfaction and brand trust have a positive and significant effect on brand attachments. The implication is that to increase brand attachment can be done by increasing the satisfaction of stakeholders to the institution and also by increasing their trust in the institutions that are communicated with social media especially Instagram.

Keywords: Brand attachments; brand satisfaction; brand trust; and social media.

# An Error Analysis's Students to Finding Solution From a Differential Equation

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**Abstract**— In solving the general solution of a differential equation UNRIKA students common mistakes made by students. This research is a quantitative descriptive study conducted on 44 semester V students in the 2018/2019 school year who took courses in differential equations. The instrument used in the form of essay test was 2 questions that were valid and reliable ( $r = 0.758$ ). From the results of the analysis, mistakes made in the form of procedural errors, process errors and student understanding errors. The more frequent error is a process error, especially in algebraic processes in determining the general solution of a problem of differential equations. To that end, as educators, it should often be reminded to be careful in doing calculations, often repeat more varied material and provide contextual modules so that the concept of the material can be understood by students properly and correctly.

**Keywords**— Error Analysis, Student's Error, Differential Equation

## I. INTRODUCTION

Mathematics is a science derived from a thought and procedure for managing logic quantitatively and qualitatively that has an abstract objective object, relies on agreement and has a deductive mind set. In the process, it must understand the concepts given and repeat the material consistently or continuously[1]. Furthermore, one of the vocational mathematics courses that study first order differential equations and second order differential equations is in the differential equation courses. Where in its settlement uses the properties and theory of algebraic functions in its proof.

In the work of differential equations must be able to model a problem in the form of an equation. Models are mathematical representations of mechanisms that govern natural phenomena that are not fully recognized, controlled, or understood[2]. Algebraic equations describe relations among varying quantities. Differential equations go one step further. They describe, in addition to relations among changing quantities, the rates at which they change [3]. A differential equation is an equation involving derivatives of an unknown function that depends upon one or more independent variables. If the unknown function depends on only one independent variable, then the equation is called an ordinary differential equation [4].

In completing differential equations, previous students must be understands the subject that has been taught in calculus I, II and Advanced which are prerequisite material in differential equation courses. In general, in determining the solution of differential equations, students must master the concept of algebraic functions correctly. Nevertheless, many students make mistakes in solving differential equations. Where the error is a deviation from anything that has been predetermined. Munandar argues, mistakes are defined as deviations from the right thing and are systematic, consistent or incidental in certain parts<sup>[5]</sup>. Mathematical errors when viewed from the mathematical object found by Begle among others are factual errors, concept errors, operation errors, and principle errors. The type of error according to Clement is 1) *Coreless Error*, mistakes because of lack of accuracy or carelessness, this is like students lack understanding of the questions given, the meaning of words, not mastering the concepts and lack of mastery of calculation techniques. 2) Weakness in process skills, mistakes made in the process, where students have done the steps right but will be wrong in doing calculations 3) Reading comprehension, which is an error in understanding the problem, where students do not understand the purpose and objectives of the questions given, so that it does not provide a solution of the problem presented 4) Transform Error, namely transformation error, so students incorrectly transform verbal language into mathematical language and 5) encoding error, i.e. error using notation<sup>[6]</sup>.

Based on the results of observations of researchers in a few years teaching courses in differential equations, many students make mistakes in determining the general solution of a given differential equation. For this reason, this article aims to formulate the types of errors that are often made by students in determining the general solution of a differential equation.

## II. METHOD

This research is a quantitative descriptive study. With the aim of knowing and describing errors that are often done by students in determining the general solution of a differential equation and knowing what factors cause the error to occur. The subject of the study was the 5th semester students of the 2018/2019 A.Y at the Mathematics Education Study Program in UNRIKA, who took courses on differential equations totaling 44 students.



Data collection techniques in the form of documentation and interviews. The documentation referred to in this article is in the form of the results of the answers given by students in the Final Examination Semester (UAS) consisting of 2 question descriptions that have been valid and reliable amounting to 0.758. The questions to be analyzed are presented in the following table 1:

Table 1. Type of differential equation test

Subject	Number	Question
The particular solution	1	Using the parameter variation method, determine the value of the particular solution ( $Y_p$ ) from equation $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = e^{2x}$
Non homogeny differential equation	2	Determine the general solution of the following non homogeny differential equation $y'' - 3y' + 2y = e^{2x}$

The data analysis in this article follows the guidelines for categorizing the answers given by students in table 2

Table 2. NEA stages based on mistakes<sup>[re-6]</sup>

NEA Stages	Types of student mistakes
Reading (R)	The questions cannot be understood by students
Comprehension (C)	Understand all terms in the problem but don't know what the problem is asking for
Transformation (T)	Understand how to find solutions, but do not understand how to solve them
Process Skill (P)	Understand to solve the problem but can't solve the problem properly and correctly
Encoding (E)	Cannot write conclusions and final answers correctly

The next step is to calculate the results of the percentage score acquisition using the formula<sup>[7]</sup>

$$P = \frac{\text{sum items}}{\text{max score}} \times 100\%$$

Note: P = Score Percentage

### III. ANALYSIS AND RESULTS

THE RESULTS OF EACH ITEM ARE PRESENTED IN TABLE 3 BELOW

Table 3: Students Value Acquisition

	Num 1	Num 2
Min Score	0	0
Max Score	25	25
Sum	695	475
% Achievement	63.18%	43.18%
Average	15.79	10.75
Variance	75.51	24.35
Total Average	26.59	
% Total Achievement	53.18%	

Then the process of analysis is carried out from the answers given by students, based on the guidelines given in table 2. The results obtained are as follows:

#### A. Description of students mistakes in the subject parameter variation

Table 4. Error Description about number 1

NEA's Step	Examples of student's Error	Frequency (students)	%
R	Students do not provide entries that mean they do not understand the concept	5	16.12%
C	Students are wrong in choosing the step of completion, which is wrong in determining the root characteristics.	4	12.90%
T	Error in transforming the formula accordingly (do not use the parameter variation method)	4	12.90%
P	Students are wrong in doing algebraic processes in solving problems	16	51.61%
E	Students are wrong in concluding the solution requested	2	6.45%
Sum		31	
Students who don't make mistakes		13	29.54%
TOTAL		44	

From table 4, there were 31 students who made mistakes and 13 students who answered correctly, so that only 29.54% of students could find the general solution of the requested differential equation.

B. Description of students mistakes in the subject Nonhomogenic differential equation

Tabel 5. Error Description about number 2

NEA's Step	Examples of student's Error	Frequency (students)	%
R	Students do not provide entries that mean they do not understand the concept	6	17.14%
C	Students are wrong in choosing the step of completion, which is wrong in determining the root characteristics.	10	28.57%
T	Error in transforming the formula accordingly (do not use the parameter variation method)	1	2.85%
P	Students are wrong in doing algebraic processes in solving problems	15	42.85%
E	Students are wrong in concluding the solution requested	3	8.57%
Sum		35	
Students who don't make mistakes		9	20.54%
TOTAL		44	

From table 4, there were 35 students who made mistakes and 9 students who answered correctly, so that only 20.54% of students could find the general solution of the requested differential equation.

IV. DISCUSSION

By looking at table 4 and table 5 it is found that the biggest error occurs at the stage of the process, where 51.61% and 42.85% of students are wrong in doing the algebraic process to determine the general solution of a differential equation. For more details, will be detailed based on each item.

A. An Error Analysis in the subject parameter variation

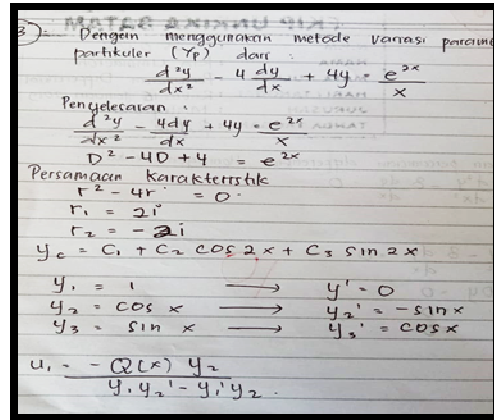


Figure 1. Error Comprehension question from No.1

In Figure 1 above, it shows that students are wrong in choosing a step in finding a general solution in a differential equation. The error made occurs in determining the root characteristics, namely:

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = \frac{e^{2x}}{x}$$

$$D^2 - 4D + 4 = e^{2x}$$

$$r^2 - 4r = 0$$

$$r_1 = 2i \text{ atau } r_2 = -2i$$

$$Y_c = C_1 + C_2 \cos 2x + C_3 \sin 2x$$

The right process should be:

$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = \frac{e^{2x}}{x}$$

$$D^2 - 4D + 4 = e^{2x}$$

$$r^2 - 4r + 4 = 0$$

$$r_1 = 2 \text{ atau } r_2 = 2$$

$$Y_c = C_1 e^{2x} + C_2 x e^{2x}$$

Furthermore, errors that often occur in the Encoding step as shown in Figure 2

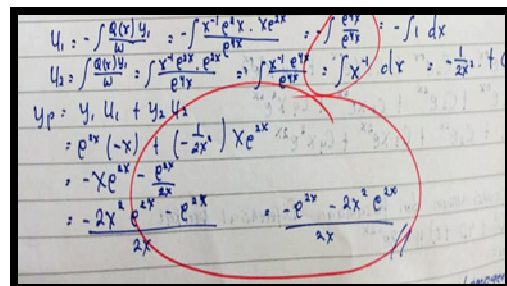


Figure 2. Error Encoding Step from number 1

The figure above shows that students incorrectly concluded the correct answer to provide a general



solution to a given differential equation. The error made was

$$Y_p = -xe^{2x} + \frac{1}{-2x}xe^{2x}$$

Which

$$Y_p = -xe^{2x} + C_1e^{2x} + \ln(x)xe^{2x} + C_2xe^{2x}$$

B. Error analysis in the Nonhomogen Differential Equation Submersion

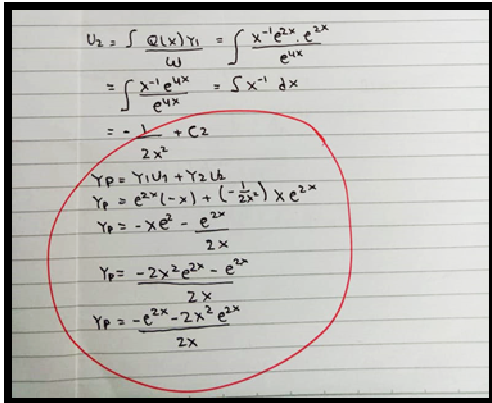


Figure 3. Error Comprehension question from No. 1

The error steps that occur are the same as problem number 1, where the error is done in the comprehension step, namely:

$$Y_p = Y_1U_1 + Y_2U_2$$

$$Y_p = e^{2x}(-x) + \left(\frac{1}{-2x^2}\right)xe^{2x}$$

$$Y_p = xe^{2x} - \frac{e^{2x}}{2x}$$

Where it should be:

$$Y_p = Y_1U_1 + Y_2U_2$$

$$Y_p = -e^{2x} - e^{2x} + xe^{2x}$$

$$Y_p = -e^{2x} + xe^{2x}$$

When a step is made wrong, it will not be found from the general solution requested. Furthermore,

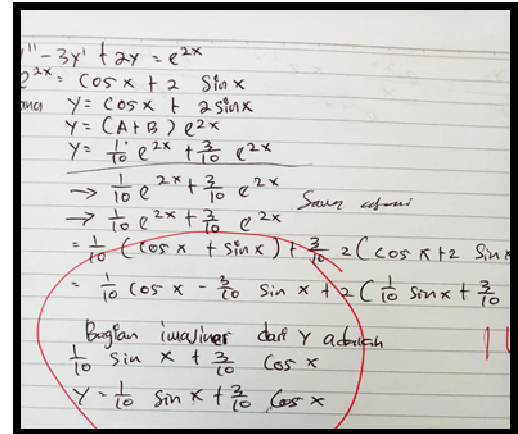


Figure 4. Error Encoding Step from number 1

Figure 4 above explains that, students are wrong in determining the root characteristics. Where:

$$e^{2x} = \cos x + 2 \sin x$$

$$y = \cos x + 2 \sin x$$

$$y = (A + B)e^{2x}$$

$$y = \frac{1}{10}e^{2x} + \frac{3}{10}e^{2x}$$

Right Steps

$$y'' - 3y' + 2y = 0$$

$$m^2 - 3m + 2 = 0$$

$$(m - 1)(m - 2) = 0$$

$$m_1 = 1 \text{ atau } m_2 = 2$$

$$Y_h = C_1e^x + C_2e^{2x}$$

The biggest mistake that occurs in process errors, this is due to carelessness in the calculation process and the most important is the lack of practice working on questions with varying shapes [re-6], in a hurry to work on so that he does not pay attention to the problems that must be resolved [8,1], less able to identify between a procedure<sup>9</sup>. Furthermore, mistakes in drawing conclusion<sup>10</sup>, combining the pictorial information with auditory information would reduce this load and, as a result, would lead to improved performance<sup>11</sup>. Students should understand interaction for reversible mathematical processes<sup>12</sup>. By seeing the overall completeness which is only 53.18%, as a teacher should often provide varied exercises, as well as provide contextual modules, so that students can understand the concept of differential understanding.

## V. CONCLUSION

From the explanation that has been conveyed that the conclusion in this article is a mistake that is more often the case is a process error, especially in the algebra process in determining the general solution of a problem of differential equations. To that end, as educators, it should often be reminded to be careful in doing calculations, often repeat more varied subject matters and provide contextual modules so that the concept of the subject matters can be understood by students properly and correctly.

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# Managing Lecturers' Competence Development at Universitas Kristen Indonesia

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*Abstract-*This article is about the management of lecturers' competence development. It was conducted at Universitas Kristen Indonesia. This article was a qualitative research which is developed by using library study, where, in finding out the management of lecturers' competence development is, books, journals and other documents related to the topics used as the source information on this article. The results were; a) in developing lecturers' competency development programs used environmental analysis consisting of internal environment analysis and external environment analysis; b) formulation of strategies for the development of lecturer's professional and pedagogical competence as an effort in improving the learning quality by forming teams, formulating strategic plans, and disseminating information; c) activities carried out in planning the development of lecturer competencies as an effort as an effort in improving the learning quality at UKI; d) activities carried out in the implementation of the development of lecturer and professional-pedagogical competencies as an effort to improve the quality of learning are based on plans from institutions, faculties, study programs, and also at the initiative of the lecturers themselves; e) supervision activities from the results of the development of pedagogical competencies and professional competencies of lecturers in both universities are almost the same, and f) activities carried out in the assessment of the development of pedagogical and professional competence of lecturers as an effort to improve the quality of learning in UKI. It is concluded that the management of lecturers' competence development will be better if UKI implements these things.

**Keywords:** managing, competence development, lecturer.

## I. INTRODUCTION

Managing human resources in the world of education is very important. Somebody's performance and success are largely determined by the level of competence, professionalism and also their commitment to the field of work they are engaged in. As a professional staff, the position of lecturers is serving to enhance the lecturers' dignity and role as learning agents which is aimed at developing the national quality education. The development of professionalization of lecturers is based on the needs of institutions, groups, personal. The development of lecturers is intended to stimulate, maintain, and improve the quality of staff in solving organizational problems [1]. Lecturers' professional development and development includes

professional, pedagogical, personality, and social competencies; [2]. The development of lecturers' professionalism and pedagogical competency can be seen based on the database of Universitas Kristen Indonesia (UKI), that the number of lecturers at UKI based on academic qualifications are classified based on the faculty as follows.

**Table 1. Number of UKI Lecturers based on Academic Qualifications 2019**

No	Faculty	Education			Total
		S1	S2	S3	
1	Teacher and Training Education Faculty	0	44	5	49
2	Faculty of Letter	1	10	4	15
3	Economic and Business Faculty	0	24	3	27
4	Law Faculty	0	17	9	26
5	Technic Faculty	1	32	0	33
6	Medical Faculty	12	83	19	114
7	Social and Politic Faculty	0	20	4	24
8	Vocation Faculty	2	18	1	21
9	Post Graduate	0	3	43	46
<b>TOTAL</b>		<b>16</b>	<b>251</b>	<b>88</b>	<b>355</b>
<b>%</b>		<b>4,5%</b>	<b>70,7%</b>	<b>24,7%</b>	<b>100%</b>

(Source: human resources data base\_2019)

The composition of the above table shows that the number of lecturers who are qualified for S1 education is 4,5% and 70,7% lecturers whose qualification is S2, and 24,7% lecturer whose qualification is S3. After looking at the condition, based on a national scale, special programs are needed to improve their educational qualifications to meet the demands of law No. 14 of 2005, that minimum lecturer education is the S2 level. In the implementation of higher education, it is also ruled not only the problem of lecturer qualifications but also the ratio between lecturers and students.

At higher education, as it is required by the government that the ration between lecturers and the students is 1:25, with the classification is that is 1:30 and the social class is 1:45. In Indonesian higher education, most of the ration between students and lecturers are still far from the expectation. However, in forming the quality learning the lecturer ratio is not the only measure in determining the quality of learning [3]. In addition to academic qualifications and the ratio of lecturers' competency development lecturers to form qualified and competent lecturers can be seen from the number of functional positions performed by lecturers

[4]. In UKI, data can be seen from lecturers who have had academic positions in 2019 based on data of UKI as follows.

**Table 2. Number of Lecturers at UKI Based on Academic Position**

No	Academic Position	Number	%
1.	Instructor	88	24,7%
2.	Assistant Professor	111	31,2%
3.	Associate Professor	28	7,8%
4.	Professor	16	4,5%
5.	without position	112	31,5%
Total		355	100%

(Source: human resources data base\_2019)

The above table shows that there are a few lecturers (31,5%) who do not develop their pedagogical competencies or lecturers who do not have academic position, and 24,7% lecturers whose academic position is Instructor, then 31,2% lecturers whose academic position are Assistant Professor, then 7,8% lecturers whose academic position are Associate Professor, and the last, 4,5% lecturers whose position is Professor. Viewed from the professional competency map of lecturers at UKI, it can be seen from the number of lecturers who have been certified as an educator, and ± 70% of lecturers' in UKI has not been certified yet, this indicates that the professional competence of lecturers in UKI still needs to be developed seriously.

In running the education system, UKI has managed the value system which should be implemented in every performance of the lecturers and the staffs. These values are humble, share and care, discipline, professional and responsible [5]. In providing, preparing and conducting the teaching and learning at UKI, all the lecturers should implement these values to create conducive, safe, peaceful, blessing environmental and then it will please everybody at the campus.

Based on the background above, an analysis on through a study was done entitled in "Managing Lecturers' Competence Development at *Universitas Kristen Indonesia*". The problem of the study is formulated in the form of question, it is: how is the management of lecturers' competencies development at *Universitas Kristen Indonesia*? The purpose of doing this research is to find out how the management of lecturers' competencies development at *Universitas Kristen Indonesia*.

## II. METHODS

This article was a qualitative research which is developed by using library study, where, in finding out the management of lecturers' competence development is, books, journals and other documents related to the topics used as the source information on this article. This was based on the formulation of research problems in which this study was intended to explore data and information relating to the application of lecturer competency development. Whereas to answer theoretical problems, literature studies are used with the

expectation of analyzing several variables that make the research factors more accurate. Several data collection techniques were used in this study such as observation, interviews, and documentation. The data technique analysis was descriptive technique started from collecting the data, reducing the data, presenting the data, verifying the data and finally drawing the conclusion.

## III. RESULTS AND DISCUSSION

The internal environment analysis related to the development of professional and pedagogical competence of lecturers is carried out through improving education qualifications, both towards S2 and S3 education, then in developing lecturers' competencies at UKI, UKI has to make a collaboration with relevant parties. Other forms of competency development include writing scientific papers that are disseminated at both national and international levels [6].

Other internal policies for the development of lecturer competencies are given stimulus in the form of awards which should be given to all the scientific product that is produced by the lecturers. The advantages/strengths that exist at UKI in developing pedagogical competencies and professional competence of lecturers include the magnitude of the motivation of lecturers, aspirations, high self-esteem, loyalty; competency between, other abilities in English [7]. This advantage in developing pedagogic competencies and professional competencies of lecturers is because there is collaboration between faculty leaders (Dean), chair of study programs and lecturers, namely leaders, always providing guidance and motivation to progress and to develop towards better development of lecturers' competencies and in lecturer performance; the chair of a study program always supports each policy implemented by the leader, and the lecturer with the guidance and support and motivation from the leadership becomes the spirit to carry out his development towards a better direction [8]. Another aspect is internal financial support from UKI.

The weaknesses in the development of pedagogical competencies and professional competencies faced by lecturers is that some of the lecturers which are mostly female lecturers, and certain lecturers do not want to take advantage of the opportunity to continue their education, for reasons of many tasks or busy reasons with small children and so on, although there are available funding opportunities for further study, but because of the limited number and the competitive nature, limited ability and lack of enthusiasm of the lecturers themselves [9].

As professional lecturers and researchers, they should be able to conduct their responsibility such as a) lecturing, b) doing research, c) doing community service, and d) disseminating the result of the research and community service [10]. Since lecturers are the

most important component at university, then they should be facilitated everything included the facilitation on improving their competencies besides doing the main task given to them. [11]. Or it is concluded that the education quality in a university muchly depends on the lecturers in conducting the teaching and learning and also the class management. Then when the lecturers are professional in conducting their main tasks, it will contribute a lot to the development of the university.

In order to achieve the goals of UKI, the lecturers themselves must be able to adapt "change power" then UKI finally UKI may have lecturers that are able to improve the students' quality. This achievement can be seen when the students who are taught by them are free from ignorance, incompetence, helplessness, dishonesty and the bad of the true and faithful.[12]" The education quality is achieved through systematic and well-planned activities or programs of a university, good governance, and delivered by good lecturers with a component of quality education, especially educators. From the analysis of this study, then it is concluded that the implemented policies at UKI have not yet been by the demands of existing policies.

The formation of the team as the first step in the preparation of the UKI strategic plan is more representative of the faculties/departments who is chosen to be in the strategic plan team, and are considered capable and capable of carrying out this task. The policy of forming the strategic team can also be interpreted as a communication pattern between the university leader and the faculty/department which is an important element in quality planning. Likewise, the placement of people who are experts in the strategic plan team shows that there is a desire from the university leaders to produce a plan that is not only originated but is born of a sharp and careful analysis of people who can do so.

It is different from some universities who give the mandate of the chair of the strategic plan team to experts and then given responsibility to the head of the planning and information section, or the sub-section head of planning. This indicates that the leadership uses a bureaucratic-structural way of thinking in selecting the team tasked with formulating the plan [13;14;15]. Such a way of thinking is structurally correct, where every activity that smells of planning must be carried out by the coordination of the planning section, but concerning the strategic plan team, the relevant parties and experts should be involved in and to lead the Team.

Planning the development of lecturer competencies at UKI begins with the preparation of a strategic plan as a guideline for implementing of how education should be managed, so the implementation of the next four years education's goal could be achieved well. In order to achieve it, then an analysis of the existing condition done through the analysis of strength, the analysis of the weakness, the analysis of the opportunity and the analysis of the threat. This analysis was done to identify achieving goals. Therefore the achievement motive is the driving force that drives those lecturers whose

mastery on the characteristics of students are lack, lecturers whose mastery on learning principle and theories are lack, lecturers whose ability on using technology are lack, and lecturers who do bit facilitate the students well and who do not do an effective communication with the students [16;17]. The efforts to apply the plan, strategically in the form of concrete actions, plans, strategically arranged in the form of an annual work plan. In general, the conditions of UKI in the planning strategy of developing lecturers' competencies in improving the quality of learning have been running by a respective program which is referring to the formulated vision, mission and objectives of educational institutions. Planing on developing pedagogic and professional competencies of lecturers in UKI is generally united with the institution's development plan in the strategic plan. but it does not include special programs or priority programs about developing pedagogical competencies and professional competencies of lecturers, which are incidental programs.

Implementation of lecturers' competencies in UKI was based on the analysis of the needs which had been conducted by the quality of assurance board. From the needs analysis conducted result, it may be known further steps that should be formulated in order to improve the lecturers' competencies needed by UKI. It has to be done because producing good quality learning, requires high lecturers' professional competence [18]. A standardized quality assurance board at UKI has been legally made, which one of its function assures the quality of the lecturers by controlling them with some structuralized formulated instrument. The analysis results of this control were used to formulate the program of the education which is going to be implemented. The main task of a university is developing the science, this task could be achieved through research and community services which are conducted by the lecturers at the university. The indicators which are used in assessing and determining the scientific products of lecturers are the quality and the number of their publication. Besides, the recognition and the reward of the publications also had a high contribution in scoring. Where those all could be done through seminars, workshops, scientific publications through national and international journals and scientific work. others.

The supervision process becomes the input of learning to emphasize the evaluation of the students' characteristics diversity, learning facilities owned by the university, infrastructure as well and lecturers. Besides, curriculum and also the teaching material, strategies used in teaching as well which are fits to each subject taught and to the learning context of the university. The teaching and learning process conducted in the university emphasizes the assesment of the management of learning carried out by learners including the effectiveness of the learning strategies implemented, the effectiveness of learning media, the way teaching is carried out, and the interests, attitudes and ways of

learning students [13]. The evaluation of the achievement of students during learning was done by conducting test to each of the students in each course, this is done in order to measuring the learning achievements and outcome. Then the benefits of carrying out evaluations are (1) obtaining an understanding of the implementation and results of learning that has been carried out or implemented, (2) making decisions regarding the implementation and learning outcomes, and (3) improving the quality of the process and learning outcomes to improve output quality. Article 1 of the teacher and lecturer law states that lecturers are professional educators. Lecturers' expertise also will indicate his professionalism in conducting his teaching management to the students. This could be seen through preparation made by lecturers before teaching, plannings, teaching performances, and evaluation made by him during teaching.

The general lecturers, especially those who have improved the competence of lecturers, have contributed greatly to the development of institutions, faculties, and study programs, and besides, they also give a great contribution to the development of curriculum formulation and the development of teaching materials, medias used in teaching, and practicing program held by the study program. Concerning the learning plans, the lecturers evaluate and refine it after one year after one semester or more than one year.

The assessment process in UKI has carried out the assessment process properly. Both aspects of the development of pedagogical competencies, professional competencies, and the assessment of lecturers the teaching and learning activities made by the lecturers whether it out and indoor learning activities. In teaching the courses, the curriculum and syllabus used are well integrated for each university because each tertiary institution already has a special implementing unit that handles the learning process of a compulsory university course for each course, for example, language learning center, computer learning center, and so on. It means that each university has a special implementing unit that handles the learning of computer science as a compulsory university subject, namely Computer Center Technical Implementation Unit. Teachers for both of these courses also come from educational backgrounds that are by the courses they have taken. So this does not make it difficult for lecturers to master the material taught.

From this phenomenon can be interpreted that the quality of learning in terms of expected competencies will be the same for each study program. So that learning competencies in English and Computer Science courses are the same for each study program. The same teaching material is also an indicator of learning that has been well integrated. However, in learning Islamic Education courses there were still some obstacles improving the teaching and learning activities quality. From the aspect of qualifications, the lecturers are still found by lecturers whose qualifications are not by the

courses that are used. As well as the absence of a special technical implementing unit that handles the learning of Islamic education as a compulsory university subject. Each lecturer makes his basic competencies taught and the syllabus made is not yet integrated between one lecturer and another lecturer. The teaching materials used also varied between one lecturer and another lecturer. This shows that the quality of learning in UKI still needs to be improved.

#### IV. CONCLUSION

Activities carried out in the management of the development of lecturer competencies are as follows: a) In developing lecturers' competency development programs used environmental analysis consisting of internal environment analysis and external environment analysis. at the stage of internal analysis, the aspect of work culture received little attention. and at the analysis stage of the external environment of the social environment, it is still the second priority in developing the lecturers' competencies (professionalism and pedagogical); b) formulation of strategies for developing lecturers' could be done by forming teams, formulating strategic plans, and disseminating information. But the obstacles faced by a long bureaucratic system make it difficult for lecturers to apply their development in the acceleration of the lecturers' careers; c) activities carried out in planning the development of lecturers' competencies in UKI. From this result, it is concluded that the development of lecturers' competencies could only be achieved or obtained through coaching activities, activating lecturers in various scientific activities namely through seminars, symposiums and scientific publications through national and international journals or proceedings; d) activities carried out in the implementation of the development of lecturers' competencies are based on plans from institutions, faculties, study programs, and also at the initiative of the lecturers themselves. Although there are limited funds provided by the internal and external funder, the number of lecturers conducting competency development activities is still quite large; e) supervision activities that are resulted on the development of lecturers' competencies. First, in the form of monitoring the progress of further studies the lecturers who attend further studies to S2 and S3. Second, the head of the study program makes a report to the faculty about the conducted activity and the achieved resulted from the competency development activities; and f) activities carried out in the assessment of the lecturers' competencies development. In general, the university has demonstrated significant results in the development of pedagogical and professional competencies. This is evident from the number of lecturers who have received certification. Other results have been achieved in the form of student achievements in the academic and non-academic fields. However, there is still a low motivation for lecturers to attend national and international scientific meetings because they are constrained by

financing and the mastery of foreign languages is still minimal.

## V. SUGGESTIONS

There are some suggestion on this study, they are: a) basic and integrated environmental analysis is needed by involving the components of higher education, alumni, graduate users, the local government, and the community; b) clearly required and well documented and socialized standard operating procedures are needed so as not to make it difficult for lecturers to develop their careers as lecturers; c) a well-planned program planning for study programs is needed in an effort to develop pedagogical and professional competence of lecturers so that the expected targets can be realized properly so that the quality of learning is maintained. As well as the existing development program planned by covering all aspects of the pedagogical and professional competence of lecturers so that the competencies possessed by the lecturers will be intact, then the learning quality at UKI could be maintained well and properly; d) special programs or priority programs are needed for the development of pedagogical competencies, among others in the form of developing multi-media learning competencies in the form of training to use various types of information technology currently available intensively and sustainably. In improving the teaching and learning quality, especially for compulsory university courses, it is expected that the university has an institution or forum for lecturers who are obligatory subjects of the university as a means to sit together to discuss important matters related to improving the teaching and learning quality so that the expected learning outcomes achieved by the students have same basic competencies; e) It is expected that the leaders of higher education can provide facilities for lecturer competency development activities in the form of intensive ongoing training activities. The form of training for the development of theoretical and conceptual competencies through peer, group, discussion techniques, namely through discussion forums between lecturers and senior tutorial partner partnership coaching techniques, developing multi-media learning competencies in the form of developing training program in ordert to enable the lecturers using technology of information facilities, administrative management training Another important thing to recommend is the implementation of supervision or monitoring of direct teaching by related parties should be carried out optimally as an effort to strengthen the findings in the form of student responses that have been made in learning monitoring; f) it is expected that the government as policymakers and implementers are expected to make specific policies regarding professionalism of lecturers with all binding rules and penalties so that the lecturer code of ethics can be carried out so that there is no malpractice in teaching that can reduce quality of learning in higher education.

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# *Interactive Multimedia in Learning 2-Dimensional Geometric Shapes in Elementary School*

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**Abstract—** Geometry is a branch of mathematics that occupies a special position in learning mathematics in schools. The importance of the concepts contained therein places geometry in relatively large proportions in the curriculum. A two-dimensional geometric shape is a flat plane shape that has two dimensions. It is a flat area that is bounded by straight or curved lines. Geometry has several different calculation formulas and some of the two-dimensional geometric shapes are known as square, rectangle, triangle, trapezoid, parallelogram, kite, rhombus and circle. The problem is how to apply a learning method or media that is enjoyable supporting by an interesting visualization. The choice can be an application that can be done with interactive learning multimedia so that students can easily understand geometry and fosters students' interest in learning mathematics.

**Keywords—** interactive multimedia, geometry

## I. INTRODUCTION

Geometry is one of the three main domains of mathematics, and it is taught since in the first grade of elementary school. This is stated in *Permendikbud* number 21 of 2016 concerning the content of mathematics subjects consisting of three main domains, namely natural numbers and basic fractions, basic geometry and measurements, and basic statistics. Geometry can be seen as a mathematical system that presents abstract phenomena, but in learning it can be taught to students steps by steps in accordance to the stages of child development. Geometry is a branch of mathematics in which visualization is one of the most important elements for understanding definitions and theorems, as well as for solving given tasks and problems (Milovanovik, 2013) [7]. Kennedy and Tipps (1994) [5] stated that learning geometry can develop students' problem-solving abilities and support other topics in mathematics.

The reality at school shows that geometry is one of the mathematics domains that is considered difficult by students. (Batista & Borrow, 1997; Elchuck, 1992; Noraini, 1999; in Idris, 2009) [4] revealed that students; low geometry achievement

were caused by several factors including the lack of understanding in learning geometry that many students failed to develop an adequate understanding of geometrical concepts, geometrical reasoning, and the ability to solve geometry problems. Selection of learning strategies that are less precise and less attention to students' geometrical thinking skills is also a factor for students' low geometric achievement (Safrina et al, 2014) [10]. Many teachers also do not understand the characteristics of the geometry thinking. By understanding students' geometrical thinking characteristics based on van Hiele's levels, it is expected that teachers are able to apply learning methods that are appropriate to the characteristics of every student as revealed by Muhassanah (2014) [6]. In addition, many students learn to memorize geometrical concepts more than constructing their own knowledge (Aydoğdu, 2014) [1].

Based on an interview with an elementary school teacher about learning geometry so far in her classroom, the teacher states that the learning geometry follows the traditional teaching model in which the teacher begins to explain concepts/procedures and gives examples, and then follows by some exercises in which the students do the exercises in accordance to the examples. The teacher uses the textbooks provided by the government without considering how the geometry should be taught. For the instructional media, the teacher only uses limited objects in the classroom and move to abstract mathematics.

Good learning can be supported by a conducive learning atmosphere and active communication between teachers and students. Departing from this, interactive multimedia in the classroom is developed on the basis of the assumption that the communication process in learning would be more meaningful (attracting students' interests and providing convenience to understand the material due to its interactive presentation) if utilizing various media as a means of supporting learning (Didik, 2009)..

Interactive multimedia is a multimedia display that is designed so that the display fulfills the function of informing messages and having interactivity with its users (Munir 2012:110) [8]. Costantinescu (2007) [2] argues that multimedia refers to computer-based systems that use various types of contents such as text, audio, video, graphics, animation, and interactivity. Furthermore, Purwanto (2004: 6) [10] suggests that teachers should use interactive multimedia in learning because it can optimize the role of the senses in receiving information into the memory system, so that it can be relatively more effective in building students' understanding structures. So, the interactive multimedia in this study means a concept in the field of computer technology where components such as text, images, animations and videos are combined into one to be presented interactively. The interactive multimedia in learning 2-dimensional geometric shapes is needed as a way to overcome the low interest of students in learning mathematics, especially geometry.

## II. METHODS

The stages of the research and development of the interactive multimedia learning model of 2-dimensional geometric shapes are as follows:

### A. Analysis

At this stage, the researchers define the topics of 2-dimensional geometric shapes to be investigated namely, square, rectangular, triangular, trapezoidal, parallelogram, kite, rhombus, and circle. To have an overall understanding of those topics, we conduct an interview with a teacher about the current learning system, so it is expected to get a system that is a unified whole and as expected.

### B. Design

The design stage begins with determining what operating system is being used. Besides, we also look for the software, the hardware, identification of learning objectives, story board planning and learning content, and the media.

### C. Development

In the development stage, the multimedia is developed using various software, including Adobe Flash CS6 from Adobe Corporation as an animation-making software and Adobe Photoshop as image processing software, specifically vector. This stage starts from making various animations that are needed in accordance with the story board. Then we create an interface that is used as a display frame, and then the display background and the images needed using Adobe Photoshop.

### D. Evaluation

In this stage, we evaluate software engineering using the white box method to find out the function of all navigation, hypertext and hyperlink. The multimedia was testing to some users to find out whether the nteractive multimedia of 2-dimensional geometric shapes is feasible or not.

## III. RESULTS AND DISCUSSION

The main results of this study are an interactive multimedia CD and a media guidebook, as seen in figure 1.



Figure 1. The interactive multimedia CD and the media guidebook

Based on the analysis of the system, an interactive learning multimedia was developed whose general functionality can be seen in figures 2 to 8.

### A. The Introduction Section

The introduction section is an animation that appears when the interactive learning multimedia runs, and it can be seen in figure 2.

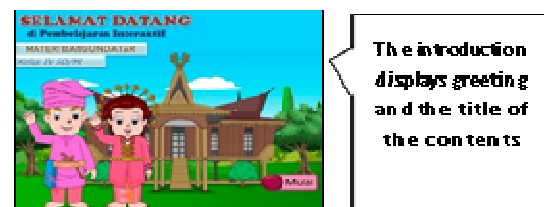


Figure 2. The display of the multimedia introduction of 2-dimensional geometric shapes

### B. Instructions for Use of Interactive Multimedia

Before students use this interactive multimedia, they must understand the instructions for using it. Figure 3 presents the display of the instructions for using the interactive multimedia.

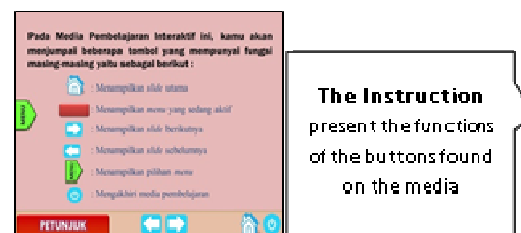


Figure 3. The media instruction

C. *The Menu of Learning 2-Dimensional Shapes*

The menu is used to present the topics or activities that can be chosen. It contains five topics and one of them is related to the learning 2-dimensional shapes (Figure 4).

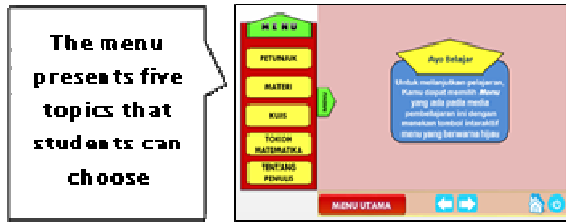


Figure 4. The display of the main menu of the interactive learning multimedia.

D. *The Display of the Mathematical Contents of 2-Dimensional Geometric Shapes*

The display of the mathematical contents presents the information of a list of 2-dimensional geometric shapes that students can choose (Figure 5).



Figure 5. The display of the mathematical contents

E. *The Display of a Specific Content, Square*

The display of a specific content, in this case square, is used to explain all properties related to square. It includes the properties and prove of the formula (Figure 6).



Figure 6. The display of the square properties and prove of the formula

F. *The Display Of Quiz Or Exercises*

Quiz is information that can be used by students to test their knowledge about 2-dimensional geometric shapes. If students can answer a question correctly, they can see the explanation of their answers, but if the students answer incorrectly, the display will return to the concept. Figure 7 presents

the display of a question and the discussion of the answer. Figure 7. The display of a question and the discussion of the answer

G. *The Display of Geometers*

In this section, some geometers are introduced to students in order to motivate them to learn 2-dimensional geometric shapes. Figure 8 presents some of them



Figure 8. The geometers

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**LAW**

# The Concept of Indonesian Welfare State: A Maqasid Al Shariah Welfare Index Perspective

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**Abstract** — This article examines empirical facts about market and state failures in improving people's welfare in Indonesia. The corporatocracy's hegemony, capitalism and neoliberalism do not provide a place for such country to make policies in generating prosperity. Therefore, a new concept is needed to create essential welfare. The concept of Indonesia welfare has been elaborated through the theory of *maqâsid al syari'ah*. The characteristic of Indonesian Welfare is by making *Pancasila* as the spirit and soul of the country (moral - spiritual). There are close relationships between religion and country (socio-religious) such as rests on the Godhead of the One (prophetic-transcendental), Guarantee of welfare and social justice for the whole community, Freedom of religion and worshipping (liberation - humanization) and the actualization of happy laws.

**Keywords**—*State Law of Indonesia Welfare, Maqâsid Al-Syari'ah, Welfare Index*

## I. INTRODUCTION

The imperfection of market in providing social services which is the right of every citizen has caused social injustice. Market injustice should be diminished by the state to ensure social stability and reduce the negative effects on capitalism. Marshall argued that the welfare state system as compensation have to be paid by the ruling class and workers to create social stability and maintain capitalist society. [1] The social services provided are basically a material expression of the rights of citizens in responding to the consequences of capitalism. The ideology of capitalism has entered the economic spirit which have a negative impact on the role of the state as an institution that should have an important role in optimally managing natural resources for the maximum welfare of the society. The state as the most legitimate institution providing basic social services for citizens should not inhibit its citizens to meet and fulfill their basic needs. [2]

Mishra firmly emphasized that this was considered as the impact of globalization which has limited the country's capacity to carry out social protection. [3] Kenichi Ohmae explicitly announced this as the end of the 'nation-state'. [4] The disappearance of the country is a necessity as global

economic activity increases. Francis Fukuyama even shows that there is a reduction in the role of the state and strategic functions which exacerbate poverty and social inequality, predicted to ignite social conflict and civil war. [5] The transformation of the capitalistic paradigm experienced an extreme leap towards neoliberalism. Neoliberalism does not increasingly provide a place for the state, even to make policies for the sake of social justice. Subsidies, basic public service guarantees, and other social guarantees, considered as inefficiencies. Education, health, and basic human rights become commodities. Neoliberalism has made the capitalist economic system and the free trade system a tool to result in market crime. Borrowing John Perkin's language as a corporatocracy crime is a network aiming to profit through corruption, collusion and nepotism from the third world countries and how this work is similar to the mafia. [6]

The facts show that many countries implementing welfare states have higher poverty rates than those do not apply. International Monetary Fund (IMF) with the Letter of Intent agreement guides the process of making and implementation of socio-economic policies by offering the concept of palliative economics [7] as the scriptures are continuously held to this day, whose contents include: liberalization, privatization, and deregulation which have tendency to be a serious threat to the nation states in the world.

Global economic imbalances, poverty and unemployment accompanied by crime have plagued most of the world. The concept and program of the welfare state can be said to have failed in bringing up humanity towards the actualization of justice, peace and mutual prosperity in life. This failure is perceived since welfare is realized, especially in Indonesia.

The failure of the welfare state which is applied by the formulator of economic and political policies due to the impact and severe attack of the economic crisis, should be used as the way to reflect back on the mistakes made by this country. Moreover, Indonesia is

the most difficult country to get out of the shackles of the economic crisis until the Reform Order government.

Basically, the purpose of establishing the Republic of Indonesia was to prosper all the people without exception. In other words, the Indonesian state aims to form a welfare state. The aim of national development is to increase social welfare, not just economic growth but to meet the various basic social and economic needs of every citizen in order to achieve a minimum standard of living.

The articles on welfare in the 1945 Constitution and its amendments are more numerous when compared to the constitutions of other countries aimed at welfare such as Norway, Japan, America and Malaysia which have relatively high human development indices. Indonesia has 14 articles of welfare in the 1945 Constitution, but does not have the power to form a prosperous society. Compared to other constitutions aimed at welfare such as Norway, Japan, America and Malaysia, they have a relatively high human development index. Norway only lists 3 articles in its constitutions Articles 110, 110a and Article 110b, [8] but such country is able to achieve an almost perfect HDI. Likewise with Japan, the country only included 1 article on welfare in the Japanese state constitution:

Article 13. All of the people shall be respected as individuals. Their right to life, liberty, and the pursuit of happiness shall, to the extent that it does not interfere with the public welfare, be the supreme consideration in legislation and in other governmental affairs. [9]

Societies have the legitimacy to demand the state to carry out its obligations. Therefore, the people should be able to demand what is their right which has been regulated so clearly and firmly by the constitution. This is what drives the author to reconstruct Indonesian law so that the state can truly be responsible for bringing up about welfare.

## II. DISCUSSION

### *Maqosid Al-Syari'ah* Foundation of a Welfare Country

Literally, *Maqāshid Al-Sharī'ah* is a compound word (murakkab idāfi) consisting of the words maqāshid and al-sharī'ah. According to the basic words, the two words each has its own meaning. The word "maqāshid" is jama '(plural) from the word "maqṣad" (*maṣdar mimy*) from the verb *qaṣada*, *yaqṣidu qaṣ* and *wa maqṣadan*" which have meaning as legitimacy; [10] commitment to the right path (Surah Al-Nahl: 9) can also be interpreted as a balance and moderate (Surah Luqman: 19). Whereas the word "*al-sharī'ah*" literally comes from the root word "shara'a" and has two meanings: (a) as a source of water (spring) which can be used as drinking water, the Arabs call it: "*mashara*" at *al-mā'i* "means:" *maurid al-mā'i* "(source of water). (b) as the right path (straight) (Surah Al-Jatsiyah: 18). [11]

*Maqāshid Al-Sharī'ah* epistemologically can be found in the work of scholars such as *Ibn 'ūshūr*, '*Alal Al-Fasi*, and also *Ahmad Al-Raisuni* and others, as follows:

*Firstly*, According to Al-Ṭāhir Ibn 'Āshūr

مقاصد التشريع العام هي: المعاني والحكم المحوطة للشرع في جمع أحوال التشريع أو معظمها بحيث لا تحتص ملا حظتها بالكون في نوع خص من أحكام الشريعة

"*Maqāshid Al-Sharī'ah* are meanings and lessons that are recorded / demonstrated by Allah SWT in all or most of His Shari'a, also included in this area as the characteristics of sharia or its general purpose". [12]

*Secondly*, 'Alal Al-Fasi: [13]

المراد بمقاصد الشريعة: الغاية منها ولأسرار التي وضعها الشرع عند كل حكم من أحكامها

"*Maqāshid Al-Sharī'ah* is the goal of sharia and a secret which is placed by Allah SWT on each of His laws".

Ahmad Al-Raisuni:

الغاية التي وضعت الشريعة لأجل تحقيقها لمصلحة العباد

"*Maqāshid Al-Sharī'ah* are the goals determined by the Shariah to be realized for the benefit of humanity". [14]

Seeing the definitions above, it can be highlighted that; the content of "*Maqāshid Al-Sharī'ah* or the purpose of law" is for the benefit of humans. Laws which have been determined and handed down to humans are not made for the law itself, but rather are made for the benefit of humans. [15] As for the scholars who have contributed greatly to the development of the *Maqāshid Al-Sharī'ah*: Imam Al-Juwainī, Izzū al-Dīn bin 'Abd al-Salam, Abū Iṣḥāq al-Shātibī and Al-Ṭāhir Ibn 'Āshūr. [16]

The concept of Welfare State which is the focus of this study is based on the development of the contribution of the maqāshid al-syarī'ah; al-Syātībī, Abu al-Ma'ali al-Juwainy, 'Izzu al-Din ibn' Abd al-Salām, al-Thāhir ibn Asyur thus conceptualized a welfare state based on maqāshid al-syarī'ah. Al-Syātībī stated that the purpose of maqāshid al-syarī'ah is to fulfill the level of human needs: Dharuriyat (Primary Rights), Hajiyat (Secondary Rights), Tahsiniyat (Supplementary Rights). Thus, if applied to a welfare state based on maqāshid al-syarī'ah, then including Dharuriyat (Primary Rights) are: Fulfillment of basic needs (hifz an-nafs), provision of employment and independence (hifz al-mal), ensuring every citizen gets education (hifz al-'aql), marriage and proper childcare (hifz an-Nasl) and, creation of an environment of piety (hifz ad-din) and hifz al-'Irdh (Honor and Protection of Human Rights ). When the citizens' needs are met, it means that the state has actualized sufficient welfare for its citizens.

Abu al-Ma'ali al-Juwainy, initiated al-maqāshid as Al-Hajat Al--Mamah (Public Needs). Meeting public



needs can be actualized through freedom of business, freedom of association, infrastructure development and transportation, fair and equitable distribution of both opinions (income) and wealth, as well as access to libraries, research and information technology. As for Al-Ismah (protection or guarantee of life) to guarantee life, health, and property so that citizens' lives are guaranteed.

'Izzu al-Din bin ' Abd al-Salâm, the truth of a rule depends on its purpose and the wisdom behind it. Therefore the aim of realizing prosperity is a state obligation and therefore, the state must regulate it in legislation and Honor (Hifz 'Ird) Protection of Human Rights which is part of the state's protective obligations towards its citizens so that human rights and honor and dignity someone can be awake.

Al-Thâhir ibn 'Âsyûr discovered that the main objectives of *maqâshid al-syarî'ah*; Order (al-fitrah), Equality (equality, *al-musawah*), Freedom (freedom, *al-hurriyah*), tolerance (magnanimity, *al-samahah*) when the country is able to present and ensure the main objectives of the *Maqâsid Al-Sharî'ah* al-Thâhir ibn 'ssyûr, it can be said that the existing law and applicable in the welfare state based on the *maqâshid al-syarî'ah* is a happy law, not just a happy one bring order, but it has exceeded all that every citizen is no longer just prosperous, but has come to a happiness level.

Based on the explanation of the *maqâsid al-sharî'ah* above, it can be seen that the concept of *maqâsid al-sharî'ah* shows various improvements based on the contextuality that is being responded by the Ulema *maqâsid al-sharî'ah*. In mapping the concept of *Maqâsid Al-Sharî'ah* which was contributed by the *Maqâsid Al-Sharî'ah* scholars, it can be seen in Table 1.1. below. [17].

Tabel. 1.1 Concept of *Maqâsid Al-Sharî'ah*

NO	NAME OF SCHOLARS	CONTRIBUTION (THEORY)
1.	Abū Iṣḥāq al-Shāṭṭibī	<ul style="list-style-type: none"> <li>▪ The Purpose of <i>Maqâsid Al-Sharî'ah</i>is to achieve prosperity</li> <li>▪ The levels of human needs:                             <ul style="list-style-type: none"> <li>○ <i>al-darūrīyah</i> (primary right)</li> <li>○ <i>al-hājīyyah</i> (secondary right)</li> <li>○ <i>al-tahsīnīyah</i> (supplementary right)</li> </ul> </li> </ul>
2.	Imam Al-Juwainī	Purposing <i>al-Maqâsid</i> as public needs. There are 5 levels of <i>al-Maqâsid</i> : <ul style="list-style-type: none"> <li>▪ <i>al-darūrīyah</i> (inevitabilities)</li> <li>▪ <i>al-hājīyah al-'ammah</i> (public needs)</li> <li>▪ <i>al-makrūmah</i> (principal acts)</li> <li>▪ <i>al-mandūbah</i> (recomendations)</li> <li>▪ <i>al-ismah</i> (protection)</li> </ul>
3.	'Izzu al-Dīn bin 'Abd al-Salām	<ul style="list-style-type: none"> <li>✓ The validity of a rule depends on its purpose and wisdom behind it</li> <li>✓ Adding <i>a-ird</i> (honour and the protection of human rights) to <i>maqâsid al-darūrīyah</i></li> </ul>

4.	Al-Tâhir Ibn 'Āshûr	The main purposes of <i>maqâsid al-sharî'ah</i> is: <ul style="list-style-type: none"> <li>○ Order</li> <li>○ Equality</li> <li>○ Freedom</li> <li>○ Simplicity</li> <li>○ The protection of human <i>fitrah</i></li> </ul>
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The construction of Islamic reasoning about law, benefit and justice represents a view that links justice with truth. To act fairly is to act properly. Looking for justice is the same as searching for truth. Truth is a representation of God's will for humans which is elaborated through al-ahkam al-khamsah, which is obligatory, sunnah, mubah, makruh, and haram. Substantial justice in Islamic law is always associated with the will of the maker of syara '(Allah) towards humans, whether the will is understood through logical deduction (*lughawīyah method*), analytical deduction (*qiyas*), or deduction from general sharia rules (*Maqâsid Al-Syarî'ah*). In the end, justice refers to the judge's efforts to find the truth and provide the law if there is a violation for which there is no formal strict rules. This is a form of procedural justice. Procedural justice is an external aspect of law, where substantive justice is actualized. Without procedural justice, substantive justice will only become theories that do not touch the reality of society. However, the value of certainty and usefulness of the law is also important to consider in law enforcement.

As explained earlier that the concept of welfare in conventional economics is widely questioned. This is because the welfare indicator is only aimed at the financial (monetary) approach and ignores other approaches, such as the capability and non-financial approaches. This is not in accordance with the concept of *Maqâsid Al-Syarî'ah* in Islam, where basically, *Maqâsid Al-Syarî'ah* is the goal of sharia as a whole, and religion is the most basic basic requirement.

Based on the formulation of the welfare state according to *Maqâsid Al-Syarî'ah* presented in the discussion above, this research formulates the *Maqâsid Al-Syarî'ah Welfare Index (MWI)* as an indicator and a measure that can be used as a holistic indicator to measure poverty and welfare in one country. [18] The formulation can be described in table 1.2 as follows.

Tebel.1.2 *Maqâsid Al-Syarî'ah Welfare Index (MWI)*

No	<i>Maqâsid Al-Syarî'ah Welfare</i>	Indicator (needs Levels)
1.	<b>Fulfillment of Individual Needs</b>	<ul style="list-style-type: none"> <li>▪ <b>Fulfillment of Primary Rights:</b> <ul style="list-style-type: none"> <li>- حفظ النفس</li> <li>- حفظ المال</li> <li>- حفظ العقل</li> <li>- حفظ النسل</li> <li>- حفظ الدين</li> <li>- حفظ العرض</li> </ul> </li> <li>✓ Fulfillment Basic Needs</li> <li>✓ Availability of Employment and Economic Independence</li> </ul>

		<ul style="list-style-type: none"> <li>✓ Civilized Education</li> <li>✓ Marriage, and Proper Child Care</li> <li>✓ Creation of the Environment of Godliness (Spiritual)</li> <li>✓ Protection of Human Rights</li> <li>▪ Access to Secondary Rights</li> <li>▪ Access to supplementary rights</li> </ul>
2.	<b>Public Needs (Al-Hajat Al-'Amah)</b>	<ul style="list-style-type: none"> <li>▪ <b>Decent, Fair and Equitable:</b> <ul style="list-style-type: none"> <li>✓ Freedom of Business</li> <li>✓ Freedom of Association</li> <li>✓ Infrastructure Development And transportation</li> </ul> </li> <li>✓ Equitable and equitable distribution: Income and Wealth</li> <li>✓ Library / Research / Information Technology Access</li> <li>✓ Cultural Resilience and Resilience of the Nation's Character</li> </ul>
3.	<b>Protection or Guarantee (Al-Ismah)</b>	<ul style="list-style-type: none"> <li>▪ <b>Guaranteed Life of Citizens:</b> <ul style="list-style-type: none"> <li>✓ Availability of Health Protection</li> <li>✓ Availability of Citizens' Housing Ownership Guarantees</li> </ul> </li> </ul>
4.	<b>Law Enforcement</b>	<ul style="list-style-type: none"> <li>▪ <b>Law gives happiness:</b> <ul style="list-style-type: none"> <li>✓ <i>Al-Fitrah</i> (naturally)</li> <li>✓ <i>Equality - al-Musawah</i></li> <li>✓ <i>Freedom - al-Hurriyah</i></li> <li>✓ <i>Magnanimity - al-Samahah</i></li> </ul> </li> </ul>

Based on the Maqâsid Al-Syarî'ah Welfare Index (MWI) as an indicator and measure for the construction and design of Indonesia's welfare state law.

#### MWI Basis for the Indonesian Welfare Law State

The constitution clearly wants the actualization of a welfare state in Indonesia, where the state bestows broad social and economic rights to every citizen. Thus, Indonesia is not a minimum state or necessary evil, and it is not even an enabling state that only modifies markets while still worshipping individualism. Based on the constitution, the state is a development agent who not only encourages equality of opportunity, but also actively seeks to enforce social justice (equality of outcome). The state is clearly mandated to place the interests of society above those of individuals.

The implication is that the country plays an important role in providing public goods and services (provider state) towards an unconditional welfare state. With fiscal policy (state finance), the country should be actively in carrying out the function of income redistribution for social justice. [19]

The Indonesian rule of law makes Pancasila as a grundnorm (basic norm) or staatsfundamentalnorm (the foundational norm of the state). Pancasila is guided by prophetic ethical ideals (historical activism, transcendence, humanization and liberation). Pancasila can also be considered as a social philosophy, the state's view of social phenomena. It can be derived into social theory. First, the divine precepts can be reduced to a social theory called pluralism (positive pluralism); besides religion itself, there are other religions that must be respected and each adherent must hold fast to his religion. From the social theory, called pluralism, the approach to religious tolerance was appeared, the application of Islamic law in Aceh should be reflected from this social theory of pluralism.

The second preception (Humanity) is a guarantee of freedom within the limits of justice and civilization. Freedom is limited by the freedom of others. Therefore, it needs to be regulated in legal regulations. Third, the derivative of the 3rd precepts (Indonesian Unity) is cultural democracy or cultural pluralism. In contrast to ethnocentrism which is strong in identity and rejects other elements of culture, and cultural melting (melting pot) blending the components into a new identity, pluralism is intended that each ethnic group still holds its group identity, but in some cases there is a different identity. Pluralism means that all regions, all traditions and all cultures should be preserved and developed.

Fourth, the derivation of the 4th precept (People's Sovereignty) is an objective state (technical and simple state), namely the state as a custodian (ambaureksa), the holder of the mandate rather than the holder of power. Likewise, fifth, the 5th precepts (Social Justice) can be reduced to sociological nationalism actualizing that in a unit called a nation, there are layers which have not been benefited by the existence of such a large unit. Social justice which is a social philosophy has been reduced to a social theory, which is a populist economy which can be said to be a new paradigm due to previous capitalistic economy. [20]

The state is not only a legal, political and social building, but it is also a cultural one. Therefore, it can be observed as cultural characteristics of a country. On the other hand, the rule of law is also "demanded" to display its cultural face as aspired by the Constitution of the Republic of Indonesia. Thus, the law should not take over the efforts to make the Indonesian people happy as the ideals of the Constitution.

The reading of the Basic Law raises an important moral value, which is to present and develop "a country with a strong commitment to make its people happy." All of the things contained in Pancasila demonstrate moral commitment. The



precepts of "God Almighty", "just and civilized humanity", "deliberation in making decisions" and "social justice for all people", make the state and the government bear the mandate to carry out duties with all morality. The inclusion of the meta-rational deity of Godhead, giving a unique color, a distinctive character, and at the same time being an important reason to say, the State of Indonesia wants its people to live happily not only materially but also based on spiritual values.

Characteristics of the Indonesian Welfare Law, related to the concept of *maqâshid al-syarî'ah*, can be interpreted in the scope of state life as the meaning contained, universality of *maqâshid al-syarî'ah* values. In the context of Indonesianism, the *maqâshid al-syarî'ah* is part of the basic conception of Godhead with the aim of creating prosperity for the people of Indonesia. [21] Making Pancasila Spirit of State (Moral-Spiritual), that the national legal development policy and economic, political, and cultural development, make Pancasila as the spirit of movement, not the values that are translated from other cultures and values. Thus, the universality of *maqâshid al-syarî'ah* values animates the concept of Pancasila in Indonesia.

Pancasila with its five principles starting from the Godhead of the Almighty, just and civilized humanity, Indonesian unity, democracy led by wisdom in consultation / representation, and social justice for all Indonesian people, are universal values of *maqâshid al-syarî'ah* in every precept. *Maqâshid al-syarî'ah* basically guarantees *kulliyatul khams*, namely the protection of souls, property (wealth), reason, descent, and religion.

The Almighty God is considered as an effort to preserve religion (*hifz ad-din*) and religious people to carry out worship and beliefs based on their respective religions. Just and civilized humanity is an effort to recognize human rights in which there is also right to a decent and civilized life that is fair so that every citizen feels justice in civilization, especially in the protection of rights (*hifz mal*). The unity of Indonesia is to maintain the continuity of each tribe and customs in Indonesia. Thus, protection against (*hifz an-nasal*) can be realized. Popular descent which is led by wisdom in consultation / representation is a process of transformation of political thought and education from the ignorance and underdevelopment of citizens towards the formation of a progressive civilization which can be actualized, so that (*hifz al-'aql*) has been carried out carefully. Social justice for all Indonesian people is the government's effort to fulfill the basic needs of every citizen so that the gap between poverty and wealth does not have too much disparity, this is in accordance with (*hifz an-nafs*).

A closer relationship between religion and state (Socio-Religious) cannot be separated as Indonesia is not a liberal or communist country, and this is of course very closely related to the historicity of the Indonesian nation which seized its independence with religious zeal. Rests on the Godhead of the One (Transcendental), Welfare Guarantee and Social Justice for All Communities, Freedom of Religion and Worshipping (Liberation - Humanization) and Happy Laws are the characteristics, a prerequisite for actualization of the Indonesian Welfare Law.

### III. CONCLUSION

The Republic of Indonesia Welfare Law was initiated based on *maqâshid al-syarî'ah*, moral - spiritual - religious and transcendental. The prosperity achieved or felt is not merely material but it is physical and spiritual happiness, not only for the world but also in the hereafter. Essential welfare cannot be achieved without the active role of the country within it. The concept of Indonesia Welfare offered is an essential one which has been elaborated through the theory of *maqâshid al-syarî'ah* and transcendental approaches.

The conception of Indonesian welfare law requires that every state or government action must be based on law, guarantee the security and public order, make the welfare state ideology as the basis for the position and function of the government (*bestuursfunctie*) in carrying out tasks, and broader responsibilities for the welfare of the people and social justice as the spirit of economic development. There is a state role in it along with a civil society movement (civil society) which can transform social and bring society to a higher stage where there is no longer an imbalance of welfare in Indonesia. Civil society has a very high level of social fragmentation.

Overall, the characteristics of Indonesian Welfare Law is given to make Pancasila as the spirit and soul of the country (moral - spiritual), in every direction of national, economic, political and cultural development policies, that the direction of developing the State is not uprooted from its roots, Pancasila which rests on the Godhead of the Almighty (transcendental), a close relationship between religion and the state (socio-religious), the existence of Welfare Assurance and Social Justice for the entire society, and freedom of religion and worshipping (liberation - humanization) and the actualization of a happy law.

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# *Responsibility of the Board of Directors to the Non-Performing Loans in Banking Company Based on Law Number 40 of 2007*

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**Abstract**— Bank is a company whose business activities raise funds, channel funds, and provide financial services. Of the three bank business activities, fund distribution activities are activities that are sources of bank-wide income. However, large profits are directly proportional to the high level of risk, namely the occurrence of Non-Performing Loans. The problem that will be discussed in this research is how is the responsibility of the Board of Directors for the occurrence of Non-Performing Loans in banking companies based on Law Number 40 of 2007 concerning Limited Liability Companies? The method used in this research is normative legal research using the statutory approach. The results of this research are that one of the causes of the occurrence of Non-Performing Loans in banks is inaccurate credit analysis conducted by bank employees in the credit department and the absence of supervision conducted by the Directors as leaders in banking companies. Pursuant to Article 97 of Law Number 40 of 2007 concerning Limited Liability Companies, it is stated that the Board of Directors is personally responsible for the company's losses if the person concerned is guilty or negligent in carrying out his duties. This means, as the party who gives approval in lending, the Board of Directors must take full responsibility if the disbursed credit becomes a problem in the future and becomes a bad credit that causes losses to the company.

**Keywords**— Banking, Non-Performing Loans, Responsibility of the Board of Directors

## I. INTRODUCTION

In Indonesia, as mandated by the Pancasila and the 1945 Constitution of the Republic of Indonesia, the goal of national development is the creation of a just and prosperous society based on economic democracy by developing a just economic system. To ensure the continuation of economic democracy, all potentials, initiatives, and creations of the people must be fully mobilized and developed within the limits that do not harm the public interest, so that all potential economic forces can be mobilized into tangible economic forces for the benefit of increasing prosperity people [1]. In order to achieve this goal, the implementation of economic development must pay more attention to the harmony, harmony and balance of the elements of equitable development, economic growth and national

stability. One institution that has a strategic role in harmonizing, harmonizing, and balancing each element of the development trilogy is banking.

Banking is everything related to banks, including institutions, business activities, as well as ways and processes in carrying out their business activities. Based on Article 1 of Law Number 10 of 1998 concerning Banking, it is explained that banks are business entities that collect funds from the public in the form of deposits and distribute them to the public in the form of credit and / or other forms in order to improve the lives of many people. In addition, Kasmir explained that banks are defined as financial institutions whose business activities are raising funds from the public and channeling these funds back to the public and providing financial services [2].

From the above understanding, it is known that a bank's business activities are raising funds, channeling funds, and providing services. Banks collect funds from the public in the form of deposits in the form of savings, deposits and demand deposits by providing monetary rewards, known as bank interest, to the public in accordance with the nominal amount of their deposits. People who have excess money certainly feel greatly helped by the existence of a bank because the security of the money is guaranteed if it is deposited in a bank and the bank also provides monetary rewards for these deposits. After raising funds, banks channel funds to the public in the form of loans in the form of credit by asking for compensation in the form of money to the community in accordance with the nominal amount of the loan. People who need money to meet their needs certainly find it helpful to have a bank because they can borrow money in cash, the return of which can be paid in installments over a period of time so that the return becomes lighter. In addition, banks also provide financial services that can provide convenience to the public in conducting various financial transactions, such as money transfer services that can send money from long distances in seconds [3].

Of the various types of banking business above, lending is the most important business activity for a bank. This is because the credit interest paid by customers is the largest bank income, which is then used

by banks to pay interest on customer deposits, carry out bank operational activities, and become one of the sources of profit for banks. However, large profits are directly proportional to the level of risk.

The risk that generally occurs in lending at banks is known as bad credit. Bad credit is a default carried out by a customer, ie the customer does not fulfill his obligation to pay credit installments to the bank as agreed in the credit agreement [4]. Non-Performing Loans has the potential to be experienced by a bank because the bank lends money to customers in cash while the customer returns it to the bank in installments according to a mutually agreed period of time.

From the background of the problem described above, the problem to be discussed in this research is how the responsibility of the Board of Directors for the occurrence of Non-Performing Loans in banking companies based on Law Number 40 of 2007 concerning Limited Liability Companies?

## II. RESEARCH METHODOLOGY

According to Soerjono Soekanto, legal research is a scientific activity that is based on certain methods, systematics, and thinking that aims to study one or several specific legal phenomena by analyzing them [5]. The method used in this research is normative legal research using a statutory approach, namely Law Number 40 of 2007 concerning Limited Liability Companies. Peter Mahmud Marzuki explained that normative legal research is a process to find the rule of law, legal principles, and legal doctrines in order to address the legal issues faced [6].

Data sources used in this research are secondary data, namely data obtained from statutory regulations, scientific journals, and legal literature. The data collection technique used in this research is literature study. The data analysis technique used in this research is qualitative analysis.

## III. RESULTS AND DISCUSSIONS

In Latin, credit comes from the word 'credere', which means trust. In line with that, based on Article 1 of Law Number 10 of 1998 concerning Banking, it is explained that credit is the provision of money or bills that can be equaled based on the agreement or loan agreement between the bank and another party, which requires the borrower to repay its debt after a certain period of time with interest.

Of the various types of banking business above, lending is the most important business activity for a bank. This is because the loan interest paid by the customer is the biggest bank income, which is then used by the bank to pay the customer's deposit interest, run the bank's operational activities, as well as being a source of profit for the bank. However, large profits are directly proportional to the level of risk. The risk that generally occurs in lending at banks is known as bad credit. Bad credit is a default carried out by the

customer, that is, the customer does not fulfill his obligation to pay credit installments to the bank as agreed in the credit agreement. Bad credit has the potential to be experienced by a bank because the bank lends money to customers in cash while customers return it to the bank in installments according to a mutually agreed period. The occurrence of bad loans is one of the reasons, namely the weak credit analysis conducted by the bank, ranging from bank employees to the Directors as leaders who approve lending.

Law Number 10 of 1998 concerning Banking stipulates that banks are required to apply the precautionary principle in all their business activities, including lending activities. Therefore, in extending credit to the public, banks must implement measures that do not harm their business and also do not harm the rights of customers who entrust their money deposited in the bank. This is because the money disbursed by the bank in the form of credit is public money deposited in the bank on the basis of trust, so the bank must continue to maintain the level of health and public trust in it [7].

Indonesian people have lost confidence in banks during the economic crisis in 1998. The economic crisis has been a devastation for the national banking system because many banks do not apply the precautionary principle in managing their business activities. The real evidence that resulted from this was the freezing of 38 private bank businesses, including Ciputra Bank, Ganesha Bank, Pesona Bank, Alfa Bank, Aspac Bank, and so on. Furthermore, there were 7 private banks that were taken over by the government, namely RSI Bank, Putera Sukapura Bank, POS Bank, Artha Pratama Bank, Nusa National Bank, Jaya Bank, and IFI Bank. In addition, there are also 4 state-owned banks, namely Dagang Bank, Exim Bank, Bumi Daya Bank, and Bapindo which collapse and are merged into Mandiri Bank.

Regarding what is meant by the precautionary principle, there is no official explanation in the legislation. Hermansyah explained that the bank and the people involved in it, especially in making policies and carrying out their business activities, were required to carry out their duties and obligations carefully, thoroughly, and professionally so as to gain public trust. In addition, banks in making policies and conducting business activities must always comply with all applicable laws and regulations in a manner that is based on good faith [8]. The trust of the community is the main key for developing or not a bank's business activities.

In general, the principle of prudence in the process of lending is implemented by banks using the 5C principle when conducting credit analysis. The 5C principles are as follows [9]:

### 1. Character

Character is the bank's assessment of the prospective customer's personality character.

### 2. Capacity

Capacity is the bank's assessment of the ability of prospective customers to manage finances and run their business.

### 3. Capital

Capital is the bank's assessment of the initial capital owned by the customer.

### 4. Condition

Condition is a bank's assessment of the current economic, social and political development and its relation to businesses that are or will be run by prospective customers.

### 5. Collateral

Collateral is a bank's assessment of collateral that will be used as collateral for credit applications submitted by prospective customers.

In lending, banks must have confidence based on an accurate analysis of the intention and ability and ability of customers to repay their debts in accordance with what was agreed in the credit agreement. To obtain this confidence, before lending, banks must make an accurate assessment of the character, abilities, capital, collateral, and business prospects of prospective customers.

Accurate credit analysis largely determines credit quality and credit refund targets. If the analysis of the credit requirements of prospective customers is carried out correctly by bank employees in the credit department and properly monitored by the bank's directors, then the loan repayment target will run smoothly from the beginning to the full.

Bank Indonesia groups credit quality at banks with the following levels [10]:

#### 1. Current Loans

If the customer fulfills his obligations in accordance with the agreement in the agreement, the quality of the credit includes Current Loans.

#### 2. Loans in Special Attention

If the customer does not fulfill its obligations in accordance with the agreement in the agreement with a maximum limit of outstanding credit installments of up to 90 days, the quality of the credit includes Loans in Special Attention

#### 3. Substandard Loans

If the customer does not fulfill its obligations in accordance with the agreement in the agreement with outstanding credit installments through 90 days to 180 days, the quality of the credit includes Substandard Loans.

#### 4. Doubtful Loans

If the customer does not fulfill its obligations in accordance with the agreement in the agreement with outstanding credit installments through 180 days up to 270 days, the quality of the credit includes Doubtful Loans.

### 5. Non-Performing Loans

If the customer does not fulfill its obligations in accordance with the agreement in the agreement with outstanding credit installments that have exceeded 270 days, the quality of the credit includes Non-Performing Loans.

Over time, various factors, both internal and external factors, can affect the quality of loans extended by banks to their customers. Bank internal factors that affect credit quality from Current Credit to Non-Performing Loans are usually caused by inaccurate credit analysis conducted by bank employees in the credit department and not supervised by the Directors due to corruption, collusion, and nepotism.

Pursuant to Article 1 of Law Number 40 of 2007 concerning Limited Liability Companies, it is explained that the Board of Directors is the organ of the company that is authorized and has full responsibility for the management of the company for the interests of the company in accordance with the aims and objectives of the company and represents the company, both inside and outside the court, in accordance with the provisions of the articles of association.

In 2013, President Director of PT Bank Riau Kepri, Zulkifli Thalib, was convicted by the court for being involved in a corruption case in the form of a fictitious credit worth 35.2 billion rupiah. Zulkifli Thalib approved the credit application of PT Saras Perkasa at PT Bank Riau Kepri Branch of Batam. Zulkifli Thalib as a Director of PT Bank Riau Kepri who approved the credit application was considered responsible for the losses suffered by the company, although Zulkifli Thalib insisted there was no money received in the case.

The occurrence of bad loans experienced by banks has the potential to cause harm to the company. In a banking company incorporated as a Limited Liability Company (PT), the authority and full responsibility for the management of the company is the Board of Directors.

Pursuant to Article 97 of Law Number 40 of 2007 concerning Limited Liability Companies, it is stated that the directors are personally responsible for the company's losses if the person concerned is guilty or negligent in carrying out his duties. That is, as the party giving approval in lending, the bank's directors must take full responsibility if the disbursed credit becomes a problem in the future and becomes Non-Performing Loans which causes losses to the company.

## IV. CONCLUSION

One of the causes of Non-Performing Loans in banks is inaccurate credit analysis conducted by bank employees in the credit department and the absence of supervision conducted by bank directors as leaders in banking companies. Pursuant to Article 97 of Law Number 40 of 2007 concerning Limited Liability Companies, it is stated that the directors are personally responsible for the company's losses if the person concerned is guilty or negligent in carrying out his

duties. That is, as the party giving approval in lending, the bank's directors must take full responsibility if the disbursed credit becomes a problem in the future and becomes Non-Performing Loans which causes losses to the company.

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# *Equitable Fulfillment of Access to Justice for the Poor in Riau Province of Indonesia*

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**Abstract—** The uneven distribution of Legal Aid Organizations in Riau Province is a problem that must be discussed regarding the obstacles and constraints. Whereas the Legal needs of the poor in Riau Province are very numerous. There are still a number of districts in Riau province where poor people get difficulties to find the legal aid providers who are willing to help them when experiencing legal cases. Riau province itself is facing difficulty regarding the prevalence of the spread of Legal Aid Organizations/legal aid agencies accredited since many Legal Aid Organizations are located in big cities. This circumstance makes the access to help the poor in the district difficult.

**Keywords—** equitable access to justice, the poor

## I. INTRODUCTION

### A. The Background of the Problems

Undang-undang No. 16 of 2011 which is concerning to Legal Aid can protect the constitutional rights of each individuals to obtain the legal assistance. Furthermore, it is expected to be able to accommodate the protection of disadvantaged people in facing legal cases in Riau Province. This recognition and guarantee of the principle of Equality before the Law is not only limited to political recognition. However, it prioritizes the concrete actions of the state. In providing guarantees to the community in gaining access to justice in order to fulfill the basic of human rights (HAM), even the actions must also be carried out to ensure the existence of this country's obligations. According to the Legal Aid Act, the provision of legal assistance is carried out by legal aid providers (legal aid organizations) that must fulfill the following requirements:

1. Legal entity;
2. Accredited;
3. Has a permanent office and secretariat;
4. Has people in charge;
5. Has a legal assistance program;
6. Has been certified.

Based on the Decree of the Minister of Law and Human Rights of the Republic of Indonesia Number M.HH-01.HN.03.03 of 2016 concerning Legal Aid Organizations/Institutions (OBH) that passed verification and accreditation as legal aid providers for

the period 2016-2018, there are 7 accredited OBH based on the results of verification of the national Legal Development Agency in Riau Province in 2015-2018, namely:

1. Faculty of Law Legal Aid, Lancang Kuning University; (located in the city of Pekanbaru)
2. Mahatva Legal Aid; (domicile in Rokan Hilir Regency)
3. Ananda Legal Aid; (located in Rokan Hilir Regency)
4. YLBHI Pekanbaru Legal Aid; (located in the city of Pekanbaru)
5. Riau KBH Legal Aid; (located in the city of Pekanbaru)
6. Paham Riau Legal Aid; (located in the city of Pekanbaru)
7. Indonesian Civil Society Forum Legal Aid; (located in the city of Pekanbaru)

The right to legal assistance itself is a non derogable right, a right that cannot be reduced and cannot be suspended under any circumstances. Therefore, legal assistance is the basic right of all people, which is not given by the state and is not the mercy of the state, but is also the responsibility of the state in realizing equality before the law, access to justice, and fair trial. The state's obligations are set out in legislation concerning legal assistance. As a price of democracy that must be paid for, of course the implementation of legal assistance must be escorted by all parties. Thus, access to justice for the poor can be fulfilled<sup>1</sup>.

The number of poor people (population below the Poverty Line) in Riau in September 2017 amounted to 496.39 thousand people (7.41 percent)<sup>2</sup>. From the data of the central statistical agency above, there are very many poor people in all districts in Riau. If the poor are in a legal case, what is expected is legal protection through a Government Program implemented by an accredited legal aid organization. In this case the policy of mapping the number of legal aid organizations is the authority of the Ministry of Justice and Human Rights of the Riau Regional Office. When viewed from the location of legal aid organizations, only Pekanbaru and

Rokan Hilir have accredited Legal Aid Organizations, whereas many poor people need these legal requirements. Districts that do not have a legal aid organization are as follows:

1. Bengkalis Regency, (no Accredited Legal Aid Organization).
2. Indragiri Hilir Regency, (no Accredited Legal Aid Organization).
3. Indragiri Hulu Regency, (no Accredited Legal Aid Organization).
4. Kepulauan Meranti Regency, (no Accredited Legal Aid Organization).
5. Kuantan Singingi Regency, (no Accredited Legal Aid Organization)
6. Dumai City, (no Accredited Legal Aid Organization).

The uneven mapping of Legal Aid Organizations in Riau Province is a problem that must be addressed regarding the obstacles and constraints, while the Legal needs of the poor in Riau Province are very many.

## II. THEORETICAL FRAMEWORK

The definition of legal aid has characteristics in different terms. Legal aid is a national system regulated locally where Legal Aid is aimed at those who are less financially able and unable to pay for personal legal advisor. From this understanding it is clear that legal assistance can help those who are unable to hire legal advisory services. Legal assistance explains the meaning and purpose of wider legal assistance from legal aid. Legal assistance further describes the profession of legal counsel as a legal expert, so that in that sense as a legal expert, legal assistance can provide legal assistance services to anyone without exception. That is, the expertise of a legal expert in providing legal assistance is not limited to the poor, but also to those who are able to pay achievements.

For the poor, the law is expensive goods and they also feel they do not have the need to feel that their rights are guaranteed by law. The poor are the exception to the law which they say is often unfair and closes their opportunity to improve their standard of living. This situation happens almost in developing and poor countries in the world.

The concept of legal assistance in the Legal Aid Law Number 16 of 2011 is funding assistance from the State for the poor who are dealing with the law. Previously, the state did not fulfill the right to legal assistance for the community. It is precisely this role that began and continues to be carried out independently by civil society pioneered by for example YLBHI-LBH (legal aid foundation) Office which develop constantly with the creation of civil society organizations engaged in legal assistance such as the Indonesian Legal and Human Rights Assistance Association (PBHI), LBH Masyarakat, LBH Apik, LBH Pers, LBH Mawar Saron, LKBH Kampus, Elsam,

kontras, Walhi, etc. The formation of the Legal Aid Law has been advocated since 1998 by legal aid activists. In 2004 a draft Legal Aid Act was made. In 2009 this Law entered the National Legislation Program. It was only on November 2, 2011 that Law Number 16 of 2011 concerning Legal Aid was promulgated (annual report of the Indonesian Ministry of Law and Human Rights, 2013).

In Law No. 16 of 2011 concerning Legal Aid, it is said that legal aid providers are legal aid organizations or community organizations that provide legal aid services. Legal services provided to recipients of free legal assistance, in the sense that they do not receive wages from those assisted, but the government will provide assistance for each case handled. The amount of which is adjusted to the type of case. The donation will indeed not be given to all OBH, but only to OBH that have fulfilled the requirements in accordance with the Legal Aid Act<sup>3</sup>.

### A. *Relevant Research*

There are some previous studies carried out in Indonesia that examined several issues regarding to legal aid for the poor. Pujiono, discussing the Legal Aid in the Perspective of State Responsibility as well as Siddid Ahmad conducted a study of the responsibilities of Advocate organizations in providing Legal assistance to the poor.

## III. DISCUSSION

Access to Justice for the poor who face legal cases in Riau Province in the implementation is not maximal because there are still several municipal districts in Riau Province in which the poor people get difficulty to find the legal aid providers that are willing to help them when facing litigation and non-litigation law<sup>4</sup>. There are some obstacles regarding this issue. The first is District and City in Riau Province has not yet completed the Regional Regulation on Legal Aid. To overcome this, the Governments of District and City should prioritize the discussion of Regional Regulations on Legal Aid so that the legal aid programs can be implemented well. The second is the absence of technical instructions regarding to the standardization of prices for the implementation of legal assistance in the Regency / City Region. To address this, the regional office of the Ministry of Justice has employees in the Legal Drafter to assist in the preparation of Regional Regulations on Legal Aid. The third is the uneven distribution of Legal Aid Organizations (OBH) / accredited legal aid agencies in Riau Province. Many of the Legal Aid Organizations are situated in big cities, so access to help the poor in the district becomes difficult. Therefore, the Government through the Ministry of Law and Human Rights conducts the verification process of the Assistance Organization accreditation prioritizing Regencies or Cities that do



not yet have a Legal Aid Organization / accredited legal aid organization then conducts the OBH accreditation process at least once a year.

In the Social Justice workshop that was held on Monday, April 8, 2019 at the Witz Hotel Pekanbaru, the authors were also invited to the event which was attended by all Chairmen and administrators of Legal Aid Organizations in Riau Province, Head of the Provincial Legal Bureau of Riau, Head of the Legal Bureau Districts of Riau Province, Head of Regional Office of the Ministry of Law and Human Rights, Representative of the Legal Services Division of the Regional Office of the Ministry of Law and Human Rights. In this event, the authors asked this issue directly to all the respondents / invitees who were present to the event.

An interview with Mr. Edison Manik from the Ministry of Law and Human Rights Office of Riau<sup>5</sup> said the Equitable Implementation of Access to Justice for the Poor in Riau Province Based on Law Number 16 Year 2011 concerning Legal Aid has actually been attempted to achieve equal distribution of access to Justice with the presence of Legal Aid Organizations in regions where there is no legal aid organization. The regional office can only propose to continue the final decision at the Republic of Indonesia National Law Development Agency. Furthermore, according to Mr. Edison Manik, the following are the names of legal aid organizations accredited in 2019-2021 as follows: There are 10 OBH that have been accredited based on the results of the National Legal Development Agency verification of Riau Province in 2019, namely:

1. Mahatva Legal Aid (located in Rokan Hilir Regency).
2. Ananda Legal Aid (located in Rokan Hilir Regency).
3. YLBHI Pekanbaru Legal Aid (located in Pekanbaru).
4. Posbakummadin Siak Legal Aid (located in Siak Regency).
5. Paham Riau Legal Aid (located in Pekanbaru).
6. Forum Masyarakat Madani Indonesia Legal Aid (located in Pekanbaru).
7. Faculty of Law Legal Aid, Lancang Kuning University (located in Pekanbaru).
8. Tuah Negeri Nusantara Legal Aid (located in Pekanbaru).
9. Paham Riau Legal Aid (located in Pekanbaru).
10. Rokan Hulu Legal Aid (located of Rokan Hulu Regency).

The results of Interview with Ms. Fitri, the Chairperson of LBH Ananda Rokan Hilir show that when viewed from the spread of Legal Aid Institutions in Riau Province from the years 2019-2021 are as follows:

- a. Bengkalis Regency, (no Accredited Legal Aid Organization).

- b. Indragiri Hilir Regency, (no Accredited Legal Aid Organization).
- c. Indragiri Hulu Regency, (no Accredited Legal Aid Organization).
- d. Kepulauan Meranti Regency, (no Accredited Legal Aid Organization).
- e. Kuantan Singingi Regency, (no Accredited Legal Aid Organization).
- f. Dumai City, (no Accredited Legal Aid Organization).

There is uneven distribution of accredited Legal Aid Organizations in Riau Province. There are still 7 Districts in Riau Province that do not have accredited Legal Aid Institutions / legal aid organizations.

The results of an Interview with Mr Adit from LBH Pekanbaru during the Social Justice workshop, which was attended by most of the Regency and City law bureaus in Riau Province, reveal that if we look at to the districts or cities that already have Regional Regulations on Legal Aid for the poor are:

1. Pekanbaru city (already has the regional regulations on Legal Aid).
2. Bengkalis Regency (no Regional Regulation on Legal Aid yet).
3. Rokan Hulu Regency (already has the Regional Regulation on Legal Aid).
4. Indragiri Hilir Regency (no Regional Regulation on Legal Aid yet).
5. Indragiri Hulu Regency (no Regional Regulation on Legal Aid yet).
6. Meranti Islands Regency (no Regional Regulation on Legal Aid yet).
7. Kuantan Singingi Regency (no Regional Regulation on Legal Aid yet).
8. Pelalawan Regency (no Regional Regulation on Accredited Legal Aid yet).
9. Siak Regency (already has the Regional Regulation on Legal Aid).
10. Dumai City (already has the Regional Regulation on Legal Aid).
11. Rokan Hilir Regency (already has the Regional Regulation on Legal Aid).
12. Siak Regency (already has the Regional Regulation on Legal Aid).

In creating the regulations of law concerning legal assistance, it must be carried out based on the principles of the establishment of good laws and regulations, including clarity of objectives, institutions or appropriate forming officials and conformity between types, hierarchies and workable material content and usefulness and usability, clarity of formulation and openness. In addition, the content material contained in the laws and regulations must reflect the principles of guardianship, humanity and nationality as well as kinship, mediation, Unity in Diversity (*bhinneka tunggal ika*), justice and equality of position in law and government, law and order and balance, and harmony. The principles of establishing

legislation above reflect the good form of legislation. If it is applied in a statutory regulation, a good legislation will be formed in accordance with the principles stated in the law without abandoning the principles of justice.

The establishment of good Indonesian legislation must prioritize the ideals of Indonesian law in taking ideas for the realization of equitable certainty. In addition, the principle of the state based on law is the proper basis for the creation of good legislation. As a legal state that has a legal level, it must prioritize the hierarchy of legislation in the formation of legislation, especially the constitution as the highest law.

The Results of an Interview with Ms. Aldis, the Head of the Legal Bureau of Riau Province, said that in Law 16 of 2011 concerning in Legal Aid there is no obligation for the Regions to make Regional regulations on Legal Aid, in the law using the words 'can be'. It means that Regions could make local government regulation about Legal Aid. Actually the words 'can be' written in Law 16 of 2011 concerning legal assistance indirectly provides opportunities to the Region to help people who are not able to litigate the Law.

Regional law products beside Provincial Regional Regulations and Regency / City Regional Regulations also include regulations stipulated by the Provincial Regional Representative Council, Governor, Regency / City Regional Representative Council, Regent / Mayor, Village Chief or equivalent. The Regional Regulation can also be revoked regulated in Law Number 12 of 2011 concerning the Establishment of Legislation, the mechanism of revocation / cancellation of Regional Regulations, Regional Head Regulations, and the Decision of the Regional Head that is problematic is regulated in Law Number 23 of 2014 regarding Regional Government as last amended by Law Number 9 of 2015 concerning the Second Amendment to Law

Number 23 Year 2014 concerning Regional Government.

#### IV. CONCLUSION

Equitable Implementation of Fulfillment of Access to Justice for the Poor in Riau Province is based on Law Number 16 Year 2011 concerning in Legal Aid. The access of Justice for the poor who have litigation in Riau Province in the implementation has not been optimal, because there are still several municipal districts in Riau Province where the poor people got difficulties to find the legal aid providers who are willing to help them when encountering legal cases.

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**SCIENCE**

# *Modification of Kenaf Fibers Composite and Empty Oil Palm Bunch With Silane Coupling Agent Addition*

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**Abstract**—This study reports the effect of coating Silane Coupling Agent (SCA) on composite surfaces with different formulation variations of 0%, 0.25%, 0.50%, 0.75%, 1% in weight fraction to the mass of kenaf fiber composites and empty oil palm bunches using epoxy resin. Composites made from composite particulate passing 50 mesh sieves. The particle board compacting process was carried out using a Hydraulic Press compacting machine with a pressure of 20 Bars, holding time 10 minutes in the initial stages, and continued using a Hot Press compacting machine with a pressure of 20 Bars, temperature 150 °C, holding time 15 minutes. The process of treating the Silane Coupling Agent solution on the composite surface is done manually layered on the composite surface. Composites were tested for flexibility using the Universal Testing Machine Galdabini Gallarate referring to ASTM D 790-03 and tested for density using ASTM D 792-13. Composites in this study have fulfilled SNI 03-3527-1994 type III strong class so that the kenaf composite and empty oil palm bunches can be used as an alternative replacing wood in buildings with high densities ranging from 1,1 – 1,3 g/cm<sup>3</sup>.

**Keywords** - Particle Board, Wood, Composite, Kenaf, Empty Oil Palm Bunc, Silane Coupling Agent

## I. INTRODUCTION

The use of composites with the use of fibers originating from nature in various fields is inseparable from the superior properties possessed by fiber composites that are lightweight, strong, rigid and resistant to corrosion. The basic advantages possessed by fibers originating from nature are abundant quantities, can be renewed and recycled and do not pollute the environment [1].

Indonesia is the second largest producer of oil palm in the world and one of the main problems associated with processing palm fruit is the amount of solid waste produced. This solid waste includes empty oil palm bunches, palm fiber and oil palm shells. Waste of empty oil palm bunches can be utilized and processed for manufacturing as natural fibers that are used for various purposes of making fiber composite materials, since fibers from the palm frond are useful for reinforcing (fillers) [2].

Kenaf fiber is a 4000 year old plant originating from ancient Africa, one of the common industrial plants in

Indonesia, where this fiber contributes to the development of environmentally friendly industries, used for the sports, automotive, food packaging, furniture, textile, paper pulp and fiber board based industries. [3]. Kenaf plants can grow up to 4.5 m in 4-5 months [4] with an estimated annual yield of 6–10 tons of dry fiber/acre, producing four times more than pine trees yield [5]. Kenaf requires a short plantation cycle, low quantity of pesticide and flexible to various environmental conditions. Furthermore, Kenaf has great potential to be used as an alternative raw material to replace synthetic fibers in the particle board manufacturing industry [7].

The process of making composites requires a good adhesive to produce composites with physical and mechanical properties that meet the required standards. Epoxy resin is an adhesive that has good dimensional stability, wear resistance and better shock resistance than other resins [8]. In addition, epoxy resins when compared to polyester type resins have better bonding strength due to the presence of polar hydroxyl groups and ether in their chemical formulas [9]. Epoxy resin is a resin that is commonly used for the manufacture of natural fiber composites. To improve its quality, this resin is continuously modified to meet the use of high technology applications.

Efforts are made to reduce the absorption of water, blocking phenolic hydroxyl groups that exist in epoxy resins are through chemical or physical reactions to fuse with phenolic hydroxyl [10-11]. Silane Coupling Agent is commonly used as a modification additive because it is an environmentally friendly, non-toxicity agent, tends to be low on water absorption, high thermal stability and has good flexibility. Silane Coupling Agent can be used as an additive in thermoplastics. This silane can be used as an additive to improve the composite properties [12]

## II. MATERIAL METHOD

### A. Material

Kenaf fiber is obtained from kenaf farmers from Kampar regency, Riau province. The fiber is soaked with water for 7 days. After soaking, it is dried using an oven at a temperature of 60<sup>0</sup> C until the kenaf fibers to remove water content. Then, the fiber is cut to the size of 5 cm. Empty oil palm bunches are obtained from oil

palm mill waste from PT. Johan Sentosa in Bangkinang, Kampar. The empty oil palm bunch fiber is cut to a size of 3 cm. Fiber is washed using water until the oil content in the water in the fiber is lost. After that, it is dried for 2 days. Epoxy resins were obtained from the chemical company called Megah Kimia, consisting of epoxy resins and hardener in a ratio of 2: 1. Silane (OFS-6030) was obtained from PT. Biopolytech Innovation.

*B. Fiber Alkalization Process*

Alkalization process for kenaf fibers and empty oil palm bunches was done respectively by soaking using NaOH. NaOH solution is prepared in the ratio of 5% (weight) from distilled water. The kenaf fiber and empty oil palm bunch are soaked with NaOH solution until the entire surface of the kenaf fiber and empty oil palm bunch are submerged. Kenaf fiber is soaked for 1x24 hours, while empty oil palm bunches are immersed for 2 hours at room temperature in different containers. After being soaked, kenaf fiber and empty oil palm bunch are washed using water. This fiber washing is done by running water on kenaf fiber and empty oil palm bunch to remove the NaOH solution and neutralize the fiber from NaOH. The fibers are dried by being placed in a container with a temperature of ±24 °C then aerated for 1x24 hours. The fiber is then dried again in an oven at ± 60 ° C for 10 hours to ensure the water content contained in the kenaf fibers and empty oil palm bunches has been lost.

*C. Fiber Refining Process (grinding)*

Kenaf fibers and empty oil palm bunches are grinded using a grinding machine to obtain fine particle fibers that pass the 50 mesh sieve.

*D. Weighing of Raw Materials*

Kenaf fibers and empty oil palm bunches are dried at 103 °C until the water content decreases at 3.0% [13], then mixed with the fractions according to Table I. Based on previous research, we have carried out research into making composites by varying the amount of weight of kenaf fibers and empty oil palm empty bunches. Composites with optimum mechanical test values are found in composites with a ratio of 1:1, also use 30:70 fiber and resin variations by different mass fractions.

TABLE I. KENAF RATIO MASS FRACTION:EMPTY OIL PALM BUNCHES:EPOXY

Composite Name	Kenaf (%)	Empty Oil Palm Bunches (%)	Epoxy (%)
K-TKKS	15	15	70

*E. Composite Fabrication*

Kenaf fiber, empty oil palm bunches and epoxy are stirred using a mixer at the highest speed for 5 minutes. All materials that have been mixed are put into a 20x15x2 cm mold then flattened and made using a hydrolic press with a pressure of 2 MPa with a holding time of 10 minutes. Then, the composite is made using a

Hot Press machine. The selected processing parameters are at a temperature of 150<sup>0</sup> C, based on the commonly used Green Composite Fabrication method, for hot press temperatures of 150-180 °C [13], in this study we use the lowest temperature parameters to avoid the charred composites. The most commonly used parameter is to use a pressure of 20 Bars with a fairly short containment time of 10 s, so in this study we chose a pressure of 20 Bars with a holding time of 15 minutes, so that the kenaf fibers and oil palm empty bunches that were initially clotted can spread evenly and avoid voids.

*F. Composite Surface Coating*

Silane is dissolved into a solution consisting of ethanol and aquades. The mass fraction of silane is 20%, ethanol is 72% and aquades is 8% of the total mass [14]. The concentration of Silane coated solution on the K-TKKS composite was 0%, 0.25%, 0.50%, 0.75%, 1% in the mass fraction. Composites are labeled K-TKKS-S (0%), K-TKKS-S (0.25%), K-TKKS-S (0.5%), K-TKKS-S (0.75%) and K -TKKS-S (1%). K-TKKS composites that have been coated with silane solution are dried in the oven for 2 hours at 80 °C, then allowed to stand for 24 hours for the conditioning process.

*G. K-TKKS Composite Density Test*

Composite board density testing is carried out under air-dry conditions, then weighed in mass with a 5 cm x 5 cm test sample. Furthermore, the average length is measured with two measurement points, and the direction of the width of the two measurement points and thickness with four measurement points to determine the volume of the test sample (ASTM D 792-13)[15]. The composite board density values are calculated by using the following formula:

$$\rho = m/V \dots \dots \dots (1)$$

Description:  
 $\rho$  = density (g/cm<sup>3</sup>)  
 m = weight of the air dry test sample (g)  
 V = test sample volume (cm<sup>3</sup>)

*H. K-TKKS Composite Flexural Test*

Flexural test is to determine flexural strength or stress, flexural or deflection and elasticity. This testing phase is carried out when the material receives a load until it changes shape (deformation) from elastic to plastic until finally the material is damaged (broken). Flexural testing is carried out using the Universal Testing Machine Galdabini Gallarate machine referring to ASTM D 790-03 [16].

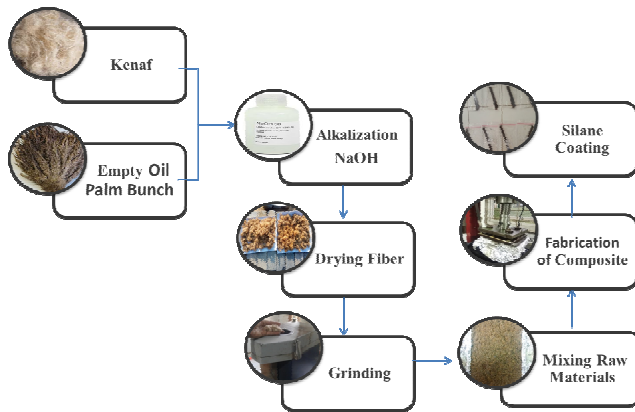


Figure I. Schematic of Experimental Procedure

III. RESULTS AND DISCUSSION

A. Density

In Figure I it can be seen that the greater the value of Silane given, the greater the density value. This is due to the function of the Silane solution which can increase the bond between the matrix of epoxy resin with filler, which is kenaf fibers and empty oil palm bunches. Based on Table II we can see that the density of the composite is in compliance with standard SNI wood for building, with density values above 0.9 g/cm<sup>3</sup>. The density test results obtained satisfactory results of this composite based on SNI 03-3527-1994[17]. As seen in Table II, it is classified as a class I strong wood building.

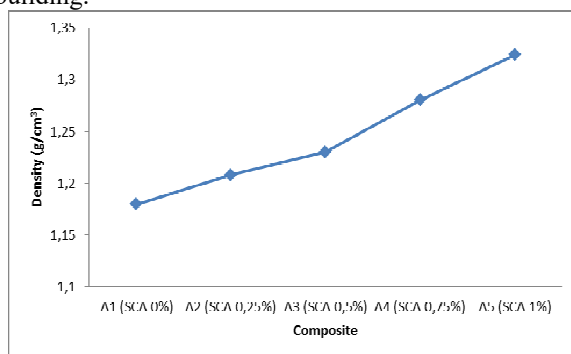


Figure II. The Graphic of Composite Density

B. Results of Flexural Strength

The powder fillers used in this study are inorganic and offer poor covalent bonding with an organic polymer resin. The weak bonding between these two components can be improved by silane coupling agent (SCA) addition. The results of the composite flexural test can be seen in Figure II. The test results showed a significant increase in strength between composites without silane and with silane. The K-TKKS-S composite (0%) is a composite without silane treatment having a flexural strength value of 425 Kgf/cm<sup>2</sup> while

the K-TKKS-S composite (1%) has a flexural strength value of 524 Kgf/cm<sup>2</sup>. The flexural strength of composites increases by up to 20%. The flexural test results also obtained satisfactory results of this composite based on SNI 03-3527-1994. Although the composite density testing in this study already meets SNI standards on wood for building type I, but for the flexural strength yet. As seen in Table II, it is classified as a class III strong wood building, meaning that this composite is strong to withstand the load and not easily broken or bent.

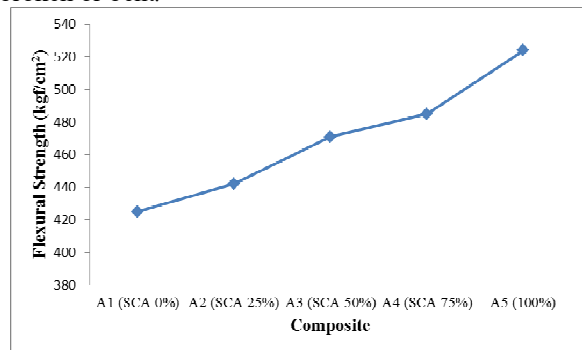


Figure III. Graphic of Composite Flexural Strength

TABLE II. COMPARATION RESULT WITH SNI 03-3527-1994 WOOD FOR BUILDING

Strengt h of Class	Density (gr/cm <sup>3</sup> )	Density Composit e (gr/cm <sup>3</sup> )	Flexural Strength (Kgf/cm <sup>2</sup> )	Flexural Strength Composit e (Kgf/cm <sup>2</sup> )
I	>0,9	1,17 – 1,32	>1221	-
II	0,6 - 0,9	-	795	-
III	0,6 – 0,6	-	437	425-524
IV	0,3 – 0,4	-	278	-
V	<0,3	-	<278	-

IV. CONCLUSION

Based on the research results, silane coatings have succeeded in increasing the bond between kenaf fibers, empty oil palm bunches and epoxy by increasing the amount of silane solution coated on the surface of the kenaf fiber composite and empty oil palm bunches. This can be seen from the increase in composite density. Composites in this study have fulfilled SNI SNI 03-3527-1994 type III strong class so that the kenaf composite and empty oil palm bunches can be used as an alternative to replace wood in buildings with high densities ranging from 1.1 - 1.3 g/cm<sup>3</sup>.

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# *Factors Related to the Use of the Long Term Contraception Method In Community Health Center of Langsung Pekanbaru*

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**Abstract—** The Long-Term Contraception Method is the best contraceptive method. It can be used for a long period of time, more than 2 years. In addition, it is effective and efficient for the purpose of using spacing more than 3 years of birth or terminating a pregnancy in a couple who do not want to have more children. The types of methods included in this group are steady contraception (male and female), implant, and IUD. The research respondents are women who have little knowledge about the Long-Term Contraception Method of 71 people (53.8%), low education of 69 people (52.3%), are <20 or> 35 years old as many as 90 people (68.2 %), low economic status of 83 people (62.9%). Furthermore, the role of the majority of health workers was less, 87 people (65.9%), and 102 people (77.3%) for the husbands who did not support. All 8 variables are significantly related, namely knowledge (p value = 0.005), education (p value = 0.0001), age (p value = 0.005), economic status (p value = 0.0001), the role of health workers (p value = 0.010), and husband's support (p value = 0.007). The final modeling of variables that are significantly related to the use of MKJP are education (p value = 0.03), age (p value = 0.03), economic status (p value = 0.04), education of the role of health workers (p value = 0.0006).

**Keywords—** MKJP Factors, Community Health Center of Langsung

## I. INTRODUCTION

The Long-Term Contraception Method (MKJP) is a contraception that can be used for a long period of time, more than 2 years. It is effective and efficient for the purpose of using spacing more than 3 years of birth or ending a pregnancy in a couple who do not want to have more children. The types of methods included in this group are the method of steady contraception (male and female), implants, and IUD (Novianti, 2011).

The use of MKJP has many advantages, both in terms of the program and in terms of the client (user). In addition to accelerating the reduction in the Total

Fertility Rate (TFR), the use of MKJP contraception is also more efficient because it can be used for a long time. According to Indonesian Demographic Survey in 2013, new Family Planning (KB) participants (PB) reached 210,480 acceptors (112.77%) with injectable contraception mix (103,651) or 49.24%, PIL 67,988 Acceptors (32.30%), IMPLANT 14,268 Acceptors (6.78%), CONDOM Acceptors (6.72%), IUD 7208 Acceptors (3.42%), MOW Acceptors (6.78%), and MOP of 269 Acceptors (0.12%).

According to data from the Pekanbaru City Health Office in 2016, the highest number of fertile age couples (PUS) in the Sidomulyo Community Health Center was 21,240 pairs, while the lowest was in Community Health Center of Langsung, 411 pairs.

There are many factors that influence a behavior. The following are the factors that influence a person in the choice of contraceptive methods, namely demographic factors (age, number of children, child sex). In addition, there are social structure factors (level of education, knowledge, religion, socioeconomic status, role models) as well as health resource factors (access to information, distance from health facilities, health workers) (Indriyani, 2014).

## II. METHOD

This research is a quantitative analytic-observational study with a type of case control study design. The population in this study was all PUS active KB acceptors in 2018 at the Community Health Center of Langsung. The sample in this study was 66 people (66 cases and 66 controls).



### III. RESULTS

This study involved 108 research samples who were willing to take part in a research on KB Long Term Contraception Method in LangsatCommunity Health Center. The following results are obtained:

#### A. Univariate Analysis

Univariate analysis is in data presented infrequency distribution table as follows:

TABLE 1  
UNIVARIATE ANALYSIS

Variable	Frequency		Percentage	
	n		%	
<b>Knowledge</b>				
Less	71		53,8	
Good	61		46,2	
<b>Total</b>	132		100	
<b>Education</b>				
Low	69		52,3	
High	63		47,7	
<b>Total</b>	132		100	
<b>Age</b>				
<20 or ≥ 35 years	90		68,2	
20-35 years	42		31,8	
<b>Total</b>	132		100	
<b>Economic Status</b>				
Low	83		62,9	
High	49		37,1	
<b>Total</b>	132		100	
<b>Role of Health Workers</b>				
None	87		65,9	
Any	45		34,1	
<b>Total</b>	132		100	
<b>Husband Support</b>				
None	102		77,3	
Any	30		22,7	
<b>Total</b>	132		100	

In the univariate analysis, it was found that the majority of mothers had low knowledge of 71 people (53.8%). The education of the majority of respondents was of 69 people (52.3%), the age of the majority of respondents <20 or> 35 years was 90 people (68.2%), the majority with low economic status were 83 people (62.9%), the role of the majority of health workers is less than 87 people (65.9%), and the majority of husbands who do not support as many as 102 people (77.3%).

#### B. Bivariate Analysis

TABLE 2  
BIVARIATE ANALYSIS

Variable	MKJP Users						(P Value)	OR/ (CI 95%)
	Cases		Control					
	n	%	n	%	n	%		
<b>Knowledge</b>							2,89	
Less	44	66,7	27	40,9	71	53,8	0,005 (1,42-5,87)	
Good	22	33,3	39	59,1	61	46,2		
<b>Total</b>	66	100	66	100	132	100		
<b>Education</b>							3,75	
Low	45	68,2	24	36,4	69	52,3	0,0001 (1,82-	

High	21	31,8	42	63,6	63	47,7		7,71)
<b>Total</b>	66	100	66	100	132	100		
<b>Age</b>								3,19
<20 or ≥ 35 years	53	80,3	37	56,1	90	68,2	0,005	(1,47-6,95)
20-35 years	13	19,7	29	43,9	42	31,8		
<b>Total</b>	66	100	66	100	132	100		
<b>Economic status</b>								4,19
Low	52	78,8	31	47	83	62,9	0,0001	(1,96-8,99)
High	14	21,2	35	53	49	37,1		
<b>Total</b>	66	100	66	100	132	100		
<b>Role of health workers</b>								2,83
None	51	77,3	36	54,5	87	65,9	0,010	(1,34-6,01)
Any	15	22,7	30	45,5	45	34,1		
<b>Total</b>	66	100	66	100	132	100		
<b>Husband support</b>								3,63
None	58	87,9	44	66,7	102	77,3	0,007	(1,48-8,91)
Any	8	12,1	22	33,3	30	22,7		
<b>Total</b>	66	100	66	100	132	100		

The results of bivariate analysis show that all variables totaling 8 variables were significantly related, namely knowledge (p value = 0.005), education (p value = 0.0001), age (p value = 0.005), economic status (p value = 0.0001), the role of health workers (p value = 0.010), and husband's support (p value = 0.007).

#### C. Multivariate Analysis

TABLE 3  
FINAL MULTIVARIATE MODELING

Variable	P value	OR	95% CI. For EXP (B)	
			Lower	Upper
Knowledge	0,35	1,55	0,62	3,89
Education	0,03	3,49	1,09	11,12
Age	0,03	3,40	1,14	10,12
Economic status	0,04	3,03	1,08	8,53
Role of health workers	0,006	6,23	2,18	17,79
Husband support	0,68	0,76	0,21	2,78

In this study, the results show that the final modeling of variables is significantly related to the use of MKJP, which are education (pvalue = 0.03), age (pvalue = 0.03), economic status (pvalue = 0.04), the role of health workers (pvalue = 0,0006). The husband's knowledge and support variable reentered into the model because it experienced a change in OR> 10% so that counfounding. The knowledge variable is counfounding with husband's education and support while the husband support variable is counfounding with age.

#### IV. DISCUSSION

##### A. Education

This study reveals that respondents with low education had a 3 times risk of not using MKJP compared to respondents with high education. This is in line with Pitriani's study (2015) that mothers with low levels of education are 23 times less likely to use an IUD than those with a high level of education. However, in this study the variable education is confounding with knowledge. This is due to the fact that a person despite having a high education but if not getting enough information will have low knowledge about MKJP contraception. This is in accordance with the results of Mahmudah and Indrawati's (2015) research that the lack of knowledge and communication with other acceptors and family planning officials makes acceptors less informed about the MKJP.

##### B. Age

The study results show that respondents aged <20 or> 35 years had a 3 times risk of not using MKJP compared to respondents aged 20-35 years. This result is in line with the results of a study conducted by Fitrianiingsih and Melaniani (2016) that age influences the selection of contraceptives in Health Center of Gading Tambaksari District in Surabaya. However, in this research, the age variable is confounding with husband support. This is due to the side effect of MKJP that makes husband uncomfortable in using the contraceptive method even though the respondent has age > 35 years. This is in line with research conducted by Setiasih, Widjanarko and Istiarti (2016) in which complaints in the use of MKJP are dealing with the condition when intercourse. The husband feels that his penis seems to be pricked by a needle and like hitting a wall. According to Wiknojosastro (2005) in Hartanto (2010), there are still many husbands who forbid their wives from using MKJP, especially the IUD because they think that the IUD reduces sexual pleasure. Contraception is not used by wives without the cooperation of husbands and mutual trust.

##### C. Economic Status

The results in this study demonstrate that respondents with low economic status had a 3 times risk of not using MKJP compared to respondents with high economic status. This study is in line with research conducted by Mahmudah and Indrawati (2015) that acceptors in poor family groups have the opportunity to choose non-MKJP contraceptive methods by 1.474 times greater than acceptors in non-poor groups. According to Istiawan (2013) in Mahmudah and Indrawati (2015), the high and low social status and economic conditions of the population in Indonesia will affect the development and number of family planning programs in Indonesia. The progress of the family planning program cannot be separated from the economic level of the community, because it is closely related to the ability to buy contraceptives used.

##### D. Role of Health Workers

This study also reveals that the low role of health workers had a risk of 6 times not to use the MKJP compared to the high role of health workers. This study is in line with Pitriani's (2015) study that mothers who lack the role of health workers are 8 times more at risk of not using an IUD than mothers who get the role of health workers. One of the roles of health workers in realizing family planning programs in the community is acting as a counselor. As counselors, the health workers are expected to guide women of reproductive age couples to find out about birth control and help women of reproductive age couples to decide which contraception to be used.

#### SUGGESTION

1. It is necessary to spread information on family planning services, especially MKJP contraceptives, both through health workers and cadres as an extension of health workers in the work area of the Langsat Health Center.
2. It is necessary to socialize MKJP contraception with the target of Fertile Age Couples, so that the MKJP is not burdensome to women but the information can also be obtained by the husband.

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# *Factors Related With Expectant Mothers to Take Antenatal Care In the North Kampar Health Center Working Area*

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**Abstract**— Antenatal care examination visit is an activity to check the condition of the pregnancy carried out by the pregnant woman to the place of the health care worker at least four times during pregnancy. In the working area of Public Health Center North Kampar the ANC coverage data decreased from 2014 to 2015, namely KI 86% and K4 71.83%. This study aims to determine the determinant factors associated with antenatal care examination visits. This research is quantitative observational analytic with analytic cross sectional design. With a population of 229 people and a sample of 194 people were taken by Systematic Random Sampling. Data analysis was performed univariate, bivariate with Chi Square test and multivariate with multiple logistic regression test. The results of this study showed the proportion of postpartum mothers who did not regularly visit the ANC was 91 people (46.9%). Multivariate results that were significantly related to regular ANC visits were parity p value 0.002 POR 2.620 (95% CI 1.430 - 5.506). The need for awareness of pregnant women on regular pregnancy checks to health workers and spacing or spacing the pregnancy to reduce the risk of pregnancy complications. Health workers also need to actively increase pregnancy visits through home visits if pregnant women do not conduct examinations.

**Keywords**—*Visit ANC, Parity, Public Health Center North Kampar*

## I. INTRODUCTION

Antenatal Care Examination Visit (ANC) is an activity of examining the condition of pregnancy carried out by pregnant women to the place of health care workers, namely general practitioners or midwives or nurses in preparation for delivery (1). The main purpose of antenatal care examination visits is to reduce maternal and perinatal morbidity and mortality, which until now has not been achieved, this is because there are still many pregnant women who do not visit antenatal care for various reasons. (2).

Ensuring the quality of Antenatal Care services needs indicators that state the visit of pregnant women, namely the scope of Visit 1 (K1) and Visit 4 (K4), where K1 is the first contact of pregnant women with health workers and K4 is the contact of fourth or more pregnant women with health workers to get antenatal care with distribution once in trimester I and II and twice in trimester III (3).

MMR can be prevented by conducting antenatal care checks. If a pregnant woman does not do a pregnancy check, it will not be known whether the pregnancy is going well or experiencing a high risk condition and obstetric complications that can endanger the lives of the mother and fetus, and can cause high morbidity and mortality (4).

Tura (5) reveals antenatal care visits conducted by pregnant women is influenced by several factors such as knowledge, attitude, educational level, parity, employment, economic status, husband's support and service quality antenatal care. The limited knowledge of the mother is one of the factors that influence the non-compliance of mothers in conducting antenatal care. Families with a sufficient economy can check their pregnancies regularly and plan for delivery well. Other factors such as the distance of residence away from health care places makes pregnant women lazy to check their pregnancy (6).

Based on the Indonesian Health Demographic Survey (7), 74% of pregnant women meet the government recommended visit schedule, but are still below the 95% target according to the Maternal Health Program. Achievement of coverage of pregnant women in urban areas (KI 85% and K4 93%) tend to be more concerned about having a pregnancy than rural pregnant women (KI 76% and K4 83%). Data on Indonesia's health profile in 2014 is also known, the coverage of K1 pregnancy examinations was 94.99% and K4 was 86.70%.

Data from the Department of Health found that from 12 districts in Riau Province, Kampar District experienced an increase in MMR from 18 cases in 2014 to 23 cases in 2015, and the achievement of ANC coverage decreased with 99.35% CC and 95.91% CC in 2014 became KI 91.91% and K4 86.12% in 2015 (8).

Local Area Health Monitoring Data for Children of Child Health District Health Service

Achievement of ANC coverage decreased from 2014 to 2015, ie 86% KI and 83% K4 to 81.00% KI and 71.83% K4. Even though the area has developed well, which consists of 8 villages (Sawah, Kp.Panjang, Sendayan, Naga Beralih, Sungai Jalau, Kayu Aro, Muara Jalai dan Sungai Tonang) each village already has a village midwife, but the community there is still found pregnant women who do antenatal care checks in several places, namely Desa Sawah, Sungai Jalau, dan Sungai Tonang. The low level of ANC visits in the North Kampar Health Center work area is related to the theory of behavior put forward by WHO. There are several factors that influence human behavior such as thoughts and feelings (level of knowledge, beliefs, attitudes, perceptions), reference groups (village heads, religious leaders, families, health workers), resources (facilities, money, time and energy), and way of life (habits and values) (9). The purpose of this study was to determine the determinant factors associated with antenatal care examination visits.

## II. METHODS

This type of research used in this research is observational quantitative analytic with Cross Sectional Study design. The sample in this study was post-partum mothers in January-September 2016 in the work area of the North Kampar Health Center as many as 194 people. Samples to be taken using systematic random sampling procedures.

The sampling procedure was carried out by selecting postpartum mothers in January-September 2016 in Public Health Center North Kampar. The type of data collected is primary data and secondary data. Primary data were obtained from filling out questionnaires for independent variables namely knowledge, attitudes, media information on husband / family support, support of health workers, parity, distance of residence, family income and education. Whereas secondary data was obtained from data of postpartum mothers in January-September 2016 in the Work Area of Public Health Center North Kampar for the dependent variable, namely the regularity of antenatal care visits.

Data processing is carried out in the stages of editing, coding, processing, cleaning and tabulating. Data analysis was performed, namely univariate analysis, bivariate analysis with chi square test and multivariate analysis with multiple logistic regression.

## III. RESULTS

The results of the univariate analysis of the independent variables that will be sought are related to the regularity of ANC visits to postpartum mothers in the work area of Public Health Center North Kampar, North Kampar District, Kampar Regency as follows: % of postpartum mothers had no information media, 31.4% of postpartum mothers had no husband / family support, 18% of postpartum mothers had no support

from health workers, 49.5% postpartum parity mothers were many, 22.7% long distance postpartum mothers, 37, 1% of postpartum mothers have low incomes and 21.1% of postpartum mothers with low education. From the results of bivariate analysis, there were 5 variables that were significantly related ( $p < 0.05$ ) with ANC visits, namely knowledge ( $p$  value = 0.008), attitude ( $p$  value = 0.033), husband / family support ( $p$  value = 0.009), parity ( $p$  value = 0,000), education ( $p$  value = 0.017) (Table 1).

Multivariate analysis carried out the first few stages, namely bivariate selection to find out which variables will be included in the multivariate modeling. Furthermore, counfounding checks ( $OR > 10\%$  change) by issuing a variable whose  $p$  value  $\geq 0.05$  gradually from a large  $p$  value. In this study, the final modeling results obtained significantly related to the ANC visit, namely parity (Table 2)

TABEL 1. FREQUENCY DISTRIBUTION AND FACTORS RELATED TO VISIT EXAMINATION OF PREGNANCY

Variable	Visit ANC					P Value	POR (95%CI)
	Do not do		Do		Total		
	N	%	N	%	n(%)		
<b>Knowledge</b>							
Low	19	70,4	8	29,6	27(100)	0,008	3,134(1,299-7,563)
High	72	43,1	95	56,9	167(100)		
<b>Attitude</b>							
Negative	37	57,8	27	42,2	64(100)	0,033	1,929(1,052-3,537)
Positive	54	41,5	76	58,5	130(100)		
<b>Information Media</b>							
There is no	7	70	3	30	10(100)	0,133	2,778(0,697-11,077)
There is	84	45,7	100	54,3	184(100)		
<b>Husband / family support</b>							
There is no	37	60,7	24	39,3	61(100)	0,009	2,255(1,214-4,190)
There is	54	40,6	79	59,4	133(100)		
<b>Health Staff Support</b>							
There is no	16	45,7	19	54,3	35(100)	0,876	0,943(0,453-1,966)
There is	75	47,2	84	52,8	159(100)		
<b>Parity</b>							
Many (>2)	58	60,4	38	39,6	96(100)	0,000	3,006(1,674-5,399)
a little (1-2)	33	33,7	65	66,3	98(100)		
<b>Distance of residence</b>							
Far	26	59,1	18	40,9	44(100)	0,066	1,889(0,955-3,737)
Near	65	43,3	85	56,7	150(100)		
<b>Family income</b>							
Low	32	44,4	40	55,6	72(100)	0,597	0,854(0,476-1,533)
High	59	48,4	63	51,6	122(100)		
<b>Education</b>							
Low	26	63,4	15	36,6	41(100)	0,017	2,347(1,152-4,781)
High	65	42,5	88	57,5	153(100)		

Source: primary data

TABEL 2. FINAL MULTIVARIATE MODELING

No	Independent Variable	P Value	POR	(95% CI)
1.	Knowledge	0,080	2,341	0,903 – 6,073
2.	Parity	<b>0,002</b>	<b>2,620</b>	<b>1,430 - 4,799</b>
3.	Distance	0,203	1,605	0,775 - 3,324
4.	Education	0,128	1,824	0,841 – 3,955

Source: primary data

In this study it was found that parity of the puerperal mother to the regularity of ANC visits can be seen from the POR value obtained of 2,620 (1,430–5,506). This means that postpartum mothers with parity have a lot of influence 3 times for irregular ANC visits compared to postpartum parity mothers. Parity is linked to cause and effect with ANC visits to postpartum mothers. The parity of postpartum mothers will influence the ANC visit 3 times compared to parity of postpartum mothers. It was found there is a confounding variable, namely distance to education, education to knowledge, knowledge to education. Postpartum mothers with a distance of residence far from health facilities will make it difficult for mothers to check their pregnancy, resulting in mothers becoming lazy or reluctant to check their health to health services, but for highly educated mothers will be more concerned to check their pregnancy even though the distance of residence is far from the facility health because with the high education of the mother, it is also good that the level of knowledge of the mother towards understanding health issues so that mothers with high knowledge will also be motivated to maintain their pregnancy by conducting regular antenatal care even though the mother has given birth more than once and the distance is no longer a barrier for mothers to check their pregnancy regularly. This study is in accordance with studies of Kakati, et.al, Wulandatika, Gitonga, and Ali, et.al (10) (11) (12) (13) that parity affects pregnant women to conduct antenatal care visits. The results of the study show that parity affects antenatal visits as it appears that as parity increases, mothers feel they have experience in pregnancy so that pregnancy visits are decreased (14). This is in line with the opinion of Zhao, et.al and Gross, et.al, Mukaromah (15) (16) (17) that women with high parity tend to rely on previous pregnancy experiences and do not feel or consider it important to utilize antenatal care examination visits. This agrees with other studies that have found that high parity has been found in many countries as a barrier to the use of antenatal care services (18) (19) (20).

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# *An Analysis of Environmental Value Losses as an Impact of a Palm Oil Mill in Rokan Hilir Regency*

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**Abstract**—This research aims to study and calculate the value of compensation for environmental damage resulting from palm oil mill effluent water in the Village of Sedingin and Teluk Mega Village, Tanah Putih District, Rokan Hilir Regency. The research location is in the vicinity of the Rokan River that passes through Teluk Mega Village and Sedingin Village, Tanah Putih District, Rokan Hilir. This research uses primary and secondary data. The calculation method used is a combination of Losses Due to Excess of Environmental Quality Standards calculation, Ecosystem value loss, and Foregone Income. Based on the results of the sum of several methods stated that the compensation value of Rp. 211,388,000.

**Keywords**—Environmental Value Losses, Ecosystem Value Loss, Foregone Income, Rokan Hilir

## I. INTRODUCTION

Ecosystem damage can have a negative impact on natural resources, biodiversity, and environmental services, and can cause harm to the country, society and each individual. In Indonesia, the estimated value of the loss is very large [1]. Environmental damage can occur due to logging, air pollution, river, and seawater pollution, as well as from industries that provide negative externalities.

This research focuses on water pollution, especially river water caused by the activities of palm oil mills or Crude Palm Oil (CPO) mills. The river is a natural channel on the surface of the earth that holds and channels rainwater from high areas to lower areas and finally empties into lakes or at sea. In the flow of water transported also sedimentary materials originating from the erosion process carried by the water flow and can cause siltation due to sedimentation where the water flow will lead to the lake or the sea [2]. Because of the growing number of population results in the development of industrial activities in general, making the river area vulnerable to change and damage [3]. Changes in land use are marked by increasing domestic, agricultural and industrial activities that will affect river water quality, especially waste [4].

Rokan River is one of the largest rivers in Riau Province. The river has a length of 350 km which is upstream in the Bukit Barisan and estuary in the marine waters of Rokan Hilir Regency. The river flows through

Rokan Hulu Regency and Rokan Hilir Regency, and along with the flow, there are various rubber and oil palm plantations, rubber, and palm oil mills and community settlements. This river is very vulnerable to pollution due to various activities.

This research is motivated by the alleged pollution in the Rokan River as reported by online media [5]. The community suspects that pollution is caused by palm oil mill effluents in the Tanah Putih District of Rokan Hilir Regency. Furthermore, the Local Government under the Department of the Environment instructed them to conduct research and calculate the cost of economic losses due to environmental damage.

In accordance with the background and instructions from the government, it is necessary to calculate the economic losses due to water environment pollution from the activities of the palm oil industry.

## II. METHODOLOGY

### A. Data Set

The population in this research is determined based on the area affected by pollution in accordance with the input and information from the relevant government agencies. The population observed was the community/household heads who lived and made a living by using the Rokan River as a source of livelihood (fishermen, fishing business owners, and cage fishermen). The community of Sedingin Village and Teluk Mega Village hereinafter referred to as the Rokan River user community. The respondent's limit is the household head has lived for more than 5 years in location.

In determining the sample size of the study determined by limiting the number of populations in the community who use the Rokan River as a source of livelihood, if the population <100 then the entire population will be sampled, whereas if the population > 100 then a sample is drawn. The technique used to determine the size of the sample can be calculated using the Slovin formula [6]:

$$n = \frac{N}{1+Ne^2} \quad (1)$$

Note: n = Total sample; N = Total Population; e<sup>2</sup> = margin error (10%)

Based on data monograph of Sedingin Village and Teluk Mega Village (2018) and calculations using (1), it is obtained a sample size of 89 respondents consisting of 74 respondents from Sedingin village and 15 respondents from Teluk Mega village.

### B. The Estimated Economic Value of Environmental Losses

#### 1) Losses Due to Excess of Environmental Quality Standards

Environmental pollution can occur due to non-compliance of companies or individual activities with the provisions of the legislation to treat waste and prevent environmental damage. Therefore, they are required to realize their obligations by building IPALs, IPUs, and other installations by operating optimally in accordance with the provisions of the law. If the person in charge of the company or activity does not carry out these obligations, it will cause harm to the environment and society. The loss value is calculated based on the minimum construction and operational costs. Furthermore, the calculation of pollution costs due to excess quality standards uses parameters of wastewater or liquid waste that are commonly used to calculate the cost of pollution along with the weight value per pollution unit of each parameter. This calculation refers to Ministry of Environment, *LH Regulation No. 7* [7].

The parameters of wastewater or liquid waste commonly used to calculate the cost of pollution along with the weight value per pollution unit of each parameter refer to Ministry of Environment, *LH Regulation No. 7* [7] adjusted to Ministry of Environment, *LH Regulation No. 5* [8] are COD, TSS, and Fatty oils. Next, the data used is sourced from the Company which is available during operations, and Environmental Department data that are relevant to the results of water quality measurements.

The calculation method based on the accumulation of pollution unit values refers to Ministry of Environment, *LH Regulation No. 7* [7]. The value of the pollution unit for each waste parameter and the base cost per pollution unit are determined based on the amount of pollution impact on the environment. The parameters of wastewater or liquid waste commonly used to calculate the cost of pollution along with the weight value per pollution unit of each parameter are as follows:

TABLE I. POLLUTANT UNIT VALUES

Parameter	Value of 1 Pollution Unit
COD	50 Kg
TSS	50 Kg
Oil & Grease	3 kg

\*The base cost per pollution unit is Rp. 24,750- [7]

In this method, the environmental burden and the danger level of various types of waste from various industries can be compared and understood. The total value of the pollution unit for each parameter in the

waste can be summed in the same unit, the Pollution Unit (PU).

#### 2) Ecosystem value loss

The method of valuing externalities is a function of environmental damage to economic impacts which states the added economic impact of each unit of environmental damage is called marginal loss [9]. Calculated components include the cost of biodiversity and the cost of genetic resources. The data collected is the base year price index of 2003 and the year price index of damage occurring in 2017. Data is obtained from the Central Bureau of Statistics.

Furthermore, the calculation formula is as follows:

$$CBD = BBD \times \frac{IH_t}{IH_d} \times LA \quad (2)$$

Note: CBD = Biodiversity Recovery Costs; BBD = Biodiversity Recovery Costs in Basic Years (Rp 2,700,000/ Ha); IH<sub>t</sub> = Price index in the year of damage; IH<sub>d</sub> = Price index basic year (2003); LA = Land area damaged (Ha).

$$C_{gen} = B_{gen_d} \times \frac{IH_t}{IH_d} \times LA \quad (3)$$

Note: C<sub>gen</sub> = Genetic Recovery Costs; B<sub>gen<sub>d</sub></sub> = Genetic Recovery Costs in Basic Years (Rp 410,000/ha)

By adding up (2) and (3), we get ecosystem value loss compensation.

#### 3) Forgone Income

Forgone income is the loss of income and alternative income caused by changes in economic activity due to pollution or environmental damage. There are several methods that can be used to calculate forgone income [10]–[12], one with the Fee losses approach. Fee losses are loss of revenue that should be received by the community or local government due to the cessation of economic activities caused by changes in the environment.

Data is collected and grouped base on the livelihoods of communities in the Rokan River, the average amount of income of the community before pollution occurs, and the amount of average income of the community after pollution occurs. Data collection at this stage was carried out by direct interviews with community leaders and fisheries actors in the Rokan River within the study area, as well as the Focus Group Discussion (FGD).

Furthermore, a quantitative analysis is carried out to obtain conclusions about the number of costs that must be incurred for compensation in the implementation of environmental dispute resolution.

Fee Losses formula as follows:

$$FL = FPU \times NU \times TU \quad (4)$$

Note: FL = fee losses; FPU = fee per unit; NU = Reduced number of units; TU = the amount of time the unit was reduced.



### III. RESULT AND DISCUSSION

#### A. Costs for building and repairing IPAL

A discrepancy in the value of water quality that is treated at the IPAL Installation Company with quality standards set based on Ministry of Environment LH Regulation No. 5 [8], so far it is suspected to have caused pollution to the Rokan River water quality. This is due to the ability of wastewater management in IPAL unable to treat the large volume of wastewater produced, besides the incompatibility of IPAL structures so as to allow leakage or ineffective wastewater treatment. Therefore, the Company is obliged to carry out repairs and rebuild its IPAL facilities in such a way that wastewater that is treated and flowed into the environment from these facilities meets the quality standards set by the government. Through discussions with the Company, several repairs and improvements to the IPAL facility have been determined, which generally consist of improvements to the structure of IPAL pool, increasing the capacity of sewage capacity in each pool, adding aerator pumps and distribution pumps, increasing the number of IPAL treatment pool.

Since 2018, the Company has implemented an environmental impact control system with the need for additional effluent treatment pool. The area of land for the construction of new ponds for wastewater treatment is around  $\pm 3$  Ha with a total capacity of IPAL pool reaching  $+ 70,000$  m<sup>3</sup>. Based on the calculation in Table 2, the cost to repair the IPAL installation is Rp. 1.12 billion.

TABLE II. ESTIMATED COST OF REPAIRING IPAL INSTALLATION

No	Description	Job volume	Unit	Unit Price (Rp)	Total Cost (Rp)
1	Repair of IPAL Pool Structure, pool no 1-7	40.000	M <sup>3</sup>	5,000	200,000,000
2	Add a new WWTP Pool, pool 8-9	27.000	M <sup>3</sup>	25,000	675,000,000
3	Extra machines aerator pump, the pipes support, and electrical installations 7 units	7	unit	35,000,000	245,000,000
<b>Total</b>					<b>1,120,000,000</b>

#### B. The cost of pollution load of COD, TSS, and Oil

From Table III, it can be seen that the average quality of wastewater treatment results from IPAL treatment still exceeds the quality standards for COD and TSS. These two parameters are used as parameters for the calculation of compensation due to exceeding government quality standards. The amount of compensation costs due to exceeding the government quality standard for the COD parameter is Rp 6,623,000. As for the TSS parameter of Rp. 352,000. Furthermore, oil and fat do not cause losses because

they do not exceed quality standards. Thus the total cost of compensation due to exceeding the quality standard is Rp. 6,975,000.-

TABLE III. ANALYSIS OF THE AVERAGE COD, TSS, OIL & FAT WASTEWATER FROM IPAL DURING JUNE 2017-AUGUST 2018

No	Parameter	Unit	Test result	Reference
1	COD	mg/L	515,6	350
2	TSS	mg/L	258,8	250
3	Minyak & Lemak	mg/L	12,9	25

#### C. Value of Compensation for Ecosystem Losses

TABLE IV. VALUE OF COMPENSATION FOR ECOSYSTEM LOSSES

Variable	LA	IHt / Ihd	Costs of Recovery Basic year (2003)	Cost of Recovery for Damage Year (2017)
Biodiversity Recovery (CBD)	60	1,10	2.700.000	178.097.061,16
Genetic Recovery (Cgen)	60	1,10	410.000	27.044.368,55
Total Compensation for Ecosystem Losses				205.141.429,71

Based on these calculations, the total value of ecosystem losses due to pollution is Rp. 205,000,000. Furthermore, in accordance with the administrative sanctions imposed by the local government to carry out fish restocking, the company has restocked fish in the Rokan River in the Sidingin Village and Teluk Mega Village on August 28, 2018, with details: (1) For Sedingin Village, 17,000 tails have been given fish seeds, consisting of 8,000 catfish, 5,500 tilapia, 3,500 tail gourami. (note: two bags (2,000) of dead catfish); (2) For Teluk Mega Village, 5,000 Fish, consisting of 2,000 catfish, 1,000 tilapia, and 2,000 tail catfish (of which 2,000 tails have been given to Pak Ijeh cages as a group of fishermen in Teluk Mega village); (3) Costs incurred by the company for the procurement of fish restocking activities are Rp. 64,000,000.

Thus the value of ecosystem losses due to pollution from companies that still have to be paid to the government is Rp. 205,000,000 less the cost of fish restocking that has been done in the amount of Rp. 64,000,000, so that the remaining is Rp. 141,000,000.

#### D. Value of community losses

The community losses that are counted are only the fishermen category, the choice of this category is based on work directly related to the Rokan River. The loss calculation is done in two steps.

Step 1, the calculation focuses on the number of fishermen from the field observations around the Rokan River, Sedingin Village, and Teluk Mega Village, which make fishermen the main livelihood, and totaling 45 fishermen, with an average monthly income of Rp. 2,076,667. Step 2, using a filter with the criteria of fishermen who have side income other than fishing and

is more valuable than fishing in one month, there are 37 fishermen with side jobs not exceeding the main income, with an average monthly income of Rp. 2,285,135, - and average income per week Rp. 571,284.

For the calculation of the fee losses period, it is used one month after the pollution, assuming that the Rokan River is an open channel and the water always flows. Then the calculation is used with a periodic reduction in time, which in the first two weeks of pollution results in disruption to the catch or does not get fish at all in other terms this condition results in a loss of 100% income. Meanwhile for the next two weeks using a calculation of 50% loss of normal income. The use of periodic calculations is consistent with the results of deep interviews conducted in the field.

Based on the above steps and the results of deep interviews in the field, the calculation of fee losses in detail is presented below:

TABLE V. FEE LOSSES CALCULATION RESULTS

No	Description	Result
1	Fee Loss for the first 2 weeks	FL = Rp. 571,284 × 37 × 2 week FL = Rp. 42,275,000
2	Fee Loss last 2 weeks (weeks 3 & 4)	FL = Rp. 571,284 × 37 × 2 week × 50% FL = Rp. 21,137,500
3	Sum of Items 1 + 2	FL = Rp. 63,412,500.- = Rp. 63,413,000 (rounded off)

#### IV. CONCLUSION

Based on the results and discussion, conclusions can be drawn from this research.

1. The value of the loss is caused by passing the environmental quality standard in the form of COD, TSS, and Oil pollution costs worth Rp 6,975,000.
2. The value of ecosystem losses due to pollution for the cost of Biodiversity Recovery (CBD) and Genetic Recovery (Cgen) of Rp. 141,000,000.

3. The value of community losses with foregone income with fee losses is Rp. 63,413,000. Therefore, the total value of environmental compensation is Rp. 211,388,000.

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# *It-Based: The Concept of SMME Equity Empowerment of Monitoring System Analysis*

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**Abstract**—*Small Micro Medium Enterprises (SMME) is a national economic support. It consists of micro, small, and medium enterprises through entrepreneurship it self. SMME has important role in reducing unemployment and poverty rate, providing vacancies, increasing prosperity, and constructing character of the nation. The small enterprise has some advantages compares to the medium one which are the capability of accommodating employee, local resources oriented, and flexible. Considering those points, SMME should be developed by including training in SMME field into account. There have been some coaching, training, and counseling related to SMME from various sources as in government and lecturers from particular educational institution. Furthermore, regarding the development of SMME, there are some problems that can be identified such as difficulties in looking for resource person who is suitable at his/her speciality in order to solve the problems in it, overlapping training, unsustainable training, no more further coordination between SMME and resource person after the training or workshop is done. All these problems generally happened because there is no accurate data and information regarding the kind of training that have been attended, SMME network, and What sort of problem that particular SMME face. This study identifies the concept of SMME equity empowerment of monitoring analysis IT-based, using extreme programming development approach. Starting by having an understanding on the process of business and identifying users' needs. Moreover, The framework in this case pictures how the system runs in a process of business based on users' needs. This analysis concept makes the development of system easier in the future.*

**Keywords**—*Analysis concept, monitoring system, agile method, Extreme Programming, SMME.*

## I. INTRODUCTION

SMME gives such a huge contribution on economic growth area in developed countries [1]. Global market does not only cause technology changing rapidly, but also SMME has to focus on innovation more so economy remains at how it should be [2]. Therefore, SMME has significance role in innovation [3]. Maintaining the competitiveness is complex due to some problems. [2]. Having the liberization exists, it triggers such intense competition among companies which is still in competitive way. [4]. The problem that should be considered is about SMME's effort in dealing with sustainable oriented innovation which is establishing business network with other organizations [5].

Furthermore, the process of innovation itself is not easy, most of organizations that involve in it are facing ton of problem. However, networking does exist for reasons, and one of which is helping smaller ones to solve their problem [6]. Establishing network among organizations creates an association that has mutualism symbiosis effect [7]. Taking national and international conference, symposium, and research laboratorium that supply small organizational collaboration facilities by providing a platform in which people can interact with competitors and discuss the problem faced for example.

Thus, the development of SMME is a prerequisite on economy growth [8]. As a result, One of the most essential step is facilitating SMME's development. There have been some workshops, training, and counseling related to SMME from various sources as in government and trainees from particular educational institution. Furthermore, regarding the development of SMME, there are some problems that can be identified such as difficulties in looking for resource person who is suitable at his/her speciality in order to solve the problems in it, overlapping training, unsustainable training, no more further coordination between SMME and resource person after the training or workshop is done. All these problems generally happend because there is no accurate data and information regarding the kind of training that have been attended, SMME network, and What sort of problem that particular SMME face.

This study aims to establish monitoring system in empowering SMME evenly in Batam. The system also serves as repository of empowering activities which have been attended by particular SMME, and provides resource person who is in accordance with his/her expertise in order to solve the problem in SMME itself.

System development requires a specific method that is capable of adapting with dynamic environment in order to build a system which has the capability of meeting the changing business enviroment based on users' needs. Users are the center of functional needs collection, and feedback on the changing needs [9]. One of the system development methods is well-known as agile. Based on the evaluation of 51 engineering practices which are collected from five IT companies regarding the comparison of various agile method. The

result revealed that agile method with Extreme Programming approach has been conducted quite a lot out of 51 practices in software engineering [10]. This study uses agile method with XP approach to establish and develop monitoring system of equitable empowerment of SMME in Batam. And then, the procedures include planning, constructing, coding, and testing. These procedures support the system development quickly. In addition, XP specifically emphasizing both team's process and responsibility by setting three process as in collective coding standards, collective code ownership, and continuous integration [9].

## II. LITERATURE REVIEW AND METHOD

### A. Literature Review

Previous study which was conducted by Tian (2018) specifically discuss about system monitoring design and its implementation for the installation of floatover. The study aimed conducting field monitoring in order to support the installation of floatover itself by using four subsystem design. Moreover, the study introduced Integrated Monitoring System (IMS) in data integration that all the information quickly and accurately received [11].

Top, OO and Onur D (2018) conducted a study about the application of assessment model by using agile method. The method was developed iteratively and systematically by conducting a case study simultaneously. The model was implemented at eight companies which are software developer. The finding showed that the use of agile method is effective to achieve expected goals [12]

Meanwhile, Konnola, et al (2016) investigated various problem in using agile method in industry area. The goal was to comprehend how to adjust agile method effectively, and developed the device itself. Comparing the result of first and last survey which was continued with an interview. As a result, the finding

revealed that the interdependency between developer's work was better, the visibility of all products increased, and the need for internal documentation reduced due to the improvement of communication.

### B. Agile Method

Agile method is a method to develop iterative and incremental software with shorter cycles development [10]. One of the approaches that exists in this method is Extreme Programming (XP). XP possess basic communication principle, practicality, feedback, and courage and compliance [14]. Furthermore, XP approach is started by comprehending the process of business, and identifying users' needs. And then, all those processes are divided into several cycles in accordance of users' needs which is handled by particular system development team. Next, make an iteration planning by prioritizing certain cycles. In system development stage, there might be improvisation as users needs change. For that, the iteration must be customized. As for the next step, testing is required in order to find out whether or not there is a mistake so it can be refined on the next iteration [15].

### C. SMME

Small business is an enterprise with net assets, excluding land and business buildings which is in total of Rp.200.000.000 (13.819 USD), and annual sales is about Rp.1000.000.000 (69.087 USD) at most. Meanwhile, Medium business possess Rp.200.000.000 – Rp.10.000.000.000 (690.859 USD) [16].

### D. Method

This study was conducted through several stages as it is showed in the figure 1 below.

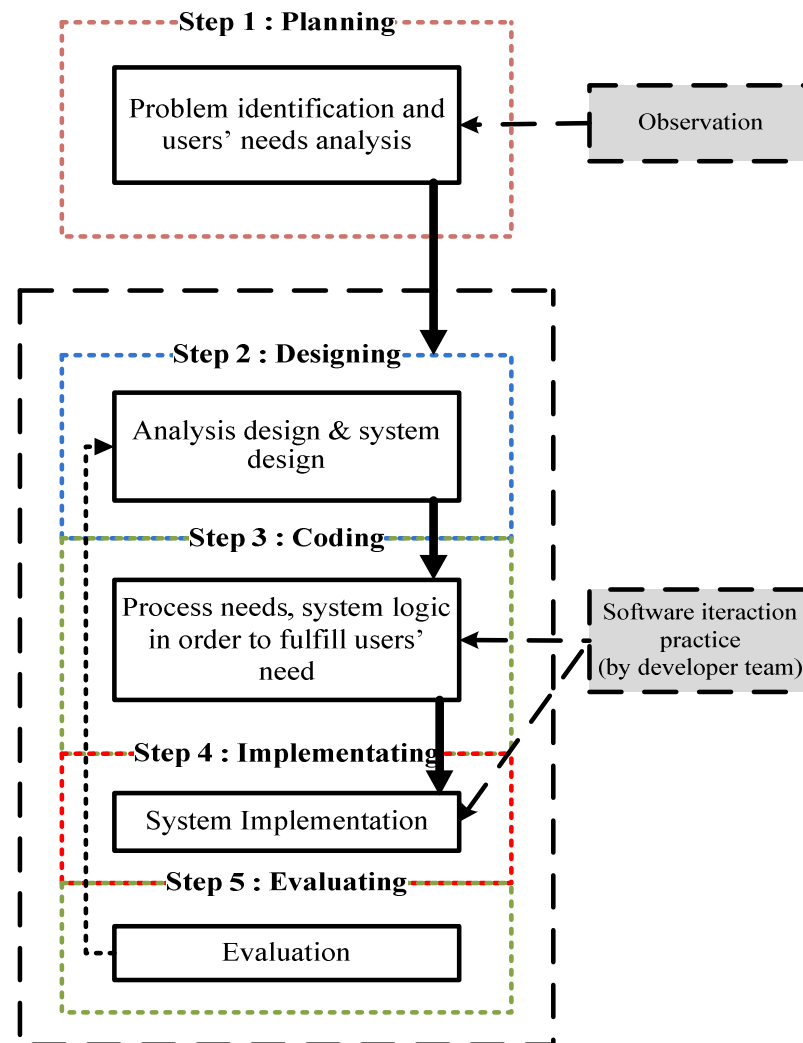


Figure 1. Research Procedures

Figure 1 above represents the procedures of this study which consists of planning, designing, coding, implementing, and evaluating.

1. **Planning** : Starting by gathering related information regarding users' needs which allow the researcher to comprehend a business context from an application. Elaborating the output, features, and function from the applications developed. This stage was executed by the leader and members of the study, along with the field workers as back up in collecting the data.
2. **Designing** : After planning, the researchers designed the system based on data gathered. The phase was conducted by leader and members of the study.
3. **Coding** : In this phase, coding is required on the system based on the process and system logic in order to obtain an expected output, and it is determined by leader and other members of the study. Moreover, staff of system developer were involved in this case.
4. **Testing** : Testing the features and function of the application. This is conducted by leader and

members of the study, along with application developers.

### III. ANALYSIS

#### A. Needs Analysis

The NA that was identified in this study are input, process, and output needs. First, input is mainly in the form of data socialization, training, workshop, and empowerment that have been participated by the SMME in the past, the biodata of resource person, data and problem that SMME face. Second, the process of helping SMME's participation. Bringing the SMME and its resource person who is expert in his/her field in order to help providing a solution based on the problem faced. Third, the output is in the form of data activities in which SMME has participated in, the problem faced by SMME, and the data of resource person.

#### B. Data Collecting Technique

The way the researchers collected the data in this study is using literature study. During the process, reading and understanding textbooks, journals, and

articles of agile metode with XP approach are required, and not to mention, system monitoring, and SMME related content too. Furthermore, Field study and direct interview between the researcher and particular SMME in Batam were applied in order to support the development of SMES empowerment distribution system.

#### IV. RESULTS AND DISCUSSION

The framework of the development of SMES empowerment distribution system in this study is agile method with XP approach, as the figure 2 illustrates below.

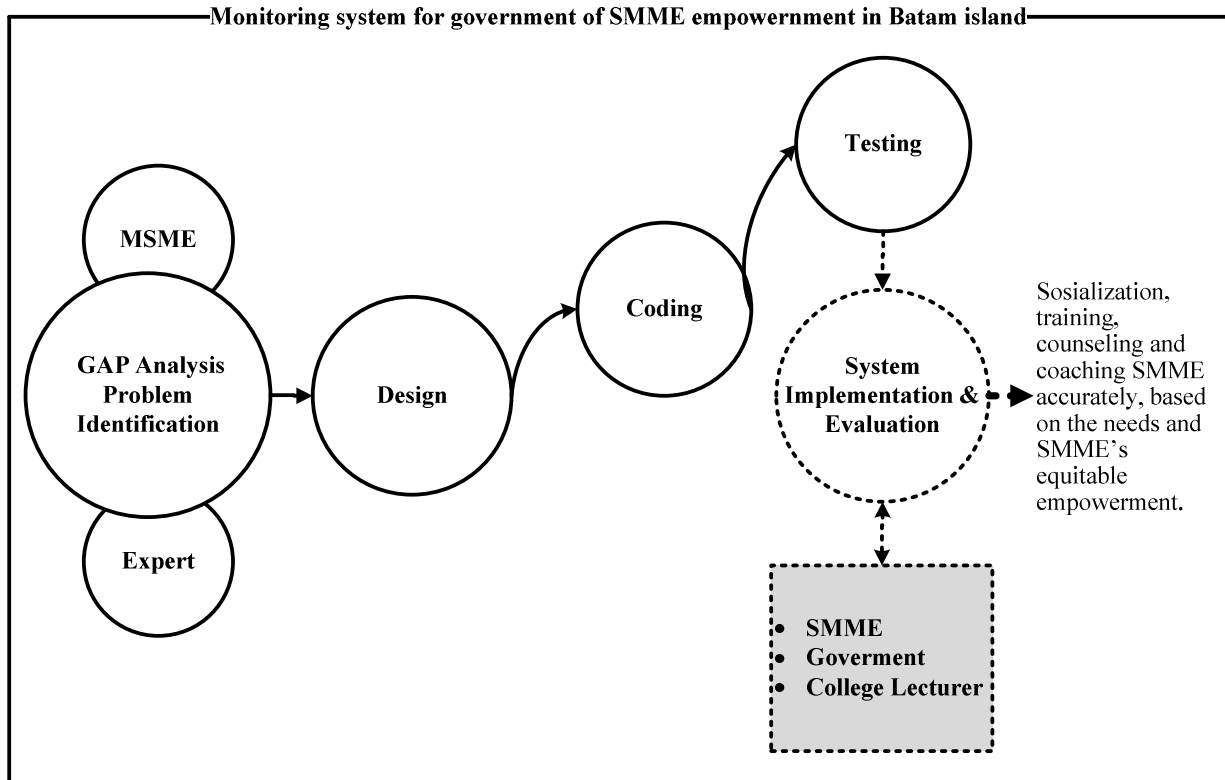


Figure 2. Framework of Monitoring SMME Empowerment Equity

Figure 2 illustrates that SMME empowerment distribution system acted as a bridge between SMME itself and other sources such as government, and lectures from particular educational institution who are holding social event, training, workshop, and empowerment on SMME. There are some information that is required in this case:

1. The resource person who wants to hold an event require specific information regarding SMME's needs or the problem faced so it is running accurately.
2. The resource person needs all the date regarding SMME's records in terms of preveious activities, so there will not be any overlapping one.
3. The SMME and the sources need more coordination on sustainable activities so it can keep growing.

4. The SMME needs all the data about resource person who are excellence in his or her field, so SMME itself is able to customize any needs.

All those information above can help the government in terms of policy making on SMME empowerment in Batam. Having identify which activities that have been participated in, the government can sort things out clearly, so the ones that have not received or participated in any training, workshop, socialization, and empowerment activities will be taken into account later on. The following figure 3 describes the framework of SMES empowerment distribution system.

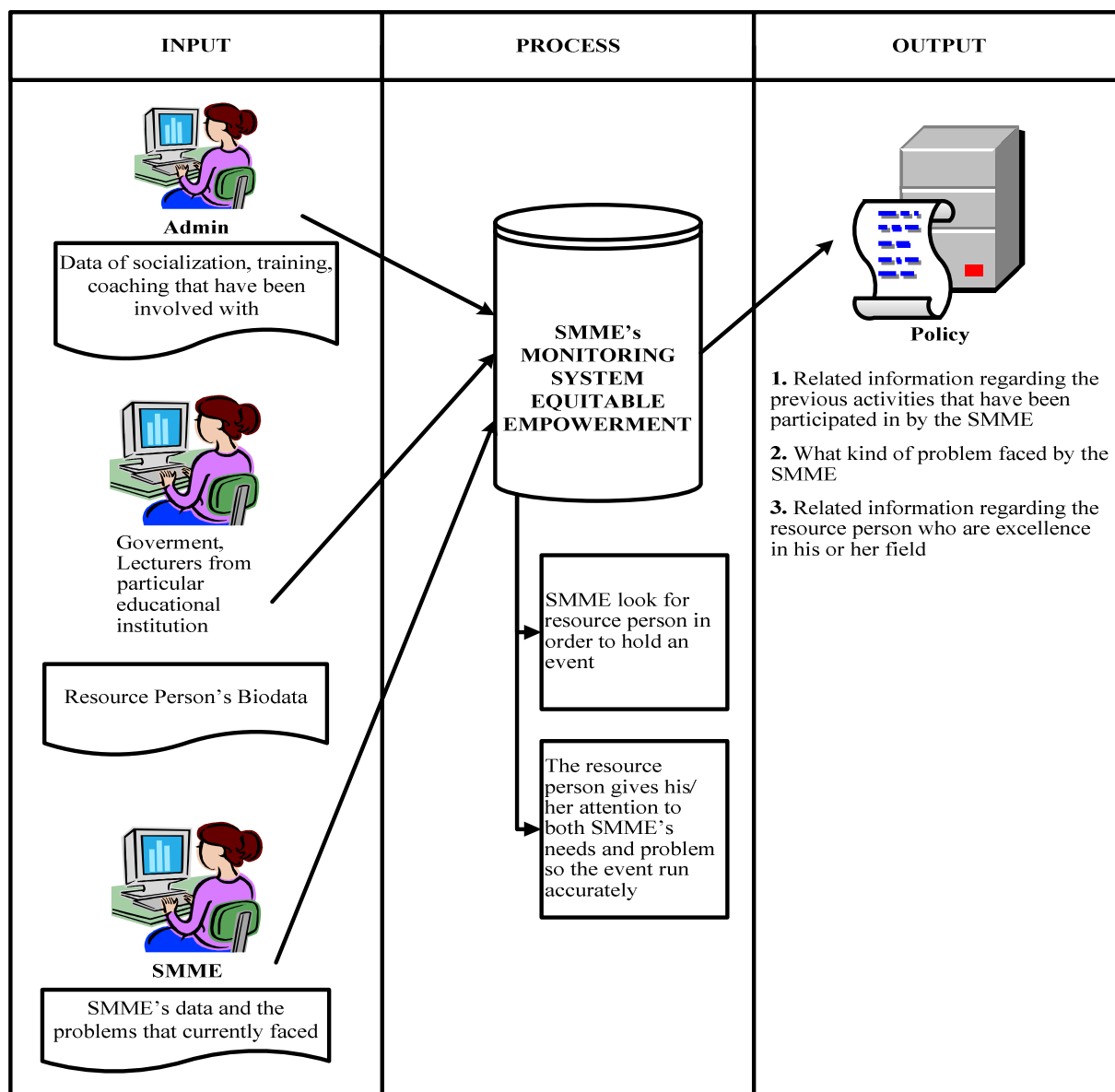


Figure 3. The Framework of SMME's equitable empowerment

### V. CONCLUSIONS

The concept of SMME's system monitoring equitable empowerment analysis IT-based in this study uses Extreme Programming (XP) approach. The approach itself was conducted by having understanding on the process of business and identifying users' need. The outcome of this study is a framework of SMME monitoring equitable empowerment system which describes how the system works on a process of business that is based on users' needs. The concept of analysis can make the establishment of the system a lot more easier in the future

### VI. SUGGESTIONS

For the next researchers, it is worth it to consider the development of concept analysis into account by adding another feature like questionnaire that can be administered to resource person. Every SMME that

participate in the activities can do this in order to build resource person's profesionalism through feedback.

### ACKNOWLEDGMENT

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# *Analysis and Implications of the Information Equity System Model for Coastal Communities*

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**Abstract**—Riau Islands Provincial Medium-Term Development Plan for 2016-2021, was explained that investment opportunities in Riau Islands began to get into coastal areas. For this reason, coastal communities are expected to be able to support the realization of these investments. In Batam City, there are still many coastal areas that are far from the city center, and are located on small islands. For communities in small islands, equal distribution of information is needed. The Batam City Government has tried to distribute evenly information through information technology, such as internet, that has get into small islands. But unfortunately, the existence of internet access on small islands has not been maximized. Although coastal communities have commonly used the internet through smartphones, the internet is still widely used only as entertainment such as playing online games, or social media. This study aims to develop a concept for system development that can be used to present information needed by coastal communities to increase productivity and quality of education for coastal communities. The system will show the informations that convenient with the needs of coastal communities. This system will be built with the Agile method with an extreme programming approach. The steps in this study begin with understanding the process of exchanging information that occurs in coastal communities, then identifying the needs of coastal communities. The results of this study are a framework for how the system can run to present framework will also facilitate the development of the system in the future.

**Keywords**—*Analysis concept, Android Application, agile method, Extreme Programming, Coastal Community.*

## I. INTRODUCTION

Indonesia has abundant natural resource potential from the sea, but this potential has not increased the prosperity of coastal communities. The amount of poverty in coastal areas and islands remains large. [1] The government through its programs has an important

role in improving the prosperity of coastal communities. [2] The use of technology is one of the strategies to increased the prosperity of fishermen. [3] The development of information technology-based systems supports fisheries management in coastal areas. [4] Through cellular phones which are now more popularly namely smart phones, fishermen can monitor weather forecasts to help with current weather uncertainties. [5]

Batam City, which is part of Indonesia, has a strategic area because it is directly conterminal to the State of Singapore. This causes the City of Batam to grow and develop rapidly. Unfortunately, the growth of Batam City is not accompanied by equitable development for its people. [6] Many coastal communities are marginalized due to settling on islands that are located far from the city center.

In Riau Islands Province Medium-Term Development Plan (RPJMD) for 2016-2021, it was explained that investors had the opportunity to invest in Riau Islands Province in developing enormous fisheries resources as an opportunity for the development of highly competitive fishery product processing industries, including tourism development. beaches, sea and small islands. To support this, coastal communities must also be developed and receive the same information in development.

The Batam City Government is trying to get people to access this information with the help of the internet. Through the internet, it is expected that coastal communities can access applications or websites so they don't miss out on information. So that equitable development continues. Unfortunately, even though in some areas has been supported by adequate internet access, its utilization is still lacking. Nowadays, internet is only used as a media of entertainment and communication.

Nowadays in some coastal areas observed by the research team, information on weather forecasting and

also education becomes an information need for coastal communities. This need is intended to increase the productivity of coastal communities, especially fishermen, and also improve the quality of education for students in the region.

This study aims to build an android application-based system for equitable information for coastal communities, especially those who live on small islands and already have adequate internet access. The system will provide information that convenient the needs of coastal communities.

In developing a system, a special method is needed that can adapt to a dynamic environment. The method must have the ability to produce a system with the ability to fulfill changes in the business environment that convenient the needs of users. Because users are central of functional requirements incorporation and feedback about changing needs. [8]

One of the most popular development methods is Agile. The Agile method has changed the practice of software development by emphasizing change tolerance, evolutionary delivery, and active end-user involvement [9]. Based on an evaluation of 51 software engineering practitioners from five IT companies that compared various agile methods, it was found that the Agile method with the approach of Extreme Programming approach was carried out quite a lot of 51 practices in software engineering. [10] The Extreme Programming approach is suitable for use because this approach can react quickly to changes in the planning. Responding to rapid changes is very important in software development. [11]

This research will use the Agile method with an extreme programming approach to build the concept of an Android application based system. Android is an open source platform that uses advanced hardware and software, with local data and servers. Android is easier to generate innovation and value for users. Although open source, Android is designed with multilayered security that provides the flexibility needed for open platforms. So that Android can be said as a complete core application. [7]

## II. LITERATURE REVIEW AND METHOD

### A. Literature Review

The research that conducted by Shaffrill, et al. (2015) found that cellular telephones have helped fishermen to improve fishermen's work productivity. One of the Fisher Friend Systems allows the fishing community to get information related to current weather and market information simply by sending a single button click request from the menu-driven client software on their mobile. Similar systems in Malaysia will improve the safety of fishermen, expand their networks and increase their incomes and such systems are expected to be accepted by fishermen when they receive something new that can benefit their daily lives. Second, as a response to minimal cellphone use for marketing purposes. Research also found that

cellphones contribute more to fishermen's social development than their economic development. [5]

The research that conducted by Zheng et al. (2016) states that nowadays the existence of information technology gives an important role in education sector, such as the stimulant of learning facilities and then sharing learning facilities. The results of this study indicate that the quality of the system, the quality of information and the quality of new IT services will directly affect access to user capabilities, further influencing the user's intention to use and user satisfaction, and then affect the realization of educational equality. [12]

Furthermore, research that conducted by Lubis (2018) found that domination of technology is one of the strategies to increase the knowledge and prosperity of society. This research was conducted on coastal communities. In addition to domination of technology, there are other strategies namely government policy, service quality, development of capital access, and construction of school facilities, construction of facilities and infrastructure, access to fisheries resources, and skills development. With the strategy of developing coastal construction that has been produced is expected to be a solution that needs to be implemented through a comprehensive strategy by placing socio-economic systems and cultural values that have been in the community as a stimulant factor for change. [3]

### B. Agile Method

Agile method is an iterative and incremental software development method with an emphasis on changing needs, user satisfaction, and team collaboration. This method is also a collection of best practices and also the principles of software engineering. The Agile approach can accommodate software development needs rapidly. [13] One of approach in this method is Extreme Programming (XP). XP is a software development approach that is floaty, more flexible and low risk. XP is more suitable for small and medium-sized teams. XP emphasizes user satisfaction. A fast response to feedback can reduce defects in the final product and also reduce costs for product manufacturing. [8], [13]. The XP approach starts from collecting user needs, then those needs will be divided into small cycles. The small cycle will be developed by each development team. After that, iterations will be planned for each small cycle according to user needs. Subsequently, testing will be conducted to obtain feedback and input on the next iteration phase. [10]

### C. Coastal Communities

Coastal communities can be described as a group of people living in coastal areas with a source of economic life depending on resources from the sea and the coast. Usually they consist of fishermen, fishermen workers, fish farmers, fish traders, fish processors, fisheries production suppliers. The coastal area can also be

mentioned as a place to collect fish and other resources that will be distributed to the mainland. [3]

#### D. Method

This research was conducted through several stages showed in the figure 1 below.

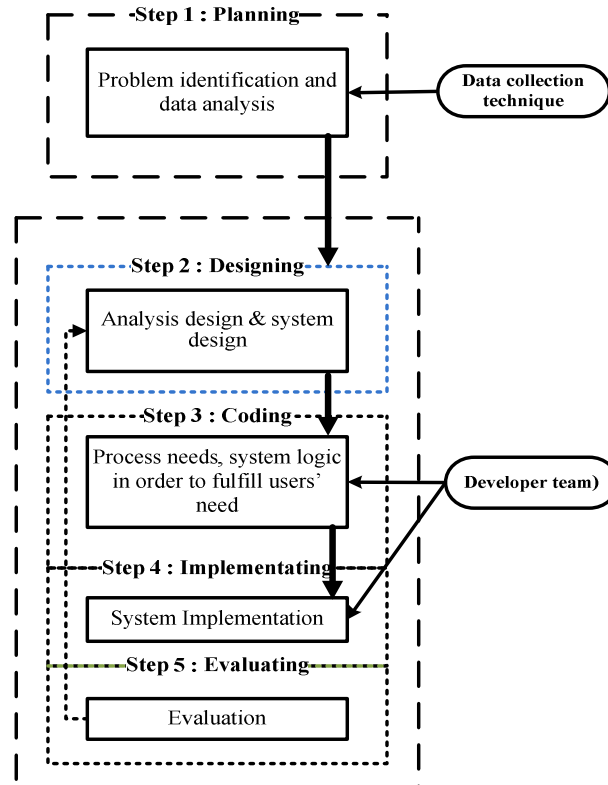


Fig. 1. Research Procedures

On figure 1, it can be seen that overall the development of this system starts from the phases of planning, design, coding, implementation, and evaluation. But in this article, it will be focused on the planning and design phases.

1. Planning: It is the initial phase, where the research team is assisted by survey officers to do the needs analysis through observation and interviews. At this phase, the research team will determine the output of the system, features, and functions that are in the system to be built.
2. Designing: After the planning process, the next phase is designing the system based on the data that has been collected and analyzed. The system design will produce an overview of the system model that will be designed along with its framework.
3. Coding: At this phase, the design that has been generated will be applied to become a system through the coding process using a programming algorithm. This phase will be supervised by a research team that will cooperate with the development team.
4. Implementation: After the system is made, then the implementation process of the system is then carried out to test the features and functions that exist in the application. At this phase, the research

team and the development team will jointly implement to the community. This process will repeat several times iterations and enough to fulfill the user needs.

5. Evaluating: This is the final phase of the research. At this phase, it will be done after the implementation to find out the evaluation of the use of the system that has been made.

### III. ANALYSIS

#### A. Needs Analysis

This needs analysis is the need for inputs, processes, and outcomes. Based on the results of observations and interviews which has been done the research team, the needs identified as input were information needs about weather forecasts to help fishermen go to sea in transitioning weather conditions as they are now, then needed information related to scholarships for students to continue to a higher level of education, and to keep in touch with island communities a discussion forum is needed that can be used as a means of sharing information. The system to be built, is planned to show information related to the needs that have been mentioned through an Android application system. As an output of this system are information that can be used

for the benefit of coastal communities. Furthermore, it also keeps the results of discussions for follow up to develop the next system.

### B. Data Collecting Technique

The techniques of data collection in this study are divided into several techniques, such as :

1. The literature studies used to study journals, books, seminar results, and also articles relating to Agile Method, XP Programming, and Application based Systems.
2. Observations and Interviews. The observations were carried out in 4 Islands, namely Belakang Padang's Island, Lenggang's Island, Sarang's Island, and Mecan's Island to see the use of

information technology for coastal communities. Then, the interviews were done with several people representing each island to complete the data related to the need for information distribution.

## IV. RESULTS AND DISCUSSION

Nowadays, the existence of the internet is accessible to coastal communities. The existence of the internet for coastal communities is widely used as an entertainment media and also communication such as in fig. 2.

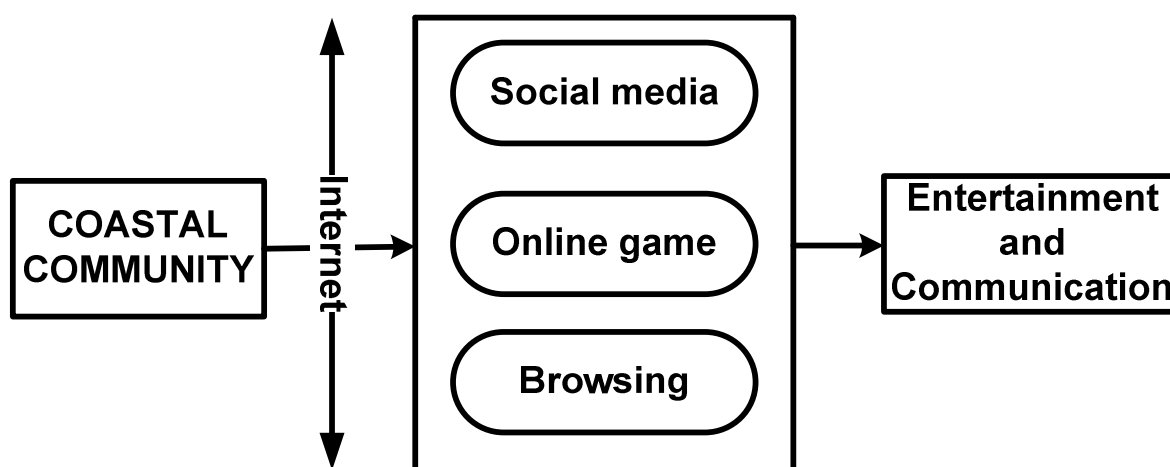


Fig. 2. Exciting Model of Using Technology

Figure 2 explains that currently coastal communities use the internet to access social media, online games, and browsing. Social media commonly used are Facebook, Instagram, Twitter, and YouTube. Whereas the commonly used chat application is WhatsApp. Internet access is also used to play online games for children and young people. Some also use the internet to find information usually related to school assignments. In general, the purpose of accessing the internet is for entertainment and communication.

Based on the results of interviews and observations of several things that researchers encountered related to the conditions of coastal communities and also the need for information, data was obtained that :

1. The habit of coastal communities accessing the internet is more dominant using application-based software, not websites.

2. The media that used to access these uses more smartphones.
3. The fishermen need information related to the weather forecast.
4. The students need information related to scholarships to be able to continue their education to a higher level.
5. The coastal communities also need media / forums to discuss in order to maintain communication between them.

According to the results of the interviews and observations that have been done, then this research proposes the concept of representing information that compatible with the needs of coastal communities such as

Figure 3.

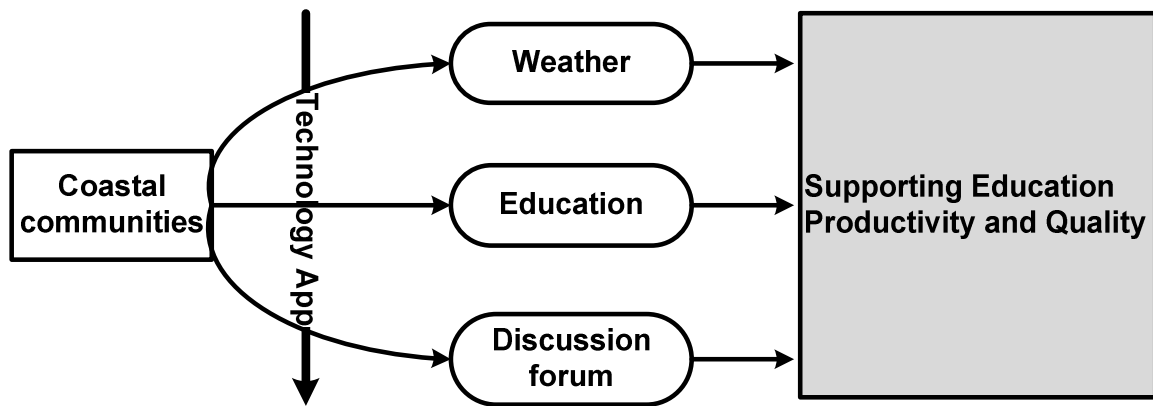


Fig. 2. Model of Equality Information System Android Based

Figure 3 illustrates that the system is designed based on application. The application will represent information such as the weather forecasts, information relating to education, i.e. scholarships, and also discussion forums. With the application, information will focus on the needs of coastal communities. Furthermore, the final goal of this application is to have a weather forecast, which will make it easier for

fishermen to go fishing. The scholarship information accessed by students of coastal communities will motivate them to overcome financial problems to continue to a higher level. Discussion forums can be used for communication between coastal communities. Next in Figure 4, the framework of the system will be explained.

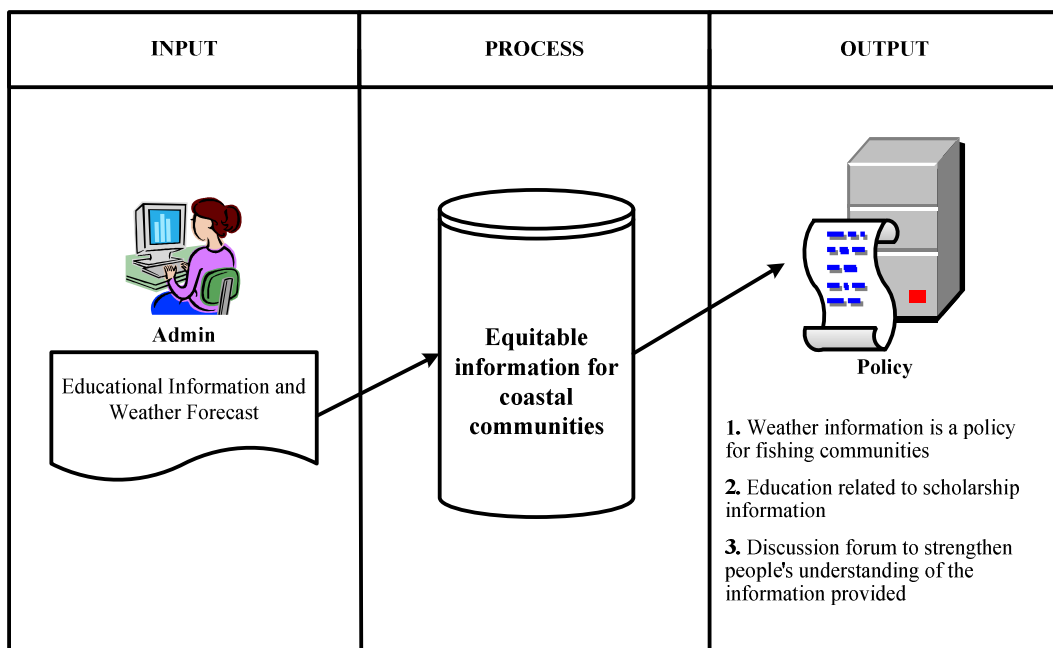


Fig. 3. The Framework of Equality Information System Android Based

### V. CONCLUSIONS

Analysis and Implications of the Information Equity System Model for Android-Based Coastal Communities in this study using the agile method. Agile method with the Extreme Programming (XP) approach. This research

begins by understanding the process of information exchange that occurs in coastal communities. Then identify the needs of coastal communities.

One of the outputs of the initial step of this research is the implications of the system model. Development of

this model is highly recommended to facilitate system development based on needs.

## VI. SUGGESTIONS

For the next researchers, it is worth it to consider the development of concept analysis into account by adding another feature like questionnaire that can be administered to resource person. Every SMME that participate in the activities can do this in order to build resource person's professionalism through feedback.

## ACKNOWLEDGMENT

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# *The Effect of Oxytocin Massage to Breastfeeding Production of Breastfeeding Mothers*

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**Abstract**—Oxytocin massage is a massage that aims to provide comfort to the mother so that it does not inhibit the secretion of the hormones prolactin and oxytocin in producing milk. This massage is done by massage along the spine (vertebrae) to the fifth or sixth costae bone. The purpose of this study is to find out the effect of oxytocin massage on breast milk expenditure in breastfeeding mothers. This type of research is quantitative with Quasi Experiment design. The population is all breastfeeding mothers in BPM Khairani Asnita from February to March 2016 with 17 samples of the experiment and 17 samples of the control. Bivariate data analysis uses nonparametric test, namely Wilcoxon. The results showed that milk production before and after oxytocin massage with pvalue of 0.004 meant that there was a significant influence on oxytocin massage given to breastfeeding mothers before oxytocin massage with after oxytocin massage. It is recommended to midwives to promote oxytocin massage and teach oxytocin massage to the class of pregnant women and motivate the participation of the husband to succeed in exclusive breastfeeding.

**Keywords**— *Oxytocin Massage, Breastfeeding Production, Breastfeeding Mothers*

## I. INTRODUCTION

Women have a very important main role in building healthy families and are able to give birth to a generation of people who are healthy and have character. The Minister of Health emphasized the importance of women in providing exclusive breastfeeding, complementary food, for the optimization of their child's growth and development. Women must be healthy because they have the demand to be able to give birth to a quality generation (1). This effort must be done since adolescents so as not to be anemic, then in the first 1000 days of life which is 270 days of pregnancy and 730 days of infants from birth to age 2 years. Until now the scope of exclusive breastfeeding is still low. Data from the Ministry of Health noted that the number of early breastfeeding initiations (IMD) in Indonesia increased from 51.8 percent in 2016 to 57.8 percent in 2017. Despite the

increase, the figure is still far from the target of 90 percent (2). The low practice of exclusive breastfeeding is due to lack of maternal knowledge, socio-cultural factors, lack of information about exclusive breastfeeding and lactation counseling from health workers and the strong promotion of formula milk in modern/private health service facilities (3).

In addition, about 80% -90% of milk production (ASI) is determined by the emotional state of the mother, because this is related to the oxytocin reflex in the form of thoughts, feelings and sensations. If this increases, it can expedite ASI production (Ramadani & Hadi, 2009 (4). Therefore, there is a need to issue milk for some postpartum mothers. In the effort to remove ASI, there are 2 things that affect production and expenditure. ASI production is affected by the hormone prolactin while expenditure is influenced by the hormone oxytocin. The hormone oxytocin will exit through stimulation to the nipples through sucking the baby's mouth or through massage on the baby's spine. By doing massage on the spine, the mothers will feel calm, relaxed, increase the pain threshold and love her baby, so that the hormone oxytocin is released and breast milk comes out quickly (5).

Oxytocin massage is massage along the spine (vertebrae) to the fifth-sixth costae bone and is an effort to stimulate the hormone prolactin and oxytocin after childbirth and can provide comfort to the mother with the aim that breast milk can come out (6). Through massage or stimulation of the spine, the neurotransmitter will stimulate the medulla oblongata directly sending messages to the hypothalamus in the posterior hypofise to release oxytocin, causing the breast to pass milk. This spinal area massage will also relax tension and relieve stress, so the hormone oxytocin is released that will help release milk, aided by baby sucking on the nipples immediately after the baby is born as a normal baby (7)

In Riau Province the percentage of exclusive breastfeeding in 2012-2016 has decreased. The percentage of exclusive breastfeeding in infants 0-6

months in Riau Province in 2016 was 56.2%, lower than in 2015 (68.8%), whereas the target of exclusive breastfeeding coverage in Riau Province in 2016 was 80%. The highest coverage of exclusive breastfeeding in the regencies/cities in 2016 was Rokan Hilir Regency at 81.57%, Dumai City at 73.97%, and Siak Regency at 72.65%. On the other hand, the City of Pekanbaru is 50.67%, and this target coverage is still low (8).

Based on data obtained from the Pekanbaru City Health Office, the Sidomulyo Health Center RI is one of the Health Centers with the most visits by maternal and postpartum mothers, namely 2911 maternity and postpartum mothers and has a low coverage of exclusive breastfeeding (9). BPM Khairani Asnita is one of the most visited BPM maternity and postpartum mothers who are in the work area of the Sidomulyo Health Center RI, 60 people in the past 6 months as well as the postpartum mothers. It was found that 15 out of 20 postpartum mothers experienced lactation and breastfeeding problems. The majority of problems experienced by these mothers are the absence of breast milk on the first day until the third day post partum. As a result, newborns who are supposed to get early breastfeeding will be delayed and alternatively given formula milk so that it fails to provide exclusive breastfeeding.

## II. METHODS

This type of research is a quantitative study with a Quasi Experiment design using pretest-posttest with control group to figure out the effect of oxytocin massage on milk production in breastfeeding mothers.

The study was conducted at BPM Khairani Asnita in 2016 starting in February-March 2016. The population in this study was all breastfeeding mothers at BPM Khairani Asnita from February-March 2016 with an experimental sample of 17 people and a control sample of 17 people with the inclusion criteria of having babies born with aterm and no physical defects such as cleft lip. The sampling technique uses consecutive sampling techniques, and bivariate data analysis is with the Wilcoxon test.

## III. RESULTS

TABLE I. MILK PRODUCTION OF BREASTFEEDING MOTHERS BEFORE AND AFTER OXYTOCIN MASSAGE AT BPM KHAIRANI ASNITA PEKANBARU IN 2016

Before oxytocin massage	Milk Production						P value
	After oxytocin massage						
	Not increased		Increase		Total		
	F	%	F	%	F	%	
Less	4	23,5	4	23,5	8	47,1	0,046
Much	0	0	9	52,9	9	52,9	
<b>Total</b>	4	58,3	13	41,7	17	100	

Table 1 shows that of the 8 respondents who had less milk before oxytocin massage, then experienced increased milk after oxytocin massage by 4 respondents (50%). Furthermore, from 9 respondents

who had a lot of breast milk before doing oxytocin massage, then experienced increased milk after oxytocin massage by 9 respondents (100%). After doing statistical tests with Wilcoxon, the p-value is 0.046 ( $p < 0.05$ ), which means that  $H_0$  is rejected and there is a difference in milk production before and after oxytocin massage for breastfeeding mothers at BPM Khairani Asnita Pekanbaru in 2016 (Table 1).

This study is in line with Kiftia Research (10), in which the results of the research hypothesis p-value is  $0.001 < 0.05$ , which shows a significant difference in the average value before and after oxytocin massage therapy. It can be concluded that this oxytocin massage therapy is effective to be used in mothers with 4-10 days postpartum.

Oxytocin massage that is done will provide comfort to the mother so that it will provide comfort to the breastfed baby. Physiologically it increases the hormone oxytocin which is sent to the brain so that the hormone oxytocin is released and flows into the blood, then enters the breast, causing the muscles around the alveoli to contract and make milk flow in the milk channel. The hormone oxytocin also makes the milk channel wider, making milk flow more easily (11). Widia and Meihartati (12) explained that in addition to being influenced by the baby's suckling while breastfeeding, the baby's sucking also affects the release of the hormone oxytocin in the ductal system. When the channel is dilated or softened, oxytocin is secretly reflected by the pituitary to extract milk from the alveoli. After delivery, the effects of estrogen and progesterone suppression on the pituitary disappear, and the effect of the hypophysical hormones reappears, including prolactin. The breasts, which have been prepared during pregnancy, become affected, causing the breast glands to contain milk. ASI production will become faster and more abundant when stimulated as early as possible by breastfeeding.

The research of Kurniati, Bakara and Susanti (13) also showed that there was an influence of oxytocin massage using lavender essential oil with smooth milk production in postpartum mothers with  $P < 0.05$ . Massage on the spine can increase lactation in all assessed parameters. Therefore, it can be recommended for all breastfeeding mothers, especially those who have problems with IMD and breastfeeding. Importantly, this is a simple method that can be implemented (14). Therefore, the midwives need to teach oxytocin massage to mothers from the start of pregnancy through the class of pregnant women and husband's support in motivating mothers to provide exclusive breastfeeding through oxytocin massage. This is consistent with Asih's research (15) regarding the influence of oxytocin massage on milk production in BPM Lia Maria Sukarame District Bandar Lampung in 2017 because doing oxytocin massage can stimulate the hormone oxytocin which functions in the release of breast milk. In terms of employment, most respondents do not work that can allow them to carry out oxytocin massage both by the husband in the morning and evening or carried out by the family. This shows that the role of the husband greatly influences the mother's effort in providing exclusive breastfeeding.



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# *SO2 Pollutant Distribution Model Using Gaussian Method for Multiple Point Sources (Case Study in PLTMG Duri)*

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**Abstract — Duri Machine and Gas Power Plant (PLTMG) is a company, built by the State Electricity Company (PT PLN) in Riau Province. This PLTMG deploys High Speed Diesel (HSD) and Liquefied Natural Gas (LNG) fuel. In this research, a SO2 pollutant distribution model from 4 active chimneys in PLTMG Duri has been made by using Gaussian dispersion. The results of the model show that SO2 Emission from HSD fuels have higher concentrations than in HSD fuels. The highest concentration at 2m receptor height occurs at a distance of 250 m from the chimney. The concentration of SO2 emissions in the air produced by PLMTG Duri is still below the quality standard (PP No. 41 of 1999).**

**Keywords—Gaussian, SO2, Multiple Point Sources, Model**

## I. INTRODUCTION

Sulfur dioxide SO2 is a pollutant from industrial sources that acts as a precursor of sulfuric acid H2SO4, a colorless gas causing flavor when the concentration is 0.3 ppm and produces a strong odor at a concentration level which is greater than 0.5 ppm, a component of aerosol particles that affects acid deposition, global climate, and the global ozone layer. The main sources of SO2 are coal-fired power plants, burning fossil fuels, volcanoes and other industrial sector resulting in additional emissions in the air [1]

The Machine and Gas Power Plant (PLTMG) is one of the companies built by the State Electricity Company (PT.PLN) which is tasked with supplying and managing electricity power, much needed to support human life. This fossil fuel uses High Speed Diesel (HSD) and Liquefied Natural Gas (LNG) is a fossil fuel which can produce exhaust gases such as sulfur dioxide (SO2), nitrogen dioxide (NO2), methane and carbon dioxide (CO2).

Gauss Dispersion Model is one of the calculation models that is widely used to simulate the effect of emissions. This can be included in the calculation of physical variables and contribute more detailed information about the source of contamination. This was reflected under the study of [2] modeling the

distribution of pollutants in gaussian method conducted by Fazrol Rozi, (2016) about the Pattern of Chimney Emission Distribution Case Study of PT. Semen Padang Indarung West Sumatra Indonesia. The study used Gaussian Multiple Point Sources method with SO2 emissions [3]. Ardi Rahmadani, (2017), modelled such Multiple Point Sources Air Pollution in the Cement Industry in Tuban, East Java, by using Gaussian method with particulate (dust) emissions [4].

PLTMG in Duri is one of Power Plants in Riau Province. Several studies on emissions produced by such PLTMG include Yulia and Sri (2014) found that the CO2 Direction and Concentration in the Chimney of the PLTMG apparently adopted Gaussian method [5]. In 2016, Yulia and Sri continued their research by simulating the direction of distribution and calculating CO, NO2, SO2 and Particulate emission levels from Single Point Sources chimneys [6]. In this study SO2 pollutant modeling was developed by using Gaussian method of all Duri PLTMG chimneys (Multiple Point Sources).

## II. THEORETICAL BACKGROUND

### A. Emission Rate

To determine the rate of exhaust emissions, it is by multiplying the Emission Factor (FE) with the amount of fuel used by an activity (A). Emission factor shows the estimated amount of pollutants to be emitted by each unit component of the activity from an emission source.

$$Q = FE \times A \tag{2.1}$$

$Q$  = Pollutant emission rate  
 $FE$  = Emission factor  
 $A$  = the amount of fuel used in an activity

B. Wind Direction and Speed

Wind speed is normally measured at standard height, which is 10 meters. For modeling data, wind speed data at the emission release height is needed. To get wind speed at removable height, the following formula is used:

$$u = u_{10} \left( \frac{z_e}{10} \right)^p \dots\dots\dots(2.2)$$

*u* is the wind speed at the height of the chimney, *u10* is the wind speed at an altitude of 10 meters, *ze* is the height of the chimney, and *p* is the land surface roughness constant in accordance with the land use conditions of an area at an altitude of 10 meters (for rural areas constant 0, 07 is used in classes A and B, 0.10 for class C, 0.15 for class D, and 0.35 for classes E and F), and *Ze* is the height of the chimney at ground level.

C. Atmospheric Stability

Atmospheric stability is a method used to classify the atmosphere's ability to thin and digest air. Atmospheric stability shows the degree of air turbulence in the vertical direction. The air condition becomes unstable when there is vertical mixing. This happens when solar radiation is strong (daytime) and wind speeds are low. Absorption of solar radiation causes the earth's surface to heat up so that it warms the layers of air near the earth's surface. This warm air will increase and cause vertical mixing. Stable conditions occur when the surface of the earth is cooler than the air above it (such as on a clear night) [7].

Atmospheric stability according to Pasquill Giffort is classified into six classes, class A to class F. Class A is intended for the most unstable air conditions, class B is unstable, class C is slightly unstable, class D is neutral, class E is somewhat stable and class F is stable. The class of atmospheric stability during the day is more determined by wind speed and the level of sunlight radiation (in-solation). Whilst, the class of atmospheric stability at night is more determined by wind speed and cloud cover.

D. Koefisien Dispersi

Horizontal ( $\sigma_y$ ) and vertical ( $\sigma_z$ ) dispersion coefficients are pollutant dispersion parameters, which are the coefficient of distance function from pollutant sources in the dominant wind direction towards various classes of atmospheric stability. For the calculation of horizontal and vertical dispersion, it should be adjusted to the conditions in the field, which should be adjusted to the wind speed and the stability of the atmosphere. According to Fasquill-Gifford, the horizontal constant is expressed as

$$\sigma_y = \alpha x^{0.894} \dots\dots\dots(2.3)$$

and the vertical dispersion constant is expressed as

$$\sigma_z = cx^d + f \dots\dots\dots(2.4)$$

Values *a*, *c*, *d*, and *f* depend on the stability of the atmosphere whose numbers are in accordance with Table 2.2. To determine the class of atmospheric stability A, B, C, D, E and F, the calculation depends on the surface wind speed, sunlight and the degree of clouds.

E. Plume Height

Plume height is a vertical and horizontal plume movement from the source. To determine the height of a puff of smoke is by using Equation 2.5, which is the height of the puff will decrease with an increase in wind speed, in other words the height of the puff ( $\Delta h$ ) is inversely proportional to the speed of the wind.

$$\Delta h = \frac{v_s \cdot d}{u} \left( 1,5 + 2,68 \cdot 10^{-3} \cdot P \left( \frac{T_s - T_0}{T_s} \right) d \right) \dots\dots(2.5)$$

Where the velocity of the gas exits the chimney (*vs*) in m/sec, the top diameter of the chimney (*d*) in meters, the wind speed in the chimney (*u*) in m / sec, Atmospheric pressure (*P*) in mb (1 atm = 1,103 mb), temperature flue gas exits (*Ts*) in OK, atmospheric air temperature (*T0*) in OK.

The effective height of the chimney (*H*) as in Figure 2.1 is the sum of the height of the puff smoke ( $\Delta h$ ) with the actual height of the chimney (*h*).

$$H = h + \Delta h \dots\dots\dots(2.6)$$

F. Gaussian Method on Multiple Point Sources

Multiple Point Sources modeling is an accumulation of several sources that are considered as sources of emissions. If the distance of each chimney is more than 100 m point stated as area sources, and if the distance of each chimney point is less than 100 m and emissions are less than 20%, then it can be called a multiple point source [8]. Calculation of multiple point source models can be calculated by using a single point source model calculation after which accumulated emissions from several sources in a receiver.

$$C(x, y, z; H) = \frac{Q}{2\pi \sigma_y \sigma_z u} \exp \left[ -\frac{1}{2} \left( \frac{y}{\sigma_y} \right)^2 \right] \left\{ \exp \left[ -\frac{1}{2} \left( \frac{z-H}{\sigma_z} \right)^2 \right] + \exp \left[ -\frac{1}{2} \left( \frac{z+H}{\sigma_z} \right)^2 \right] \right\} \dots\dots\dots(2.7)$$

Where *C* expresses the concentration of air quality parameters in units of mass per cubic meter, *Q* represents the pollutant emission rate expressed in units

of micrograms per second.  $\sigma_y$  is the dispersion coefficient horizontally with respect to the x axis and  $\sigma_z$  for the dispersion coefficient vertically with respect to the x axis, both of which are expressed in meters (m), u is the velocity of the chimney in meters per second, while H is the effective height of the chimney, and z is the height of the receptor (impact receptor) above ground level.

The assumptions used in this model include:

1. Pollutant emission rates are considered relatively constant.
2. The average wind speed and direction are constant.
3. The chemical properties of the compounds released are stable and unchanged in the air.
4. The area around the source of pollutants is flat and open.

### III. METHODOLOGY

#### A. Determination of Variables

This data was taken from January to February in 2019. To make a gaussian method, equation 2.7 is used, the data needed is industrial source data (PLTMG) and meteorological data (BMKG Sultan Syarif Kasim II Pekanbaru). This requires chimney data from industrial sources which can calculate the SO<sub>2</sub> emission rate, the effective height of the chimney, and smoke height and average wind speed. It determines the level of atmospheric stability in accordance with meteorological conditions and calculates the values coefficient of vertical dispersion ( $\sigma_z$ ) and horizontal ( $\sigma_y$ ).

#### B. Data Collection

In collecting the data, it requires industrial data and meteorological data. The data used in this study are PLTMG data derived from data on the amount of LNG and HSD fuel, chimney diameter, chimney tower height, release temperature and velocity.

Calculating SO<sub>2</sub> Concentration Value includes determining the concentration of pollutants at several points and making a map of pollutant distribution. Concentration calculations at several receiving points are based on the level of emissions produced by each stack, thus the concentration values at the same receiving point are accumulated. Following are the steps to Calculate SO<sub>2</sub> Concentration Value Accumulation, such as:

- a. Calculation of emission rates originating from chimneys of known diameter width, and emission discharge rates.
- b. Calculate the effect of meteorology on the process of pollutant dispersion in the atmosphere. The dispersion process is influenced by the state of vulnerability, wind direction and speed, and ambient temperature.
- c. Determination of atmospheric stability is based on the stability class criteria table according to Pasquill-Gifford. Determination of criteria is based

on wind speed and sunlight radiation or cloud cover.

- d. Model SO<sub>2</sub> emissions with Gaussian dispersions

## IV. RESULT AND DISCUSSION

### A. SO<sub>2</sub> Emission Rate

There are 7 chimneys found in PLTMG Duri, but there are only 4 active chimney; chimney 1, chimney 2, chimney 4 and chimney 6. There are 3 nonactive chimneys such as chimney 3, chimney 5 and chimney 7, as it is caused by the damage to the engine and there has been no repair or maintenance actions. Emission fuels used throughout the chimney are Liquefied Natural Gas (LNG) and High Speed Diesel (HSD), where the required data is emission factor (FE) data and the amount of fuel emissions. The data collection was carried out in January and February 2019, because it was caused by the system that occurred in the PLTMG using the latest data annually.

How to calculate the SO<sub>2</sub> emission rate is by using equation 2.1. The results of the calculation of SO<sub>2</sub> emission rates can be seen in Table 4.1, based on the fuel used, the total SO<sub>2</sub> emission rate of 4 chimneys of LNG fuel is 30,208,333 and HSD is 21,534,753. The rate of emission of LNG fuel is greater than HSD fuel, because the emission factor (FE) of LNG fuel is greater than HSD.

### B. Atmospheric Stability Classes

Classes of atmospheric stability according to Pasquill Gifford are divided into six classes, namely class A to class F. Class A is indicated for the most unstable air conditions, class B is unstable, class C is slightly unstable, class D is neutral, class E is somewhat stable and class F is stable which is affected by wind speed and solar intensity. The intensity of the sun is determined based on the number of sunny days. If the number of sunny days > 60%, categorized as strong sun intensity, 30% - 60% is categorized as moderate sun intensity and < 30% is categorized as weak sun intensity.

In January and February 2019, wind speeds were 3.9 m/s and 3.87 m/s, respectively. The number of sunny days is above 60%, both in January and February. So that the atmosphere's stability is in class B (unstable) and the sun's intensity is categorized as strong.

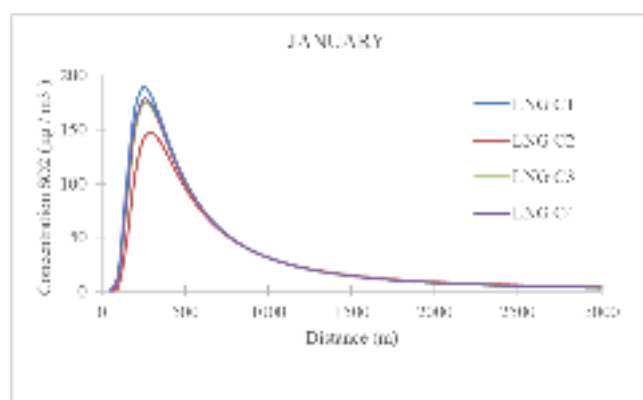
### C. Calculation of SO<sub>2</sub> Concentration Gaussian Dispersion Model

Gaussian dispersion model uses equation 2.7. In this study, this concentration was calculated from a distance of 0m to 3000m at 500m intervals. The SO<sub>2</sub> concentration threshold used is the national ambient air quality standard according to government regulation No. 41 of 1999 [9]. The parameter used is SO<sub>2</sub>, where the SO<sub>2</sub> quality standard has 24 hours with 365 quality

standards, the calculation is 365 multiplied by 31 days (in one month) with 11,315 results.

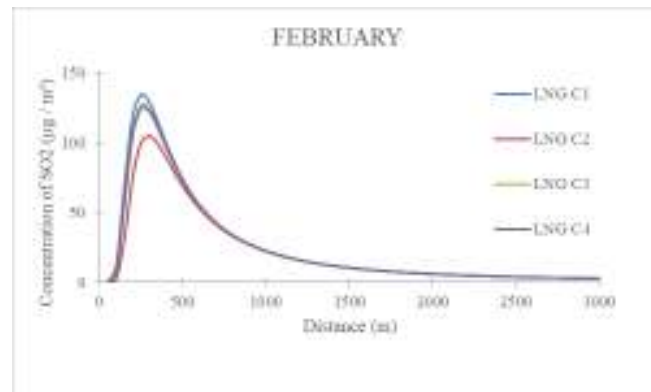
BMKG analysis results in January found that the wind moved from northeast to southwest with an average wind speed of 3.90 m/s and an ambient temperature of 32.5 C, so that the receiving point of the emission distribution is in the west. In February, it was found that the wind moved from the southwest to the northeast with an average wind speed of 3.78 m/s and an environmental temperature of 31.8 C, so that the receiving point of the emission distribution was in the northeast of the industrial area.

For LNG fuels with a range of (x) 50 to 3000 m, the highest SO<sub>2</sub> concentration values were found in Chimney 1 in January with a distance of 250 ie 189.2706519 µg / m<sup>3</sup> and the lowest was in chimney 2 which was 140.7483918 µg / m<sup>3</sup> (Figure 4.1 ). This LNG fuel used 70% of natural gas, namely coal, since it burns faster and the biggest combustion occurs at a distance of 250 m. This resulted in the evaporation of smoke and the spread of smoke accompanied by wind direction which is not necessarily all stable depending on the difference in chimney temperature with ambient temperature and wind conditions at such time. If the air in the surrounding environment is cold, the smoke coming out of the chimney can decrease instead of going up.



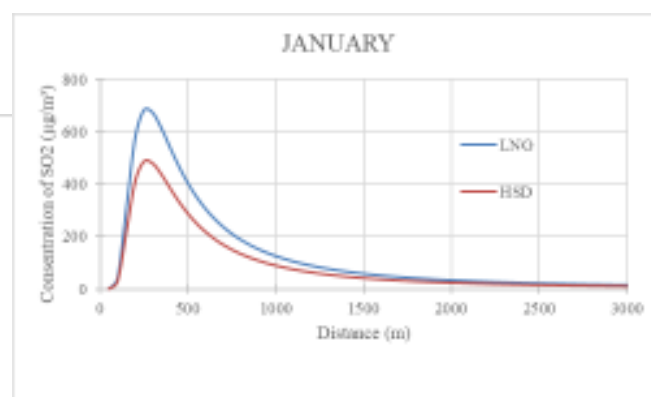
**Figure 4.1. Concentration of SO<sub>2</sub> with LNG fuel in January**

LNG fuel with the highest SO<sub>2</sub> concentration value was found in February at chimney 1 with a distance of 250 m; 186.7541995 µg / m<sup>3</sup> and the lowest was found in chimney 3; 160.7371886 µg / m<sup>3</sup> (Figure 4.2). In February SO<sub>2</sub> concentrations had almost the same concentration value.



**Figure 4.2. Concentration of SO<sub>2</sub> with LNG fuel in February**

Gaussian SO<sub>2</sub> dispersion with LNG and HSD fuels can be seen in Figure 4.3. In January, LBG fuel obtained with the lowest SO<sub>2</sub> concentration was found at a distance of 50 m with a value of 0.028255366 µg / m<sup>3</sup> and the highest was at a distance of 250 m with a value of 681.4055409 µg / m<sup>3</sup>. While at a distance of 300 m, there was an exponential decrease and SO<sub>2</sub> concentrations began to stabilize at a distance of 2050 m with a value of 31.75000568 µg / m<sup>3</sup> to a distance of 3000 m with a value of 15.01369571 µg/m<sup>3</sup>.



**Figure 4.3. Concentration of SO<sub>2</sub> with HSD and LNG Fuels**

The same thing happened with HSD fuel in January, but the highest value of SO<sub>2</sub> emission concentration was lower than LNG fuel. The lowest concentration was at a distance of (x) 50 m with a value of 0.020142532 µg / m<sup>3</sup> and the highest was at a distance of 250 m with a value of 485.7566891 µg / m<sup>3</sup>, and an decreasing SO<sub>2</sub> concentration occurred at a distance of 300 m.

In February, the highest concentration of SO<sub>2</sub> emissions from LNG fuel was found at a distance of 250 m with a value of 699,3619097 µg / m<sup>3</sup>. While the SO<sub>2</sub> concentration of HSD fuel is lower at 498.557328 µg / m<sup>3</sup>.

SO<sub>2</sub> emissions generated from chimney 4 by using gaussian dispersion indicated that the value of SO<sub>2</sub> emissions from LNG fuels was higher than HSD fuels.

And the value of SO<sub>2</sub> emissions from the PLTMG was still below the quality standard, both in January and February.

#### V. CONCLUSION

1. SO<sub>2</sub> Emission Concentrations from HSD fuels have higher concentrations than HSD fuels
2. The highest concentration at 2m receptor height occurs at a distance of 250 m from the chimney
3. SO<sub>2</sub> emissions concentrations in the air are still below the quality standard (PP No. 41 of 1999)

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# *Design Of Formalin Use Investigation System In Food Using Android-Based Tcs34725 Color Sensor*

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**Abstract**—A system design has been made that functions to investigate formalin in food. This tool uses a color sensor (RGB) with type TCS34725 which can be accessed through an android phone to display the contained formalin contamination. In general, this system consists of four parts, namely the color sensor, Arduino Nano CH340, Bluetooth HM-10, and Android. Samples tested were chicken and beef. The concentration of formalin given was 0%, 2% and 5%. The data collection process was repeated 15 times for each type of food sample. Indicators that appear on the display are color. Green indicates that the sample is not contaminated, while the red color indicates that the sample is contaminated with formalin. Testing formalin contamination of beef and chicken meat samples has an accurate value of 99%.

**Keywords** — *Color sensor, formalin, android*

## I. INTRODUCTION

Food preservatives are used to slow down the decay process, so food becomes more durable. Some materials and preservation methods that are often used are natural preservatives such as salt, vinegar, drying and others. However, the use of natural preservatives uses expensive and less effective in preserving long-term food. Therefore, many people are switching with synthetic preservatives, because the price is cheap and makes food last longer.

As reported by the okezone.com online news page on 12/17/2018, there are several types of dangerous food preservatives that are often used such as borax and formalin and textile dyes, namely Methanyl Yellow and Rhodamin B. The use of formalin can be found in the society [2].

The method commonly used to detect the formalin content of foods today is the spot test method. The method requires expensive costs because this method is only done in the laboratory, while not everyone can test the sample to the laboratory, and only certain agencies are permitted [1]. Therefore, we need a special tool that is able to detect formalin content in food with a system that is easy, inexpensive, fast and can be used independently, so that people can check at any time.

Food contaminated with formalin has a change in color compared to food that is not contaminated. Proportional color intensity differences can be used to determine whether food is contaminated or not. Based on this, by utilizing a color sensor (RGB), a formalin contaminant detection device was made in the food called BOLIN DETEKTOR

## II. RESEARCH METHODS

### A. Analysis and Literature Study

The initial stage that needs to be done is the analysis and study of literature, while the activities carried out are gathering information about the characteristics of various food samples containing formalin.

### B. Design and Planning Stage

In general the system only consists of four phases as shown in figure 2.

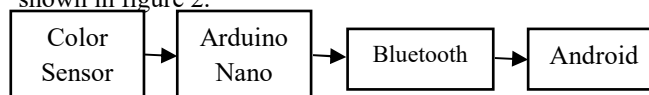


Figure 2. Parts of Bolin DETEKTOR

### C. Hardware Assembly Stage

The activity carried out is to implement the component assembly in accordance with the design that has been made both at the design stage of the tool casing and at the schematic series stage. Then the wiring is done in accordance with the design of Photoshop software.

### D. Programming Stage

After assembling the hardware, the program is loaded in the microcontroller by coding the Arduino IDE software in C language. The contents of the code include system control between the microcontroller with the TCS34725 color sensor and wireless Bluetooth communication control to the Android device.

### E. Making food sample stage

The samples used were meatballs, chicken and beef. Each sample was made into 3 samples with 3 different



types of treatment. The sample would be given formalin treatment with different concentrations. The concentration of formalin given was 0%, 2% and 5%.

*F. Testing Stage*

The testing stage was carried out by looking at the ability and accuracy of the TCS34725 color sensor in identifying formalin in food. The data collection process was repeated 15 times for each type of food sample.

III. DISCUSSION

*A. Food Sample*

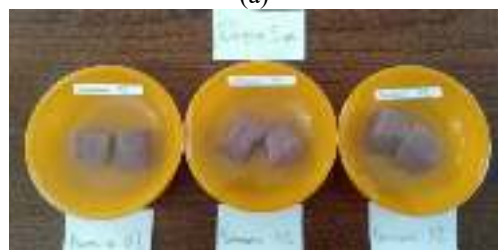
Food samples that have been given formalin contamination can be seen to have differences in each treatment given. Formalin contamination was given to chicken and beef meat samples. The more formalin content is given, the color in the food sample will be whiter, as in Figure 3.

*B. The Appearance of Hardware and Software*

The appearance of Bolin Detector can be seen in Figure 4, and software display can be seen in Figure 5.



(a)



(b)

Figure 3. Formalin Contamination Sample (a) Chicken Meat (b) Beef



Figure 4. Appearance of BOLIN DETEKTOR



Figure 5. BOLIN DETEKTOR Software Display

*C. Results of System Test*

System testing is done on chicken and beef food samples. Indicators that appear on the display are color. Green indicates that the sample is not contaminated, while the red color indicates that the sample is contaminated with formalin. The results of system testing can be seen in table 1.

TABLE 1. TEST RESULT OF SAMPLE WITH FORMALIN CONTAMINATION

Types of Food	Formalin Concentration	Sample	Results
Chicken Meat	0 %	1	Negative
		2	Negative
		3	Positive
	2 %	1	Positive
		2	Positive
		3	Positive
	5 %	1	Positive
		2	Positive
		3	Positive
Beef	0 %	1	Positive
		2	Negative
		3	Negative
	2 %	1	Positive
		2	Positive
		3	Positive
	5 %	1	Positive
		2	Positive
		3	Positive

Based on testing that has been done, BOLIN DETEKTOR can distinguish between samples without formalin contaminants and samples containing formalin. Testing formalin contamination of beef and chicken meat samples has an accurate value of 99%.

IV. CONCLUSION

Based on the results of this study, it can be concluded that food identification devices containing formalin have a color sensor input response that changes according to the color conditions of the food read by the TCS34725 color sensor from each sample.



This tool can distinguish between samples without formalin contaminants and samples containing formalin. The accuracy of this tool is 99%.

#### ACKNOWLEDGEMENT

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# Computational Study of Hydroxy Chalcone Compound as Potential Chemosensor for Cyanide Anion

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**Abstract** – A theoretical computational study has been carried out to study the interaction of hydroxy chalcone (COH) compound as chemosensors for  $CN^-$  anion. This research is modeling the molecular structure of hydroxy chalcone (COH) compound and its interaction model with  $CN^-$  using DFT method. The results of geometry optimization show an O-H bond lengthening of 0.7 Å with its interaction with the  $CN^-$ . This indicates the formation of a strong hydrogen bond causing deprotonation of the hydroxy chalcone (COH) sensor by the  $CN^-$ . The hydroxy chalcone (COH) sensor which is deprotonated has a large interaction energy that is -224.75 kJ/mol. Sensors that are deprotonated cause the HOMO-LUMO energy difference to decrease from -3.94 eV to -2.62eV.

**Keywords** – chemosensor, hydroxy chalcone, cyanide, DFT

## I. INTRODUCTION

Cyanide is an interesting anion because it is known to be highly reactive and is toxic to biological systems and the environment [1]. In very small amounts, cyanide can cause disorders of blood vessels, heart, vision, endocrine enzymes, central nervous and metabolic processes [2]. Cyanide can also inhibit the use of oxygen in cells and interfere with the activity of oxidasitochrome [3]. Cyanide can then be absorbed into the lungs, digestive tract and skin so that it can cause vomiting, seizures, loss of consciousness and even death [4]. Although toxic, cyanide is widely used in various processes and raw materials in synthetic fibers, synthetic resins, pesticides, medicines, fertilizer and gold and silver extraction processes [5]. According to the World Health Organization (WHO), the amount of cyanide allowed in drinking water is only 1.9  $\mu$ M [6].

Various methods have been carried out to detect the presence of cyanide such as titration [7], chromatography [8], and electrochemistry [9]. But these

methods have drawbacks such as requiring a lot of analysis time, expensive costs, and often less sensitive and selective. Therefore, in the last few years chemosensor have been developed to detect cyanide anions. Chemosensor has many advantages such as high sensitivity, simple, fast results, and can be analyzed from the change in color given by the sensor compound [10].

One of compound that is believed to be a potential sensor compound is the chalcone compound. Structurally, chalcone compounds have two aromatic rings connected by a double bond  $C\alpha=C\beta$ . Chalcone compounds can be modified by adding substitution groups and one of them is a hydroxy (OH) group. The existence of this hydroxy group is expected to be the center of activity that will interact with cyanide [11]. Interactions between hydroxy groups and cyanide are expected to form hydrogen bonds [12].

Studies using computational chemistry calculations can be used to examine the interaction of sensor compounds and anions. One of the advantages of computational chemistry is that it can visualize the structure of sensor compounds and their interactions with anions [13]. One of the computational chemistry calculation methods that can be used in predicting the interaction of sensor and anion compounds is the density functional theory (DFT) method [14]. Calculations using the DFT method can give good results for calculations involving interactions such as hydrogen bonds or van der Waals [15].

In this research, a computational study regarding the potential of hydroxy chalcone compound (COH) as a cyanide anion sensor ( $CN^-$ ) was conducted. The results of this theoretical study are expected to provide comprehensive information in assisting the synthesis of

sensors of hydroxy chalone (**COH**) derivative compounds in the Laboratory.

## II. METHODS AND MATERIALS

### A. Materials of Study

The study materials used in this study were hydroxy chalone (**COH**) compounds as sensor molecules and cyanide anion ( $\text{CN}^-$ ) as target molecules. The structure of chalone derivatives as sensors and their interactions with anions is shown in Figure 1.

### B. Computational Calculations

All calculations are performed using Gaussian 09 software [16]. Prediction of the interaction model between the sensor compound (**COH**) and the cyanide anion ( $\text{CN}^-$ ) is done by optimizing the sensor complex geometry (**COH**)- $\text{CN}^-$  using the DFT 6-31G(d,p) method with the B3LYP density function. Next, the interaction energy of the sensor compound (**COH**) and  $\text{CN}^-$  anion is calculated by the same method. The absorption and transition energy properties of the sensor (**COH**) and sensor ion (**COH**) $^-$  calculated using the TD-B3LYP/6-31G(d,p) method. Observation of the effect of solvents on optical properties in the molecular system is carried out using DMSO and methanol solvents, calculated using a polarized continuous model (PCM) with the TD-DFT method [17]. Interaction energy ( $\Delta E_{\text{interaction}}$ ) is calculated from the difference between the sensor complex energy (**COH**)- $\text{CN}^-$  ( $E_{\text{COH}---\text{CN}^-}$ ) and total sensor energy (**COH**) and  $\text{CN}^-$  anion [18].

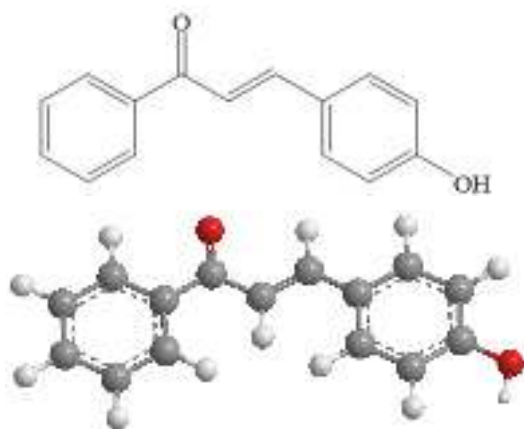


Figure 1. Structure of hydroxy chalone (**COH**)

## III. RESULTS AND DISCUSSION

The mechanism of sensor interaction (**COH**) and  $\text{CN}^-$  anions is analyzed by optimizing the geometry of the molecular complex (**COH**)- $\text{CN}^-$  using the *density functional theory* (DFT) method. Geometry optimization is done by making the phenol (OH) group as a binding subunit which is the active side and the center of the reaction. The results of the optimization of the sensor geometry (**COH**) and  $\text{CN}^-$  anion are shown in Figure 1 and Table 1.



Figure 2. Geometry optimization of sensor interaction (**COH**) and  $\text{CN}^-$  anion

The length of the O-H bond on the sensor molecule after geometry optimization is 0.97 Å. After interaction with the  $\text{CN}^-$  anion, the O-H bond length became 1.67 Å. O-H elongation of 0.7 Å indicates a break in the O and H and the sensor is deprotonated [19]. Breaking the binding in the binding subunit sensor will cause the transfer of intermolecular protons (IPT) with  $\text{H}^+$  to be bound to the anion [20]. Deprotonation of sensor compounds by anions will give color changes when tested in the Laboratory [21]. In addition, optimization of the sensor molecular geometry (**COH**) and the  $\text{CN}^-$  anion results in a distance between O-H and  $\text{CN}^-$  which is smaller than 3 Å and the formation of angles formed between O-H and  $\text{CN}^-$  which is greater than 110°. This shows the occurrence of hydrogen bonds between O-H as a binding sensor unit with  $\text{CN}^-$  [22] [23].

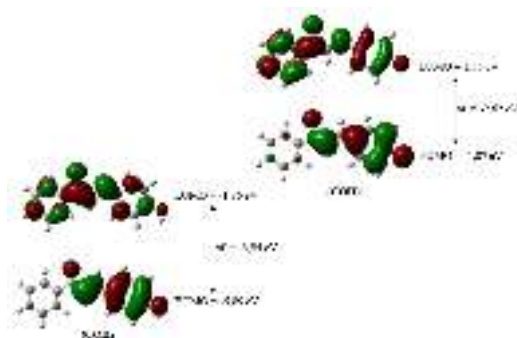
Table 1. Geometry sensor parameter (**COH**) and cyanide anion ( $\text{CN}^-$ )

Molecule	$r_{\text{(O-H)}} (\text{Å})$	$r_{\text{(H---CN}^-)} (\text{Å})$	$\theta_{\text{(O-H---CN}^-)} (^\circ)$
( <b>COH</b> )	0,97	-	-
( <b>COH</b> )--- $\text{CN}^-$	1,67	1,12	175,28

Table 2. Interaction energy (**COH**) and cyanide anion ( $\text{CN}^-$ )

Molecule	$-\Delta E_{\text{interaction}} (\text{kJ/mol})$
( <b>COH</b> )--- $\text{CN}^-$	224,75

The process of sensor deprotonation can also be analyzed from the sensor and anion interaction energy. If the sensor and anion interactions are strong to cause deprotonation, the sensor and anion interaction energy will be of great value. The interaction energy calculation results are shown in Table 2. Sensor interaction (**COH**) and  $\text{CN}^-$  anion have a big interaction energy so that it supports the prediction result of geometry optimization that indicates the  $\text{CN}^-$  anion causes the sensor to deprotonate.



**Figure 3.** The changes of HOMO-LUMO energy in sensor (COH) and ion sensor (COH)<sup>-</sup>

Deprotonation that causes intramolecular charge transfer (ICT) in sensor interactions (COH) and CN<sup>-</sup> anion can be demonstrated by electronic transitions using *Frontier Molecular Orbitals* (FMOs) analysis and changes in HOMO-LUMO energy. The electronic transition from HOMO to LUMO causes changes in the spread of electrons in the sensor structure (COH). The FMOs form the sensor (COH) in a neutral state and the ion shaped sensor (COH)<sup>-</sup> after deprotonation is shown in Figure 3. The electron  $\pi$  on the sensor (COH) in the neutral state comes from the double bond C=C on the benzene ring and the enon group C=O. Whereas in the ion-shaped sensor (COH)<sup>-</sup> after the transfer of intramolecular ICT charges, electrons  $\pi$  also originate from the lone pair of oxygen atoms in the O-H group. Electron pairs on oxygen which are negatively charged (COH)<sup>-</sup> can enter the ring due to resonance with double bonds. In the FMOs image (COH), it appears that electron density in HOMO is only distributed to the bound group and the enon group. The existence of electron excitation from HOMO to LUMO causes the flow of electrons in LUMO which is spread to all parts of the sensor (COH). Electron flow in sensor ions (COH)<sup>-</sup> greater than in neutral conditions. Electron scattering to all parts of the ion (COH)<sup>-</sup> indicates the transfer of intramolecular charge (ICT) to the sensor (COH) and anion interactions.

Changes in HOMO-LUMO energy in sensor (COH) and ions in the form of ions (COH)<sup>-</sup> which undergo intramolecular charge transfer (ICT) will also be related to the optical properties shown through the prediction of UV-Vis spectra. The prediction peak of UV-Vis spectra on the sensor ion (COH)<sup>-</sup> occurs at a larger wavelength. This proves that the small difference in HOMO-LUMO energy will cause UV-Vis adsorption to occur in larger wavelengths. In the electronic transition, prediction has been proven the difference in energy of the HOMO-LUMO sensor at ion condition (COH)<sup>-</sup> smaller than in the sensor (COH) neutral conditions. Table 3 shows the results of absorption of the UV-Vis sensor (COH) and ion sensor (COH)<sup>-</sup> which were calculated using the PCM TD-B3LYP/6-31G(d, p) method in DMSO and methanol solvents.

**Table 3.** Absorbed wavelength ( $\lambda_{\text{abs}}$ ), oscillator strength ( $f$ ) sensor (COH) and ion sensor (COH)<sup>-</sup> in DMSO and metanol solvents

Solvent	(COH)		(COH) <sup>-</sup>	
	$\lambda_{\text{abs}}$	$f$	$\lambda_{\text{abs}}$	$f$
DMSO	355,84	0,8253	436,52	0,9900
Methanol	353,99	0,8177	433,38	0,9619

#### IV. CONCLUSION

Computational studies conducted in this study provide a description of hydroxy chalcone compound (COH) as a potential chemical sensor of cyanide anion (CN<sup>-</sup>). The results of the analysis of sensor interactions (COH) with anion CN<sup>-</sup> indicate the formation of strong hydrogen bonds that cause sensor deprotonation (COH).

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# *Influence of Star Fruit and Bamboo Sprout on Nutritional and Organoleptic Values on Nugget From Snakehead Murrel and Jackfruit Seed Flour*

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**Abstract-** This study aims to determine the effect of adding starfruit extracts and bamboo sprout on snakehead murrel nuggets substituted with jackfruit seed flour on nutritional value and storage time. The addition of starfruit extracts and bamboo sprout in fish nuggets serves as an antioxidant and antibacterial. This study uses a Completely Randomized Design (CRD) consisting of 4 variations of the composition (NG0, NG1, NG2, and NG3) and stored for 6 weeks in the refrigerator. Observation data were analyzed with ANOVA and continued with the Tukey test. F test analysis on the variation of 4 compositions significantly showed significant differences ( $P < 0.05$ ) on water content, protein, fat, crude fiber and organoleptic values (color, odor, taste and texture). The best value is obtained in the treatment of NG3 with 43.77% water content, 9.59% protein content, 1.76% fat content and 1.18% crude fiber content. The results obtained meet the SNI 7758-2013 quality standard requirements.

**Keywords-** Starfruit Extract, Nutritional Value, Snakehead Murrel Nugget, Tukey Test.

## I. INTRODUCTION

Nugget is a processed meat product that is quite popular especially among children and adolescents. The main ingredient of nuggets usually comes from beef and chicken meat. In addition to beef and chicken, the main ingredients for making nuggets can use snakehead murrel. Snakehead murrel (*Channa striata*) is an economically valuable type of fish. This species has a distinctive taste, thick and white meat texture so that the price is quite expensive both in the form of fresh and dried (salted fish) [6].

Snakehead murrels have high protein content, especially albumin and essential amino acids, fats especially essential fatty acids, minerals especially zinc (Zn) and some vitamins that are very good for health [2]. This is supported by research results from [8]Pratiwi et al., (2016) that snakehead murrel is a food product rich in protein, phosphorus

and calcium needed for bone growth and free from cholesterol. Snakehead murrel processing is generally made fresh processed, such as fried or baked. This snakehead murrel has the potential to be developed into processed products that have added value, one of which is the raw material for making nuggets. The use of snakehead murrel in the making of nuggets can be an alternative diversification of processed fish products [8] (Pratiwi et al., 2016).

Making fish nuggets requires ingredients that contain carbohydrates as a binder so that the ingredients are bound to one another in dough that is useful for improving texture. Binder which is often used is various types of flour containing carbohydrates, such as flour from grains, wheat flour from wheat, rice flour and glutinous rice. Fiber is a complex carbohydrate and can be classified as soluble and insoluble. According to [8], processed fish in general have the disadvantage of not containing the fiber needed in the digestive process. The addition of vegetable resources in making nuggets can mask these weaknesses. One potential biological resource is jackfruit (*Artocarpus heterophyllus*).

Jackfruit seeds have a high nutrient content, such as carbohydrates, proteins, fats, iron, calcium, phosphorus, water, vitamin C and vitamin B1. There have been many studies conducted on the potential of jackfruit seeds as food products. A study conducted by [9] uses jackfruit seeds into flour to make various processed food products from jackfruit seed flour. According to [12], community acceptance of processed products from jackfruit seed flour can be accepted, as evidenced from the processed "onde-onde ketawa biji nangka" which have a shape with an average value ranging from 2.86 - 3.60 and taste with an average value of 2.89 - 3.57 which is the same as the original product or without the addition of jackfruit seed flour, only slightly different aroma of processed jackfruit seed flour products, with an

average value ranging from 2.94 - 3, 51 a bit unpleasant but people still like it.

Sweet star fruit (*Averrhoa carambola* L) contains calcium, iron, beta-carotene, vitamin B1, vitamin B2, vitamin C, and flavonoids, tannins, saponins, and alkaline. Star fruit is often used as an anti-inflammatory, antimicrobial, antimalarial, antipyretic, and antidote [3]. Phytochemical analysis of this fruit shows the presence of saponins, alkaloids, flavonoids and tannins. This fruit is rich in antioxidants, especially proanthocyanidins, epicatechin and vitamin C. Star fruit extract has good anti-microbial activity against both gram-positive and gram-negative bacteria, including *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Streptococcus typhimurium* [13].

Raw bamboo sprouts have a compound content of about 85.63 grams of water and about 9.10 grams of fiber [14]. Bamboo sprout extracts are reported to supplement antioxidants that occur naturally in the human body or are consumed in food, reducing oxidative stress in the human body and , thus, the risk of developing chronic diseases. Furthermore, the presence of natural antioxidants in meat products has been shown to increase the acceptance of health-conscious consumers [13].

Starfruit and bamboo sprouts have abundance and great potential as antioxidants and antimicrobials in processed meat products. Meat nuggets made by adding several variations of star fruit extract and bamboo sprout using flour. The addition of star fruit extract variations are 1%, 2%, 3%, 4%, 5% and 6%, and as for the sprout extract are 1%, 2%, 4%, 6%, 8% and 10%. As a result of several variations of extract addition into the nugget, the researchers obtained optimal results in the treatment of 4% starfruit extract and bamboo sprout extract 6%, each increasing the storage period of the nugget for at least two weeks, from 14 days to 35 days at  $4 \pm 1$  ° C compared to control [13]. Therefore, the authors are interested in conducting further research to determine the effect of adding starfruit extract and bamboo sprouts on snakehead murrel nugget with jackfruit seed flour. This research was conducted to see the effect of treatment on the nutritional value of proximate namely water content, protein content, fat content and crude fiber content.

## II. RESEARCH METHOD

The research carried out was the manufacture of snakehead murrel nuggets with the addition of star fruit extract and bamboo sprout extract which was substituted with jackfruit seed flour. The preliminary research stage was making jackfruit seed flour referring to the research of [10], making both starfruit extracts and bamboo sprouts, making snakehead murrel nugget spice formulation by modifying the seasoning formulation.

This study uses an experimental method, which is adding star fruit extracts and bamboo sprout extract with different amounts in the processing of snakehead murrel nuggets. The addition of star fruit extract and bamboo extract on the nugget dough was carried out at a concentration of 4% for starfruit extract and 6% for bamboo extract. The research finding of [13] obtained optimal results in the addition of extracts of 4% and 6% into meat nuggets.

The experimental design used was a two factorial Complete Randomized Design (CRD) consisting of 4 levels of treatment namely, NG0 treatment (nuggets without the addition of extracts) as a control, NG1 treatment (nuggets with the addition of 4% star fruit extract), NG2 treatment (nuggets with the addition of bamboo sprout extract 6%), and NG3 treatment (nuggets with the addition of star fruit extract 4% and bamboo extract 6%), performed with two repetitions. Organoleptic test was carried out on 20 untrained panelists, and then the organoleptic value was taken from the best nutritional value.

The process of making snakehead murrel nuggets is based on the method of [5]. After the nuggets are cooked, the water content, protein content, fat content and crude fiber content will be analyzed (SNI 01-2891-1992), while organoleptic testing (SNI 7758-2013) in the nugget condition is fried.

## III. RESULTS AND DISCUSSION

### Proximate Analysis

#### Close Analysis

The results of the analysis of the nutritional value of snakehead murrel nuggets obtained in this study can be seen in Table 1.

**Table 1. Analysis Result of the Nutritional Value of Snakehead Murrel Nugget**

Week	Code	Water Content	Protein Content	Fat Content	Crude Fiber Content
0	NG <sub>0</sub>	50,36 <sup>a,b</sup>	9,28 <sup>b</sup>	1,43 <sup>f</sup>	1,31 <sup>c</sup>
	NG <sub>1</sub>	49,36 <sup>b</sup>	<b>9,61<sup>a</sup></b>	<b>2,00<sup>a</sup></b>	1,16 <sup>e,f</sup>
	NG <sub>2</sub>	49,30 <sup>b</sup>	9,51 <sup>a</sup>	1,92 <sup>b</sup>	1,26 <sup>c,d</sup>
	NG <sub>3</sub>	<b>50,66<sup>a</sup></b>	9,49 <sup>a</sup>	1,43 <sup>f</sup>	<b>1,63<sup>b</sup></b>
3	NG <sub>0</sub>	47,57 <sup>c</sup>	8,63 <sup>d</sup>	1,04 <sup>h</sup>	1,15 <sup>e,f</sup>
	NG <sub>1</sub>	46,55 <sup>c</sup>	8,87 <sup>c</sup>	1,01 <sup>h</sup>	1,15 <sup>e,f</sup>

Week	Code	Water Content	Protein Content	Fat Content	Crude Fiber Content
	NG <sub>2</sub>	46,44 <sup>c</sup>	9,53 <sup>a</sup>	1,29 <sup>g</sup>	1,26 <sup>c,d</sup>
	NG <sub>3</sub>	47,65 <sup>c</sup>	9,43 <sup>a,b</sup>	1,34 <sup>g</sup>	1,23 <sup>c,d,e</sup>
6	NG <sub>0</sub>	43,52 <sup>d</sup>	8,37 <sup>c</sup>	2,02 <sup>a</sup>	1,69 <sup>b</sup>
	NG <sub>1</sub>	42,59 <sup>d</sup>	8,51 <sup>d,e</sup>	1,60 <sup>e</sup>	2,01 <sup>a</sup>
	NG <sub>2</sub>	42,54 <sup>d</sup>	8,92 <sup>c</sup>	1,83 <sup>c</sup>	1,09 <sup>f</sup>
	NG <sub>3</sub>	43,77 <sup>d</sup>	9,59 <sup>a</sup>	1,76 <sup>d</sup>	1,18 <sup>d,e</sup>

Description: The numbers followed by different letters show significant differences (P<0,05).

### Organoleptic Assessment

Based on the results of organoleptic assessment conducted by 20 panelists who have not been trained on the value of color, odor (aroma),

texture and taste in snakehead murrel nuggets with the addition of starfruit extract and bamboo sprout extract substituted with jackfruit seed flour, the following data were obtained.

**Table 2. The Average Value of Organoleptic Snakehead Murrel Nugget**

Code	Color	Odor	Taste	Texture	Quality Requirement
NG <sub>0</sub>	8,15 <sup>b</sup>	8,0 <sup>b</sup>	8,1 <sup>a</sup>	8,6 <sup>a</sup>	Min 7 (Score 3-9)
NG <sub>1</sub>	8,45 <sup>a</sup>	8,2 <sup>a</sup>	8,1 <sup>a</sup>	8,1 <sup>c</sup>	
NG <sub>2</sub>	8,15 <sup>b</sup>	7,5 <sup>c</sup>	7,8 <sup>a</sup>	8,2 <sup>b,c</sup>	
NG <sub>3</sub>	7,75 <sup>c</sup>	7,6 <sup>c</sup>	7,8 <sup>a</sup>	8,4 <sup>a,b</sup>	

Description: The numbers followed by different letters show significant differences (P<0,05).

### Water Content Analysis

Based on the results of research on snakehead murrel nugget water content with the addition of starfruit extract and bamboo sprout extract substituted with seed flour experienced a decrease in each treatment (Table 1). The value of water content ranges from 42.54% to 50.66%. The lowest decreased water content was obtained from the treatment of NG<sub>2</sub> (snakehead murrel nugget + bamboo sprouts), namely at week 0 = 49.30%, week 3 = 46.44% and week 6 = 42.54%. The highest value of water content was obtained in the treatment of NG<sub>3</sub> (snakehead murrel nugget + second extract), ie at week 0 = 50.66%, week 3 = 47.65% and week 6 = 43.77%.

Decrease in the value of water content in snakehead murrel nuggets allegedly due to the influence of the material used has different water content, as well as an increase in the value of fat and protein content. The addition of extract significantly (P <0.05) reduced the water content of snakehead murrel nugget, shown in snakehead murrel nugget with bamboo sprout extract (NG<sub>2</sub>) which had a lower water content value than other treatments (Table 1). Snakehead murrel nuggets with the addition of both extracts (NG<sub>3</sub>) have a higher value than other treatments allegedly because starfruit and bamboo sprouts have high water content of 86.91% and 85.63% [14].

### Protein Content Analysis

Protein is a source of amino acids consisting of elements C, H, O and N. Protein content in food varies both in quantity and type. Based on the research results, protein content showed a decrease in each treatment during storage except NG<sub>3</sub> treatment (Table 1). Snakehead murrel nugget protein content ranged from 8.37% - 9.61% in accordance with SNI 7758-2013 quality requirements regarding fish nuggets with a minimum limit of 5.0%. Significant decrease in protein content occurred in the treatment of NG<sub>0</sub> (nuggets without the addition of extracts), namely week 0 = 9.28%, week 3 = 8.63% and week 6 = 8.37%. In contrast, the nugget added the two extracts (NG<sub>3</sub>) did not experience a significant or permanent decrease, namely at week 0 = 9.49%, week 3 = 9.43% and week 6 = 9.59%. This is because both starfruit extracts and bamboo sprouts have a high enough protein content, as well as due to the addition of wheat flour, jackfruit seed flour and snakehead murrel which have high albumin and protein content. According to research conducted by [4], the nugget protein content is influenced by the components of its constituent ingredients. In addition to its constituent ingredients, an increase in protein content can also be influenced by increased water content as well, because water content can reduce the percentage of food production.



## Fat Content Analysis

Fat is a potential source of energy that is more effective than carbohydrates and protein. The most widely used energy source for metabolism is fat. The fat content in food serves to improve the shape, texture, add nutritional value and calories and provide flavor in food. Based on the analysis of the Tukey test, it showed a significant difference ( $P < 0.05$ ) on 4 variations of treatment and duration of storage. The level of fat of snakehead murrel nugget NG0 (nugget without extract) treatment increased at week 0 = 1.43, week 3 = 1.04 and week 6 = 2.02. The increase in the value of fat content in NG0 is caused by the decrease of the value of NG0 water content.

In the treatment of NG1 (nuggets with star fruit extract), it decreased at week 0 = 2.00, week 3 = 1.01 and week 6 = 1.60, whereas for NG2 treatment (nuggets with bamboo extract) and NG3 (nuggets with both extracts) did not significantly decrease or increase fat content (Table 1). Decrease in the value of fat content in snakehead murrel nuggets allegedly due to the influence of the material used has a different fat content. The addition of extract significantly ( $P < 0.05$ ) reduced the fat content of snakehead murrel nugget, shown in snakehead murrel nugget with star fruit extract (NG1) which had decreased fat content than in other treatments. Decrease in fat content in NG1 treatment was due to low starfruit fat content that is 0.3%. The maximum fat content according to SNI 7758-2013 is 15.0% and in this study the fat content obtained for each treatment during the 6-week storage process meets the quality requirements. Even the fat content obtained is far below 15.0%.

## Crude Fiber Analysis

Crude fiber is a part of food that cannot be hydrolyzed by chemicals and are used to determine levels of crude fiber, namely sulfuric acid ( $H_2SO_4$ ) and sodium hydroxide (NaOH), while food fiber is a part of food that cannot be hydrolyzed by enzymes digestive enzymes. Therefore, the value of crude fiber is lower than food fiber because sulfuric acid and sodium hydroxide have more ability to hydrolyze food components compared to digestive enzymes [7].

Based on the research results obtained, crude fiber content showed that the value of crude fiber content of each treatment and storage time of 0, 3 and 6 weeks for all variations of the nugget were significantly different ( $P < 0.05$ ). Crude fiber content of snakehead murrel nugget treatment NG0 (nugget without extract) and NG1 (nugget with star fruit extract) increased, whereas in NG2 treatment (nugget with sprout extract) and NG3 (nugget with both extracts) decreased (Table 1). The results of the average value of crude fiber snakehead murrel nugget with the addition of starfruit extract and bamboo sprout extract substituted with jackfruit seed flour obtained ranged from 1.09% - 2.01%. Decrease and increase the value of crude fiber content in snakehead murrel nuggets due to the influence of the material used has different fiber content. Indonesian National

Standard 7758-2013 regarding fish nuggets does not include the standard fiber content in the nuggets, so the fiber content of all treatments is considered as added value of the nuggets.

## Organoleptic Assessment

Organoleptic assessment is one way of evaluating to know the acceptability of a product and assess the quality of a food. This study conducted a test of preference on panelists whose function was to determine the preferences of panelists on a product. The panelists in this study were 20 panelists who had not been trained. Snakehead murrel nugget products in this study were tested by giving a code to each sample tested. The organoleptic testing panelists were asked to provide an assessment of snakehead murrel nugget products which included an assessment of color, odor, texture and taste.

### 1. Color

The color of a food product is the main attraction before consumers know and like other properties. Consumers by looking at color can assess the quality of food easily and quickly [11]. The results of organoleptic assessment of snakehead murrel nugget color can be seen in Table 2. Based on the results of organoleptic tests conducted by 20 panelists on 4 variations of the treatment of extract addition with different concentrations, the average color values of snakehead murrel nuggets ranged from 7.75-8, 45.

This study uses the addition of the same Jackfruit Seed Flour (TBN) in each treatment formulation. The addition of TBN can cause a decrease in the color value of the snakehead murrel nugget, with this addition causing the color of the nugget to turn brownish yellow even close to pale which initially (only the addition of wheat flour) is bright yellow/golden. After the frying process, the color of the nugget turns yellowish brown. TBN has a yellowish white color, while white flour can be thought to affect the color of the resulting nugget, besides the change of color in the nugget possible from the frying process. The highest organoleptic color assessment is found in the NG1 treatment (addition of 4% star fruit extract) with an average value of an average of 8.45 and the lowest average value in the NG3 treatment (addition of both extracts) with an average value of 7.75.

Based on the results of the color organoleptic assessment, it was obtained that the organoleptic assessment of the colors had fulfilled the SNI-7758-2013 quality requirements with a minimum value of 7 (score 3-9).

### 2. Odor

The odor (aroma) can also be referred to as a remote tasting because humans can recognize the delicious food that has not been seen just by smelling it from afar. The odor (aroma) of a lot of food determines the delicacy of food and the taste of food itself [15].

Organoleptic test results carried out by 20 panelists on 4 variations of the treatment of extract addition with different concentrations obtained the average value of odor (aroma) in snakehead murrel nugget ranged from 7.5 to 8.3. This can be seen in Table 2. Based on organoleptic assessment of odor (aroma), the highest average value was found in the treatment of NG1 (addition of starfruit extract) which was 8.3 and NG0 (without the addition of extract) with an average value of 8 close to the specific strength criteria of nuggets, producing odors that panelists preferred. According to the panelists' assessment, they chose the treatment of NG0 and NG1 because it had a fragrant smell of nuggets and the smell of complementary spices such as garlic and scented onions compared to other treatments, which were considered to have a less strong specific odor nugget. According to [16], the aroma is influenced by the amount of seasoning added to the dough, the more seasoning added the more sharp the aroma.

Based on the organoleptic assessment of odors obtained, the organoleptic assessments for odors have met the SNI-7758-2013 quality requirements with a minimum value of 7 (score 3-9).

### 3. Taste

Taste is a very important factor in determining panelist acceptance or rejection of food. Taste can also be assessed as a response to stimuli derived from chemical compounds in a food that gives the impression of sweet, bitter, acidic and salty [11]. The average value of organoleptic testing of snakehead murrel nugget flavor with the addition of starfruit extract and bamboo sprout extract substituted with jackfruit seed flour can be seen in Table 2.

Organoleptic test results conducted by 20 panelists on 4 variations of the treatment of extract addition with different concentrations, it is obtained that the average value of the cork fish nugget ranged from 7.8 to 8.1.

Based on the organoleptic assessment, the NG0 and NG1 treatments had the highest mean value of 8.1 approaching the specific nugget-specific criteria, producing a taste that panelists preferred. According to the panelists' assessment, they chose the NG0 and NG1 treatments because they had a taste that was in line with the nugget and snakehead murrel taste more than the other treatments.

Based on the organoleptic assessment results, it is obtained that the average value of the taste organoleptic produced meets the quality requirements of SNI-7758-2013 with a minimum value of 7 (score 3-9).

### 4. Texture

The nugget texture is formed during the heating process. The content in the binder will undergo a gelatinization process, aiming to form a compact, easily printed and cut texture. Organoleptic test results carried out by 20 panelists on 4 variations

of the treatment of extract addition with different concentrations obtained the average value of the texture of the snakehead nugget ranged from 8.1-8.6, this can be seen in Table 2. Based on the results of organoleptic assessment NG0, NG1, NG2 and NG3 treatments have almost equal high mean values, namely NG0 (8.6), NG1 (8.1), NG2 (8.2) and NG3 (8.4), approaching the rather dense criteria or rather compact, producing textures that are preferred by panelists. Texture is strongly influenced by water content, the lower the water content of a material, the more compact and dense the texture produced [1].

Based on organoleptic assessment, the taste and texture for NG0 and NG3 treatment is preferred, but for odor (aroma), it is less preferred. The results obtained can be said that the organoleptic assessment of the resulting texture has fulfilled the SNI-7758-2013 quality requirements with a minimum value of 7 (score 3-9).

## CONCLUSION AND SUGGESTIONS

### Conclusion

Based on the analysis that has been done, it can be concluded that the effects of adding starfruit extract and bamboo sprout extract substituted with jackfruit seed flour to the nutritional value of snakehead murrel nuggets are as follows.

1. Snakehead murrel meat and jackfruit seed flour can be used as raw material for snakehead murrel nuggets by adding starfruit extracts and bamboo sprouts.
2. Variation in the composition of the nugget and variations in storage time affect the nutritional value. From some NG0, NG1, NG2 and NG3 treatments, the best value was obtained in the NG3 treatment with a water content of 43.77%, protein content of 9.59%, fat content of 1.76% and crude fiber content of 1.18%.
3. Good storage for 6 weeks does not affect changes in nugget nutrition.
4. Snakehead murrel nuggets produced in this study meet SNI 7758-2013 quality standards for all variations of treatment.

### Suggestions

1. In future studies, it is recommended to conduct microbiological tests on 4 treatment variations in order to find out which treatment formulation is better.
2. Further research needs to be done for the formulation of snakehead murels in multiply so that the taste and protein content values are higher.
3. Further research needs to be done by replacing the addition of extracts to the nugget formulation with other extracts.

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# **TECHNOLOGY**

# Design of Ergonomic Biomass Stove Using Ergonomic Function Deployment (EFD) Method

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**Abstract**— Increased energy use is caused by population growth and depletion of world oil reserves. Emissions from fossil fuels give problems to every country to immediately use alternative energy. Briquette is one of the methods used to convert biomass energy sources. Other biomasses such as coconut shells, wood charcoal, rice husks, and sawdust can be made into briquettes. Biomass stoves are stoves used specifically for the use of non-fossil fuels. The current problem is the design of biomass stoves used by respondents, one of which is biomass stove that is not ergonomic and difficult to control the size of the fire. So this research was conducted to design an ergonomic biomass stove using the Ergonomic Function deployment (EFD) method which is a development from Quality Function Deployment (QFD). The conclusion of the research design of an ergonomic biomass stove using the Ergonomic Function Deployment (EFD) method is a specification of the results of the design of a biomass stove needed, namely: a biomass stove that is safe, easy to use, a size that is comfortable to use, a lightweight and durable material, easy to set fire and easy to ignite. Then the anthropometric data used are the dimensions of the width of the palm of the hand measuring 8.62 cm, the dimension of the palm of the hand 4, cm.

**Keywords**—*Alternative Fuels, Ergonomic Function Deployment, Biomass Stove*

## I. INTRODUCTION

At present the increase in energy use is caused by population growth and depletion of world oil reserves. Other problems such as emissions from fossil fuels make a nation immediately use alternative energy. Biomass is a biological resource that can be converted into renewable energy sources. Coverage of biomass energy comes from organic materials such as plants or animals, whether formed from the results of their production, metabolic waste, or derived from the waste they produce.

Based on the data from the Ministry of Energy's Statistics Indonesia, 2018 focuses on the use of

stoves or daily cooking activities. From these activities can be utilized by the conversion of energy into biomass. Biomass that can be used includes coconut shells, rice husks, sawdust, and other biomass waste. Making briquettes is not too difficult, the tools used are also not too complicated (Usman, 2014). Another problem arising from this energy conversion is related to the design of the stove that does not pay attention to ergonomic factors. Considered more efficient but enough complaints are found that will later be corrected to be superior products.

Popular research has been made by Rahman J. (2015) in his journal "Pollution-free Biomass Stove Design" is different from this research. One of the methods used is not in accordance with ergonomic aspects. Other research was also made by Sulistiyarningsih (2015) in her journal "Designing a Square Biomass Stove with Matlab Modeling and Matching Different Methods" variation with this study is wrong, the method used is not in accordance with ergonomics.

Regarding complaints felt by biomass stove users are: Experiencing low back pain, Causing a lot of smoke, Trying to cook a stove, Working out the size of the fire, Feeling the heat caused when using the stove. So that biomass fuels and biomass stoves can be used by the community using the Ergonomic Function (EFD) method.

## II. RESEARCH METHOD

Ergonomic Function Deployment (EFD) is a development of Quality Function Deployment (QFD) (Ulrich & Eppinger, 1995) by adding a new relationship between consumer desires and the ergonomic aspects of the product. This relationship will complete the House of Quality matrix form which also translates into desired Ergonomic aspects. The House of Quality matrix used in the Ergonomic

Function Deployment (EFD) was developed into the House of Ergonomic (HOE) matrix.

The first step of this method is the identification of needs variables by designing open questionnaires, determining samples and distributing questionnaires, ending with determining the needs variables. Then proceed with the identification of the level of importance in the form of designing open questionnaires, determining samples and distributing questionnaires, ending with a test of validity and reliability. The determination of the needs variable is based on the ENASE rule, which is (Effective, Comfortable, Safe, Healthy and Efficient). Then after the level of importance is obtained, it is continued with the formation of the House of Ergonomic which contains the needs and desires of consumers as a reference for the creation of new products according to consumer desires. The last stage is product design as an effort to meet the wants and needs of consumers. The flow of this research is arranged in the form of Flowchart as follows:

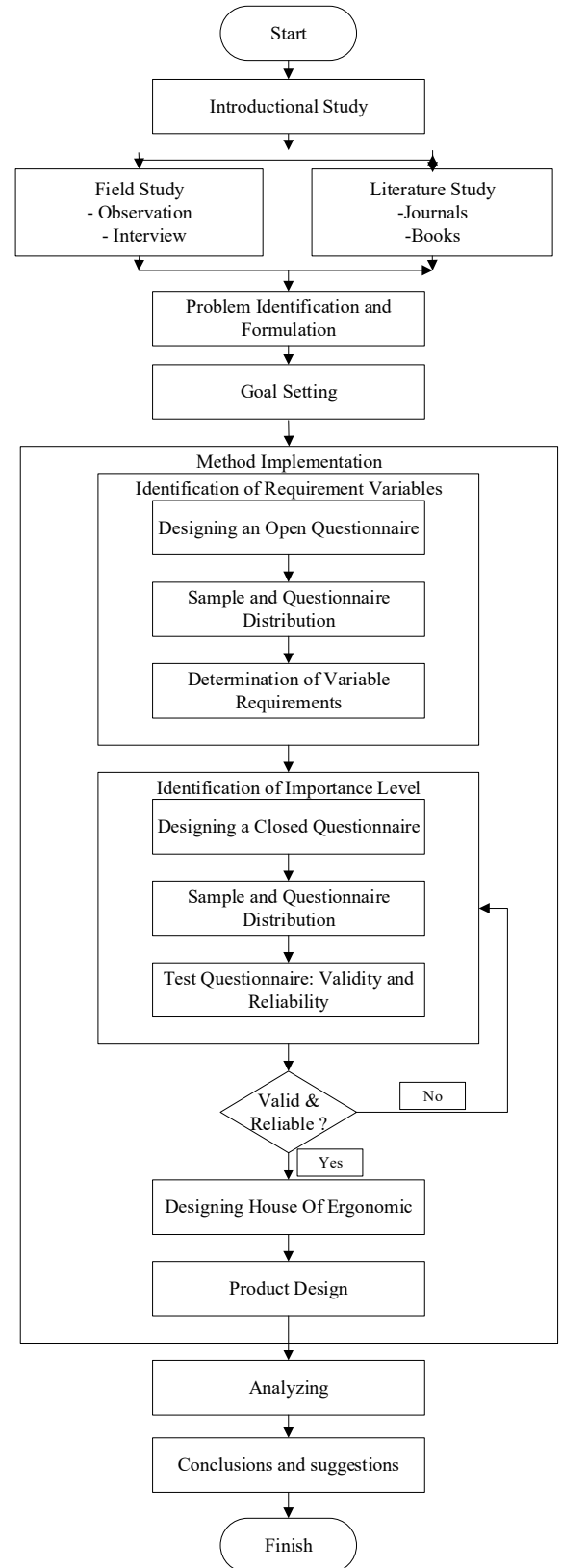


Figure I. Research Methodology Flowchart

Source: Data processed in 2019

### III. RESULTS AND DISCUSSION

#### A. Respondent Identification

TABLE I. Variable of consumers' needs

Aspect	Code	Variable of Needs	Description
Effective	V1	Easy to set fire and easy to ignite	Biomass stove design can easily adjust the level of fire
	V2	Light and durable material	The biomass stove material is lightweight, inexpensive, easy to carry and durable
	V3	Easy to use	The design of the biomass stove is easily understood by users
Comfortable	V4	The stove size is comfortable to use	The dimensions of the biomass stove are in accordance with Indonesian anthropometric body measurements
Safe	V5	Safe when used	The design of the biomass stove makes the user safe from accidents such as there is not much smoke, no pungent odor, and does not explode easily
Healthy	V6	Doesn't cause back pain	Biomass stove design can reduce back pain
Efficient	V7	Economical in usage	A fuel-efficient biomass stove is easily available

Source: Data Processing, 2019

#### B. Level of Consumer Interest

TABLE II. Level of Consumer Interest

No	Variable	STP	TP	CP	P	SP	Total	Performance value
1	Easy to set fire and easy to ignite				4	6	46	4,6
2	Light and durable material				5	5	45	4,5
3	Easy to use				6	4	44	4,4
4	The stove size is comfortable to use				4	6	46	4,6
5	Safe when used				4	6	46	4,6
6	Doesn't cause back pain				6	4	44	4,4
7	Economical in usage				4	6	46	4,6
Total							317	31,7

Source: Data Processing, 2019

#### C. Level of Consumer Satisfaction

TABLE III. Level of Consumer Satisfaction

No	Variable	S T P	T P	C P	P	SP	Total	Performan ce value
1	Easy to set fire and easy to ignite		5	5			25	2,5
2	Light and durable material		6	4			24	2,4
3	Easy to use		6	4			24	2,4
4	The stove size is comfortable to use		5	5			25	2,5
5	Safe when used		5	5			25	2,5
6	Doesn't cause back pain		6	4			24	2,4
7	Economical in usage		5	5			25	2,5
Total							172	17,2

Source: Data Processing, 2019

#### D. Goal

TABLE IV. Goal Setting

No	Variable	Goal
1	Easy to set fire and easy to ignite	5
2	Light and durable material	5
3	Easy to use	5
4	The stove size is comfortable to use	5
5	Safe when used	5
6	Doesn't cause back pain	5
7	Economical in usage	5

Source: Data Processing, 2019

#### E. Determine Technical Response

TABLE V. Technical Response

No	Variable	Technical Response
1	Easy to set fire and easy to ignite	Product Design
2	Light and durable material	Material component
3	Easy to use	Product Design
4	The stove size is comfortable to use	Product dimension
5	Safe when used	Product Design
6	Doesn't cause back pain	Product dimension
7	Economical in usage	Material component

Source: Data Processing, 2019

#### F. Uniformity Test, Data Sufficiency and Percentile value

TABLE VI. Recapitulation of Anthropometric Data Uniformity Test calculation

No	Dimension code	Body dimension	$\sigma$	BKA	BKB	Description
1	D12	Dimension of the width of the palm	0,52	8,61	6,59	Similar
2	D16	Dimension of the	0,26	4,27	3,23	Similar

		thickness of the palm				
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Source: Data Processing, 2019

TABLE VII. Recapitulation of Anthropometric Data Sufficiency Test calculation

DATA	N	N'	Description
D12	10	6,4	Adequate
D16	10	6,8	Adequate

Source: Data Processing, 2019

TABLE VIII. Selected Percentile value

No	Dimension Code	Body Dimension	Selected Percentile
1	D12	Dimension of the width of the palm	P 95 (8,62)
2	D16	Dimension of the thickness of the palm	P 95 (4,26)

Source: Data Processing, 2019

Product dimensions are based on anthropometric measurements. The anthropometric data used were the width dimension of the palm (D12) of 8.62, and the dimension of palm thickness (D16) of 4.26.

### G. House of Ergonomics

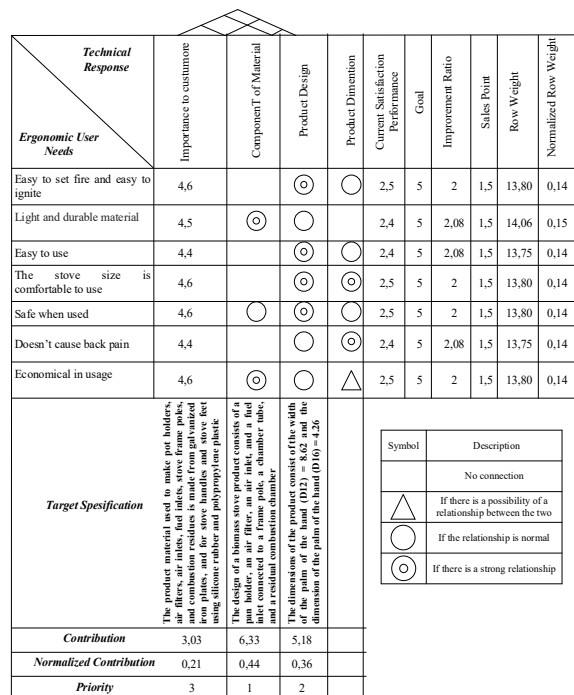


Figure II. House Of Ergonomic

Source: Data Processing 2019

HOE functions to unite all data into 1 picture that explains all EFD processing that forms a house image. HOE consists of consumer needs, technical responses, the relationship between customer needs

and technical responses, the relationship between technical responses, the level of importance, level of satisfaction, Goal, Imitation Ratio, Sales Point, Raw Weight, Normalized Raw Weight, Target Specification, contribution value, normalized contribution and priority order.

### H. Design of Ergonomic Biomass Stove



Figure III. Design of Ergonomic Biomass Stove

Source: Data Processing 2019

The design of the stove consists of filters, air holes, fuel inlet, frame poles, tubes and ash disposal sites connected and can use galvanized iron plate material, and there is a handle to hold or dispose of ash and add ash disposal in the design of biomass stoves which is resistant from fire.

### I. Material Cost Calculation

Material	Size Description	Size used	Per unit	Price	Price Per unit
Galvanized iron plate	75 x 75 x 2,7mm	150 x 85mm	9	\$ 35,66	\$ 2,80
		165 x 196mm	7		\$ 1,10
		110 x 20mm	8		\$ 16,21
		122 x 70mm	12		\$ 4,18
		150 x 50mm	20		\$ 4,76
Polypropylene plastic + silicon rubber	2 kg	3 x 30 x x100mm	9	\$ 14,21	\$ 15,79
Service			1	\$ 7,10	\$ 7,10
Total					\$ 34,58

Source: Data Processing, 2019

The manufacture of one biomass stove needs galvanized iron plate materials, with a total price of Rp.486,792,- per unit.

### J. Benchmarking

Product Type	Product Design	Product Material	Product Specification
Product on the market		Iron	1 Material can rust
			2 Size doesn't adjust to body dimension, which can be seen from (Palm thickness, and palm width)
			3 No handle
			4 No ash shelter
			5 The price is \$ 27,00




Product Design		Galvanized iron plate, Silicon rubber, Polypropylene plastic	1	Rust and fire resistant material
			2	Size is based on the body dimension of stove user, which can be seen from (Palm thickness, and palm width)
			3	It has handle to carry the stove
			4	It has a place to accommodate the rest of the burnt or ashes
			5	The price is \$ 34,58

Figure IV. Benchmarking  
Source: Data Processing 2019

At this stage many differences are found in terms of the materials and components available on the biomass stove. In the proposed design, this biomass stove uses galvanized iron plate material because it has a material that is lightweight and resistant to fire, and so that users are more comfortable in using the stove, and can easily create a shelter or ash disposal after burning. In addition, silicone rubber has stable properties, non-reactive, and has the ability to survive in extreme environmental conditions and still be able to maintain its properties and functions.

#### IV. CONCLUSION

The conclusions of the research design of an ergonomic biomass stove using the Ergonomic Function Deployment (EFD) method are as follows:

1. The required biomass stove design specifications based on the results of the distribution of questionnaires to users or users of biomass stoves are stoves that have a lightweight and durable material, and the size of a stove that is comfortable when used, does not cause back pain, is easy to use, safe when used, and can set fire easily and easy to ignite.
2. From the data processing, an ergonomic biomass stove design with anthropometric data is obtained, namely the dimensions of the width of the palm of the hand measuring 8.62 cm, the dimension of the palm of the hand 4, cm.

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# *Detection of Hate Speech in Indonesian Language on Twitter Using Machine Learning Algorithm*

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**Abstract**—Hate speech is an act of communication carried out by an individual or group in the form of provocation or insults to other individuals or groups. Hate speech is prohibited because it can trigger acts of violence and prejudice either from the perpetrators of the statement or victims of the act. This study aims to find the best algorithm for detecting Hate Speech by comparing the Decision Tree, Naive Bayes, Support Vector Machine and Random Forest algorithms using N-Gram-based Word Scoring (TF-IDF) methods, including the Union Gram, Bigram and Trigram using the programming language Python. The results reveal that the Naive Bayes algorithm shows the best results using the Trigram feature with an Accuracy of 88.57%, Precision of 96.75% and Recall of 99.34%.

**Keywords**—*Machine Learning, text classification, Python, Decision Tree, Naive Bayes, SVM, Random Forest*

## I. INTRODUCTION

Social media is now a communication media that is quite popular among internet users. One of the most popular social media is Twitter. Twitter can be an effective and efficient place of promotion or campaign. The success team of a regional head candidate or president candidate can now use social media in their candidate's campaign. Black campaign is an act of insulting, slandering, pitting, inciting, or spreading hoaxes committed by a candidate, group of people, political parties or supporters of a candidate against their opponents. This is different from expressing criticism of a particular candidate's vision and mission or program, which is not classified as the Black Campaign. But for now after the campaign period has passed, there is a new term called Hate Speech.

Hate Speech is an act of communication carried out by an individual or group in the form of provocation or insults to other individuals or groups in various aspects such as race, color, ethnicity, gender, disability, sexual orientation, citizenship, religion, etc. [1] - [7].

Research on hate speech is mostly done in English texts [3] - [7], and there are still few studies conducted

in Indonesian Language texts. Pratiwi, et al. [1] tried to conduct research to detect hate speech in Indonesian texts, but this study only focused on hate speech on religion. The results of this study are creating a new dataset for the detection of hate speech in Indonesian. The dataset used is divided into 2 classes, namely Hate Speech toward religion and non-religion. The quality of the dataset used is inadequate, because it only discusses tweets about religion, and with an unequal number of tweets between the two classes. Therefore, the classification results can wrongly detect tweets related to religion as words that contain Hate Speech.

Alfina, et al. [2] also conducted research on the detection of hate speech using Indonesian language text by creating a new dataset. The dataset was taken from Twitter using a hashtag on the DKI PILGUB by using the hashtags #DebatPilkadaDKI and #SidangAhok. The dataset collected was 710 and divided into 2 classes, namely 520 HS tweets and 260 NONHS tweets. Because the dataset was not balanced between the two classes, the researchers reduced the majority dataset with the Undersampling Method to be balanced, and the result became 260 HS tweets and 260 NONHS tweets. It can be seen that the dataset in this study was reduced by 450, which should be maximized dataset to detect Hate Speech.

Limited use of data sets results in a decrease in the value of accuracy in text classification. The method proposed in this study addresses the problem of limited data sets and compares the performance of the Tf-Idf Scoring method with several machine learning algorithms.

## II. RESEARCH METHOD

### A. Data Set

The initial stage of this research is data collection. Previously there had been hate speech dataset totaling 713 in Text (.txt) format. Then the format is changed to CSV format.

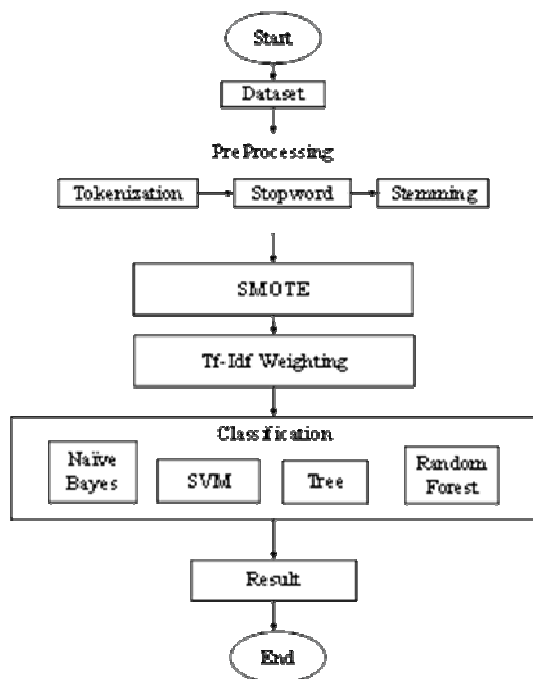


Figure 1. Research Flowchart

### B. Pre-process

We adopt the preprocessing method used by [8] with a few modifications. Pre-processing is the initial stage in the classification of texts to prepare texts. In a text document, the feature in question is the text content contained in a text document. At this stage there are several stages carried out in this study:

- Case Folding

The Case Folding process is the stage for changing all letters in each document into lowercase letters.

- Tokenizing

Tokenizing is the process for separating words from paragraphs in text content into single words or multiple words.

- Stopword Removal

It is a process to eliminate common or less important words (stop list) that have little effect on the text. At this pre-process stage, the output is a structured text document and stored in a "Bag-of-Word" representation model. This representation is a model used in text classification because of the ease of use in classification purposes [8].

- Stemming

It is a process for finding the root of words. The root search for a word or commonly called basic word can reduce the index results without having to eliminate the meaning. In this study, the Stemmer used was the Tala Stemmer [9]. Tala Stemmer is the adoption of the Porter Stemmer algorithm in English.

- SMOTE

Synthetic Minority Oversampling Technique is a technique for handling imbalanced classes [10]. This study conducted the SMOTE technique aimed at balancing class data.

TABLE 1. CONFUSION MATRIX

	Predicted Positive	Predicted Negative
Actual Positive	TP	FN
Actual Negative	FP	TN

The work assessment of the model is determined based on accuracy and precision. Accuracy and precision values can be calculated based on the values of True Positive (TP), False Positive (FP), True Negative (TN), and False Negative (FN) formulated in the equation.

TABLE 2. Comparison Using SMOTE

Algorithm	%Accuracy Original Data	%Accuracy SMOTE Data
Naïve Bayes	47.5 %	76.4 %
SVM	50.0 %	76.4 %
Tree	50.0 %	58.8 %
Random Forest	42.5 %	64.7 %

Table 2 shows the results of the accuracy values comparison with the original dataset and using SMOTE. The results show the best accuracy results using the SMOTE technique found in the Weka application [10].

### C. Classification

- Word Weighting Method

After the pre-process, the token or word produced is given a score that can represent how much influence the score has on a document [11]. The word scoring method used in this study is Term Frequency - Inverse Document Frequency (TF-IDF). The workings of the word scoring in the TF-IDF method are by using 2 scoring parameters, namely the local scoring  $tf_{i,j}$  which is the score obtained from the frequency of occurrence of the word  $i$  in the document  $j$  and global scoring using  $idf_i$  which is the score obtained by considering the number of occurrences of the word  $i$  ( $DF_i$ ) for all  $N$  documents. Then, the score of the local scoring is multiplied by the score of the global scoring [12]. How to calculate the score is using equation (1):

$$(1) \quad w_{i,j} = tf_{i,j} \times \left( \log \left( \frac{N}{DF_i} \right) \right)$$

This study uses a machine learning algorithm to classify text in detecting hate speech using the Weka Data Mining Tool application [12].

### III. RESULTS AND DISCUSSION

Evaluation on this research was carried out using the K-fold Cross Validation Method. The first stage is to divide the data into k subset pieces that have the same size. The second stage is to use each subset to become test data and the rest is used for training data to form a model and bring up the evaluation results.

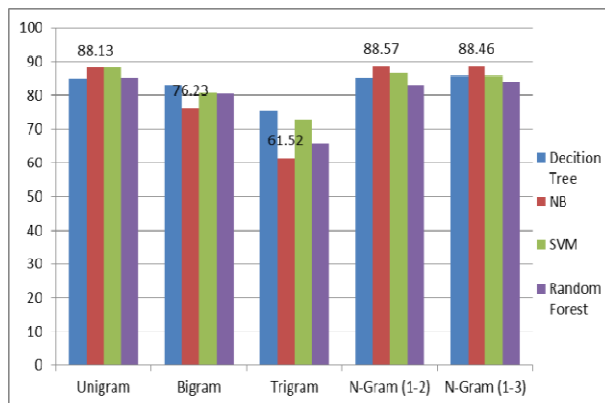


Figure 2. The Results of Accuracy Value Comparison

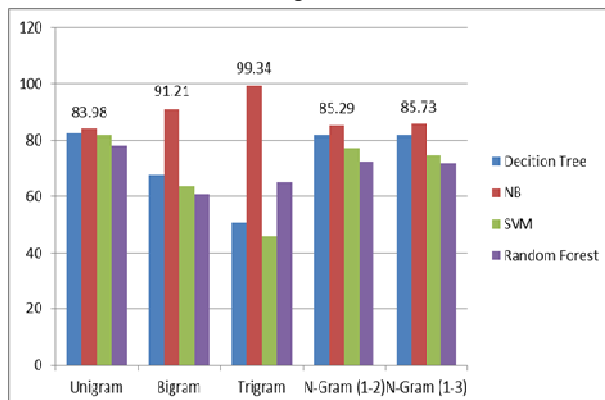


Figure 3. Kappa value comparison results

Figure 2 and Figure 3 show the results of the comparison of the accuracy and kappa values of the hate speech text classification. The results show that the

Naive Bayes algorithm has the highest level of accuracy and kappa value, with an accuracy value of 88.57% and a Recall value of 99.34% and using the N-gram scoring method (1-2) and Trigram.

From the results of this study, it can be concluded that the Tf-Idf scoring method based on N-Gram (1-2) and Trigram with the Naïve Bayes algorithm shows the best results, in terms of accuracy and kappa values.

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# *Design and Fuel Consumption Analysis of Betel Nut Dryer With Capacity 25 kg*

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**Abstract**— The purpose of betel nut drying is to make it easier to separate the contents of betel nut with the betel nut skin. There are 2,000 Rupiah value added for every kg of dried betel nut compared to wet betel nut price. Drying time using dryers is less than conventional drying by using sunlight which need two days for drying, our dryer only needs 1,5 hours. Drying cost is expected to reduce by using biomass materials for dryer fuel. The cheapest drying cost obtained by using rambutan twigs, there are need 8,7 kg rambutans twigs with 1740 Rupiah cost per cycle. Liquid petroleum gas (LPG) gives the best drying uniformity with 3.05 standard deviation.

**Keywords**— *Betel Nut Drying, Dryer, Biomass Fuel, LPG.*

## *Introduction*

Betel nut is a tropical plant that is planted to get fruit and its beauty. Farmers use betel nut as a fence or garden boundary. Areca nut contains polyphenol compounds, namely flavonoids and tannins, antioxidant activity and functions as a delay in aging for the skin. The use of areca nut as a natural colorant is one of the efforts to diversify products to increase the added value of betel nuts and can meet the needs of domestic dyes which are still imported from abroad (1).

Dyes from betel nut can be obtained through the extraction process. Betel nut is extracted into powder by drying. Betel nut extract in powder form can reduce the volume, weight, and make it easier when packaging, handling and transportation also can be store for long time (2).

In the drying process need to settings the temperature, humidity and air flow. Changes in water content in food are caused by changes in energy in the system. For this reason, need to do the calculation for mass and energy balance to achieve balance (3).

Riau Province is known as one of the areca-producing productive areas. The amount of areca nut production in Riau Province in 2014 of 12,409 Ha planted area of smallholder plantations was 6,328 tons totaling 27,471 farmers.

Traditional drying by sun's heat in open areas requires a long time and will be more susceptible to contamination by the environment. Drying optimization requires complete knowledge of the entire drying process so that it leads to saving energy, time and avoiding environmental pollution by using appropriate technology in the form of drying ovens.

Drying is the occurrence of evaporation of water into the air due to differences in the content of water vapor between the air and the dried material. In this case the water vapor content is less or air has low humidity resulting in evaporation (4).

From field observations, the price of whole wet areca nut is 1,000 Rupiah, while for dried skinless areca nuts is 10,000 Rupiah. Yield of areca nut drying process after separated the skins approximately 30% of the wet betel nut. Based on this data it can be calculated the addition of selling value of drying areca nut. Every 1 kg of betel nut will produce 0.3 kg of dried betel nut with a selling price of 3,000 Rupiah. This means that there is a value increase of 2,000 Rupiah for every kilo gram of dried betel nut.

In this research we will be design and manufactured of nut drying oven with a capacity of 25 kg per hour. Testing the amount of fuel needed to determine the type of fuel that is most suitable for use.

## I. RESEARCH METHODOLOGY

### A. Design and manufacture of Dryers

The specifications of this frame have dimensions of 700 x 650 x 25 mm and use angled steel and wire counters as the base. The L profile steel used in the

manufacture of the oven rack frame and has a shelf base made of white window counter material. A 20 mm square hole counters wire is used so that the heat from the combustion results easily spreads upwards.

This frame design is square in shape with each frame using 37 mm x 37 mm plate with a thickness of 1.70 mm. The concept of this frame is to support the strength of the frame used to support the weight of the betel nut with an outer dimension of 860 x 750 x 600 mm. The inner stem has dimensions of 800 x 700 x 560 mm. Dimensions of the drying chamber size are obtained from the initial calculation, which refers to the size of the baking pan by: baking area + pan width x fire gap area = cross-sectional area of the frame.

The manufacturing process begins by providing the equipment and materials used in the manufacture of drying ovens.

Complete figure of betel nut dryer shown in “fig. 1”.



Fig. 1. Betel Nut Drying

### B. Data Collection and Processing

The data needed from testing:

1. Drying oven temperature on all types of fuel used.
2. Areca weight before drying and areca weight after drying.
3. Fuel consumption for areca drying.
4. The time needed for drying.

### C. Dryer Fuel Consumptions

- Moisture Content Calculation

Betel nut moisture content calculated by the following formula:

$$\text{Moisture Content} = \frac{A - B}{A} \times 100\%$$

Where,

A : Dried Betel Nut, kg

B : Solid Content, kg

- Heat Needed Calculation

Calculation of heat needed for areca drying is to add up three types of heat requirements, which are the equation:

$$Q_{\text{Total}} = Q_1 + Q_2 + Q_3$$

Where,

Q<sub>1</sub> : Heat to raise the temperature of the betel nut from 30°C to 65°C

Q<sub>2</sub> : Heat to increase the water temperature from 30°C to 65°C.

Q<sub>3</sub> : Heat to evaporate water.

Calculations for Q<sub>1</sub> can be done like the following equation:

$$Q_1 = m_{\text{nut}} \times C_{\text{nut}} \times \Delta T$$

Where,

m<sub>nut</sub> : Betel nut mass AD, kg

C<sub>nut</sub> : Specific heat of Betel nut, kkal/kg °C

ΔT : Temperature difference, °C

Calculations for Q<sub>2</sub> can be done like the following equation:

$$Q_2 = m_{\text{water}} \times C_{\text{water}} \times \Delta T$$

Where,

m<sub>nut</sub> : Water nut mass, kg

C<sub>nut</sub> : Specific heat of Water, kkal/kg °C

ΔT : Temperature difference, °C

Calculations for Q<sub>3</sub> can be done like the following equation:

$$Q_3 = m_{\text{water}} \times L_{\text{water}}$$

Where,

M<sub>water</sub> : Water nut mass, kg

L<sub>water</sub> : Latent heat of evaporation, kkal/kg

- Fuel Needed Calculation

Calculations to determine the fuel requirements needed are as follows (5):

$$F = \frac{Q}{\eta \times \eta_{\text{ex}} \times C_{\text{m}}}$$

Where,

F : Fuel Needs, kg/hour

Q : Calorie needs for drying, kkal/hour

η : Combustion Efficiency, %

η<sub>ex</sub>: Efficiency of Heat Exchanger, %

- Fuel Cost Calculation

Calculations to determine the fuel requirements needed are as follows:

$$\text{Fuel Cost} = \text{Fuel Consumption} \times \text{Fuel Price}$$

## II. RESULT AND DISCUSSION

The final product from the design and manufacture of an economical type of areca nut dryer oven specifications are shown by “Table. 1”:



TABLE I. OVEN SPECIFICATION

No	Specification	Remark / Dimension
1	Oven Dimension	860 × 750 × 600 mm
2	Drying Chamber Dimension	800 × 700 × 560 mm
3	Blower	150 watt
4	Voltage	220 volt
5	Heating Temperature	70°C to 120 °C
6	Kapasitas Pengeringan	25 kg
7	Fuel	Wood Waste
8	Drying Time	±1 Hour 30 Minute
9	Operation	Manual

This dryer is easier for ordinary people because it is intended for betel farmers. The design and manufacturing is very sturdy and strong and equipped with wheels and holders to makes it easier for farmers can move easily to reach places where farmers will do the drying process. This is also can be used as a dryer rental business in rainy season, so farmers only need to rent it and do not need to buy the dryer.

To find out how big the economic value of the dryer is then made a comparison between the cost of the dryer and the price of similar devices that are already on the market. From the calculation of the production cost of betel nut dryer, the cost of the tool above is Rp. 2,534,000. This price is still cheaper than similar devices in the market which have a price of Rp. 15,000,000 to Rp. 25,000,000.

A. Drying Time and Temperature

From the oven test results obtained the results of temperature and drying time as described in “fig. 2”.

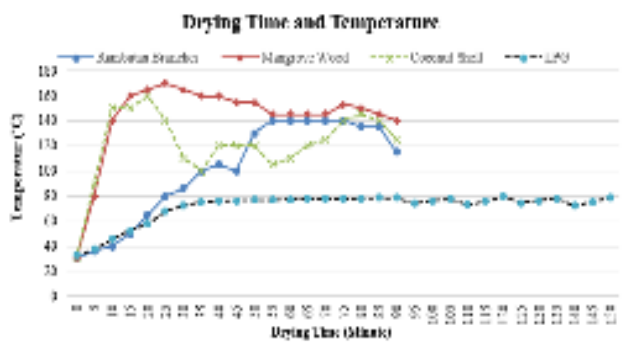


Fig. 2. Drying Time and Temperature

From “fig. 2” Comparison of Drying Temperature, it is seen that the highest oven temperature is reached when using mangrove with a maximum temperature of 170 °C. While the lowest temperature occurs when using LPG fuel which has an average drying temperature of 82.2 °C. Even so, the oven temperature using LPG is more stable and easier to operate because controlling combustion is easier. While for rambutan branches, mangrove and shell fuels, stricter controls are needed to control fire by control fuel feeding in accordance with the desired large fire. If too much fuel is added, the oven temperature will be too high and reduce the quality of the areca nut produced, if too little,

the drying time will be longer. Coconut shell is the fuel most needed for supervision to request fuel.

Higher oven temperatures in the use of rambutan branches, mangrove and coconut shell provide an advantage in shorter drying times of 90 minutes, while for LPG fuels take 150 minutes. This happens because of the low drying temperature when use LPG fuel.

B. Betel Nut Drying Quality

From the results of the calculation of the data obtained from the test results are obtained as described in the following “fig. 3”.

“Fig. 3” explained that drying using mangrove wood fuel produces the lowest moisture content of 68.92%. However, the difference in water content produced from each fuel used is not significantly different. letters for table footnotes.

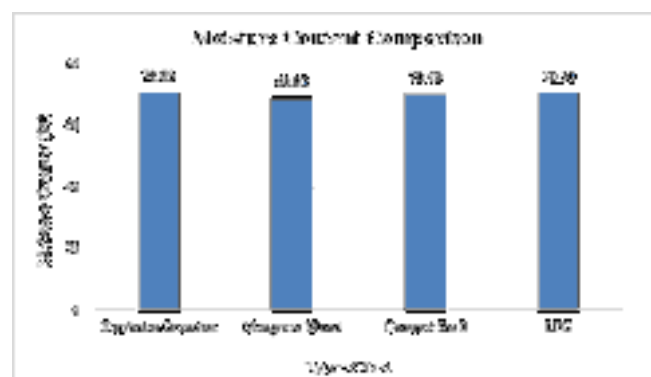


Fig. 3. Moisture Content Comparison. (figure caption)

One of the factors that determines the quality of the drying product is the uniformity of the areca nut drying in one batch. To find out the uniformity level of drying, it is necessary to calculate the standard deviation of water content in each pan in one batch drying. From the calculation of the data obtained from the test we get the standard deviation values as described in the “fig. 4”.

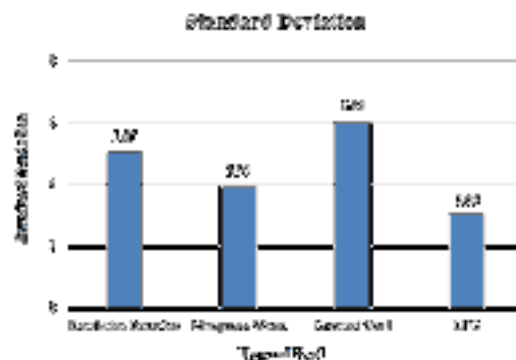


Fig. 4. Standard Deviation Comparison. (figure caption)

From “fig. 4” can be seen that the standard deviation of the results of drying using LPG fuel has the lowest standard deviation of 3.05. This shows that the betel nut drying using LPG has better drying uniformity.

Coconut shell has the highest standard deviation value of 6.04, this means that the quality of drying produced by using coconut shell fuel is at least uniform.

C. Betel Nut Drying Cost

Drying costs are calculated only the cost of fuel, while the cost of electricity for blowers is ignored. Drying costs for each fuel can be seen in the “fig. 1”:

TABLE II. DRYING COST WITH DIFFERENT FUEL

Fuel Type	Fuel Consumption (kg)	Price (Rupiah)	Fuel Cost (Rp/Cycle)
Rambutan Branches	8.7	200	1,740
Mangrove Wood	7.2	500	3,600
Coconut Shell	6.8	500	3,400
LPG	1.6	8,333	13,333

Table. II explain the the biggest fuel consumption data obtained is the use of rambutan branches while the least is when using LPG. Lowest fuel cost is when using rambutan twigs as much as 1740 Rupiah, this is because rambutan branches price is very low compare than other fuel. While the highest cost is the use of LPG fuel, amounting to 13,333 Rupiah. The high cost of LPG is due to the high price of LPG compared to other biomass fuels.

D. Drying Efficiency

Comparison of the total Q with the heat used in the drying process can be seen in the “fig. 5”.

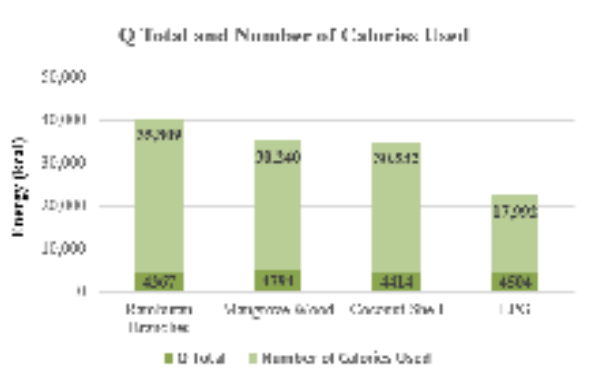


Fig. 5. Standard Deviation Comparison. (figure caption)

From “fig. 5”, can be seen the greatest calorie consumption is when using rambutan fuel which is equal to 35,809 kcal, while the lowest is when using LGP fuel with a value of 17,992 kcal. This will affect the value of drying efficiency. As for the Q total required, the value will depend on the mass of the dried areca nut, the mass of the evaporated water, and the difference in initial and final drying temperatures.

By comparing the number of calories used with the ideal number of calories needed, the drying efficiency

value can be determined. Drying efficiency shown in “fig. 6”.

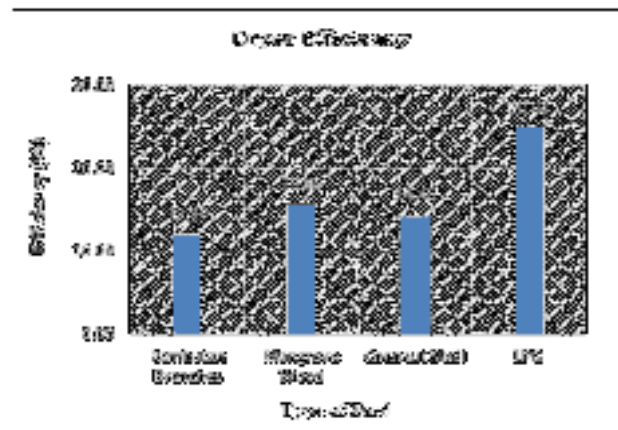


Fig. 6. Standard Deviation Comparison. (figure caption)

In “fig. 6” explain that the highest drying efficiency value is drying using LPG gas which is 25.03%. Whereas the lowest efficiency value is drying when using rambutan fuel which is 12.19%.

The drying efficiency value shown is the total efficiency value, which is the combining of the combustion efficiency (furnace) value and the heat transfer efficiency (oven) value. The drying efficiency value shown is the total efficiency value, which is the combining of the combustion efficiency (furnace) value and the heat transfer efficiency (oven) value.

III. CONCLUSION

From the results and discussion it can be concluded:

- The cost needed to make this betel nut dryer is Rp. 2,534,000. This is very much different compared to the selling price in the market which reaches Rp. 15,000,000 to Rp. 20,000,000.
- This dryer is capable of drying 25 kg of betel nuts in 1.5 hours.
- This dryer can be a solution for drying areca nuts in the rainy season. The drying process can be done at any time without being affected by the weather.
- The lowest fuel cost is rambutan branches which is 1740 Rupiah.
- The highest drying efficiency value is drying using LPG gas, which is 25.03%.
- Based on economic factors, the recommended fuel for use is rambutan twigs with the lowest cost and faster drying time.



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# *Design of Batako Molding Machine Using Value Engineering Method*

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**Abstract**— The method used in repairing this batako molding machine is the value engineering. In using this method, an initial design is needed, where there are problems experienced when making batako machine. The resulting mold is not good, so an assessment of the brick madewas carried out. The results are not satisfactory making the product as reference for improvement. This method consists of six general stages, which can be used in this improvement, namely: the information stage, the creative stage, the evaluation stage, the planning stage, the reporting stage, and the implementation stage. After implementing the new way of working using a batako molding machine with a new design, a comparison is made to determine whether the repair effort is effective or not. For this reason, the calculation of the value of each tool is calculated. From the results of calculations, it is known that an increase in improvement from machine with the old design to a machine with a new design

**Keywords**— *Disain, Reliability, Validity, Value Engineering*

## I. INTRODUCTION

The infrastructure in the city of Pekanbaru is experiencing very significant developments every year. Tall buildings have begun to appear in every corner of the city of Pekanbaru. One of the building materials used to support infrastructure is brick. Bricks are one of the building materials that are still often used by Indonesian people today. Brick molding currently still uses a lot of traditional tools, so the production process tends to be slow and the results are also not satisfying. Moreover, the demand for bricks in the community is very high. As a result, brick makers are very difficult to meet the demands of the community. As a result of the lack of brick production, the community tried to get another alternative as a substitute for bricks, namely batako. Materials needed to make batako are sand, gravel and also cement. These ingredients are still easy to get.

As the main support in making a batako, batako molding machine is needed. With the existence of a batako molding machine, it is possible to make it easier for people to make their own batako quality according to their desired qualities. The process of

molding batako using a batako molding machine is simply by mixing the sand, gravel, and cement together with water, and then stirring until blended. After that, it is put into a batakomolding machine. Making a batakomolding machine is quite easy and affordable. XYZ Batako Business is the name of a brick-and-mortar business located on Pasir Putih street, Siak Hulu sub-district, Kampar Regency. In the XYZ Batako Business, making a batako is still in a simple way without any supporting tools or machines. Batako is made using a wood molding, and then pressed by slamming or beating using wood. With the production process using this simple method, XYZ batako molding business can produce an average of 400 pcs per day.

### A. Limitation of the Problems

To avoid overly extensive problems, the following problem limitation is made:

1. The study was conducted in the XYZ Batako Business.
2. Data were taken in May-June.

### B. Problem Formulation

Based on the above background, the problems can be formulated, as follows:

1. What are the characteristics of the desired batako molding machine?
2. How to design a batako molding machine that suits the needs?
3. What is the cost of procuring a batako molding machine?

### C. Research Objectives

The objectives in this study are:

1. Knowing the characteristics of batako molding machine.
2. Designing and making batako molding machine to maximize the production process in the Batakobusiness.
3. Determine the cost of procurement of batako molding machine.

### D. Research Benefits

The expected benefits of this research are:

1. This research as a science output obtained during the study.
2. Being a solution for the XYZ Batako Business to maximize its production process.
3. Adding insight and knowledge about the batako making business.
4. As a reference for future research.

## II. RESEARCH METHOD

The following is a research methodology used to direct and simplify the analysis process in finding solutions to solve problems. It is hoped that by following the stages of this research methodology, the quality and content of this research will be better.

### A. Preliminary Research

Preliminary research is the initial stage to find out what problems to be examined. The methods used to identify the problem are as follows:

#### 1. Interview

Data collection techniques were carried out through face-to-face and question and answer directly with several Pekanbaru residents to find out what complaints were felt related to the batako, then asked directly about the plan to make the batako molding machine.

#### 2. Observation

Data collection methods are complex because they involve a variety of factors in their implementation, one of which is the XYZ Batako Business that was interviewed with the existence of a plan for batako molding machine.

#### 3. Questionnaire

Data collection was done by giving a set of questions or written statements to several residents to be answered. The questionnaire used was an open and closed questionnaire. An open questionnaire was used to find out the wants and needs of consumers for the batako molding machine products to be made later, while the closed questionnaire was used to find out the level of importance and satisfaction with the batako molding machine design products which would be made later as an alternative to the manual batako molding machine which is still very simple that is used by the XYZ Batako Business.

### B. Literature Review

The theory presented in the literature review chapter explains the relationship between several concepts used to explain research problems. These concepts will then be translated into research variables. Therefore, this chapter presents research findings related to research problems or variables that have been carried out by previous researchers, including a literature review of a batako molding machine, a literature review of the Value Engineering (VE) method. Based on these findings, the researchers then present a theoretical framework explaining the relationship between the variables to be studied. Value engineering methods are developed to provide a way of value processing and

efforts to increase systematic innovation to provide competitiveness for a product. In short, through this literature review chapter, a researcher is expected to be able to provide readers with an explanation of the rationale or theoretical basis of conducting research, especially regarding why a problem is chosen to be studied and why certain variables are considered to provide clarity to the problem to be studied.

### C. Problem Identification

Problem identification is a stage of mastery of existing problems, in the XYZ Batako Business where a certain object in a particular situation can be identified as a problem. Therefore, a batako molding machine is designed that can facilitate the XYZ Batako Business. The purpose of identifying this problem is make the readers get some understanding regarding the problems related to the title of the research.

### D. Formulation of the Problem

The formulation of the problem are the questions that will be sought answers through data collection and data processing of the business founded by XYZ Batako Business. The purpose of the problem formulation is to make the problems studies clear.

### E. Research Objectives

In a study, there will be results that will be achieved. The success of the research can be seen from the research objectives whether it has been achieved or not. Therefore, setting research objectives is a target to be achieved in an effort to answer all problems that are being faced/researched.

### F. Implementation of Method

At the implementation stage of this method, there would be several processes that would be passed, including identifying the needs of consumers for batako products obtained from an open questionnaire. After the identification process, the next thing is the closed questionnaire design process to find out the level of importance and level of satisfaction with the product that we would be made later. After the closed questionnaire is complete, we continue at the stage of distributing the closed questionnaire.

After the data from the closed questionnaire that we distributed was collected, the data is processed, and the validity and reliability testing process would be carried out. If the data were valid and reliable, the data would proceed to the Value Engineering method process and the batako molding machine design process and then continue at the stage of determining the cost of procurement of batako molding machine.

#### 1. Information Stage

Gathering as much information as possible includes information about the system, structure, functions and costs of the object being studied. This stage also addresses the problem of who is doing, what can be done, and what should not be done.

## 2. Creative Stage

It is the stage to develop possible alternatives to fulfill primary and secondary functions. This stage also answers questions about the ways to find needs, what is displayed by the desired function.

## 3. Analysis Stage

This stage evaluates alternatives that have been formed and make the largest choice of values. This stage also answers questions about what to do, and how much it costs.

## 4. Development Stage

This stage is to make improvements and adjustments to selected alternatives. This stage also answers the question of what else to be done at work

## 5. Presentation Stage

This stage explains the work of the value engineering team to management. This stage also answers the question of which alternative is best, what is the effect of developing ideas on alternatives, how they are costed, and how they are performed.

After the implementation process of the Value Engineering method is passed, the next step is to design the product based on the variables obtained in the previous stage, the design of the batako molding machine would be made using the 2017 Solidwork Software. After the product design, it continued at the product manufacturing stage.

## III. RESULTS AND DISCUSSIONS

### A. Results

From the data processing that has been carried out, the design of the batako molding machine is as follows.

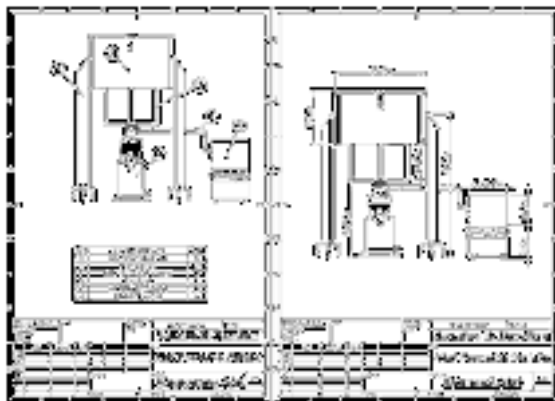


Figure2. 2D Design for Component of Batako Molding Machine

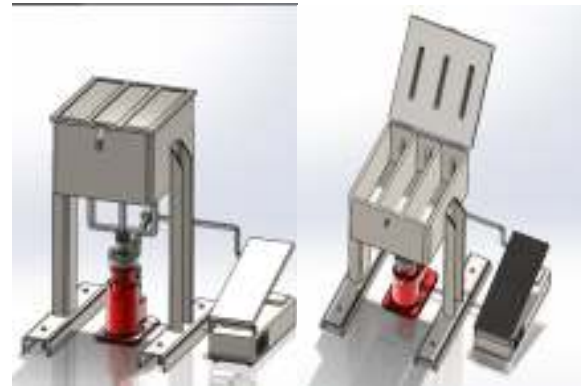


Figure 2. 3D Design for Component of Batako Molding Machine

### B. Discuss

#### 1. Questionnaire Distribution

To know the characteristics of batako molding machine that fits the needs of workers, this questionnaire was distributed as many as 30 to batako molding workers. The following is the data of the distribution of questionnaires results: practical and fast, safety, durability, price, design, capacity, and efficiency.

#### 2. Validity test

From the results of closed questionnaire processing, the data obtained must be tested whether valid or not using the SPSS 22 software. It can be seen that the data of importance and satisfaction level tested using the SPSS 22 software are declared valid, because the correlation probability value is smaller when compared with the value of  $\alpha = 0.05$

#### 3. Reliability Test

Based on the results of processing, the reliability coefficient (Cronbach Alpha) is 0.719 and 0.915. Declared reliable if the Cronbach Alphabet value  $>$  of the r table value at  $N=30$ ,  $DF=N-2 = 30 - 2 = 28$  with  $\alpha = 5\%$  then the value of r table = 0.361. N is the number of questionnaires distributed. Based on the criteria, the Cronbach Alpha value above is already greater than 0.361, the results of the questionnaire data have a good level of reliability, or in other words the results obtained can be trusted.

#### 4. Creativity Stage

In this study the design is based on alternative choices from workers by distributing questionnaires, so the results of the design of the machine are in accordance with the wishes of the workers. The selected alternatives are based on variables from the user of the machine that is selected in alternative 1.

#### 5. Analysis Phase

The alternative ideas are evaluated based on the most choices of the use of the machine of the choice of dominant workers to the first alternative with a total of 113 workers' answers. Therefore, the chosen alternative is the first alternative in this design, and the material used is iron plate, angle iron and iron ump. The expenditure calculated from the total price of raw

materials used is Rp. 671,000, with the price of machines Rp. 342,577.

#### 6. Development Stage

The explanation of the results of the alternative ideas chosen according to the wishes of the community based on the distribution of questionnaires is outlined in a batako molding machine design in the form of 3-dimensional images and ready-made tools

#### 7. Recommendation Phase

At this stage, recommendations are given for the alternative batako molding machine that is selected and suits the needs of workers, and then there will be better ideas that can be developed in further research.

### III. CONCLUSION AND SUGGESTIONS

#### A. Conclusion

The conclusions that can be drawn from this study are as follows:

1. The specification of the machine needed by the public is known based on the results of the distribution of questionnaires that can be seen from a number of aspects including: the use of practical and fast tools, safety, strong tool durability, price and attractive shape design, mold capacity, efficiency.
2. The proposal for the design of batako molding machines in accordance with the needs of the community is as follows:
  - a) The use of machine that is easy and fast  
A working system that uses elastic spring force that is pressed at the top of the pedal
  - b) Safety  
The addition of tools that maintain the safety of workers while doing work, tools used in the jack and handle legs
  - c) Strong endurance  
The material used, steel plate, iron ump, each angle iron has a different shape but has a strong resistance and also affordable prices
  - d) Economical price  
making high quality molds at affordable prices so that the batako molding machine entrepreneurs can increase the production of the batako making
  - e) Attractive design  
the design used must be attractive and have a size that is consistent with the standards on the market
  - f) Capacity  
more capacities are made than previously made, to make it easier for brick making companies in the printing process.

#### g) Efficiency

the basic idea is taken from initial printing where the initial printing is still manual and tends to be slow so I designed a tool that can increase production and maximize printing.

3. The price of equipment per unit of Rp. 342,577. -

#### B. Suggestions

1. The design of machine in this study can still be further developed by the addition of multifunctional other tools, like using a motor for presses
2. For the next researcher, it is hoped that this research can continue by adding methods, characteristics and feasibility aspects in this design.

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# *Comparative Analysis of Two-Way Concrete Slabs using the Direct Planning Method with the Equivalent Frame Method*

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**Abstract**— The choice of method in planning the slab has regulated in the latest regulations on reinforced concrete in Indonesia. However, the selection of the most optimal process of utilization in the field needs to be examined to get a more efficient structural cost. The design of reinforced concrete slabs is based on applicable standards regulated in SNI 2847: 2013. Therefore, a two-way plate study is carried out using the direct design method and the equivalent frame method — the analysis to show on the Ultimate bending moment that results from loading. The results compared with using the Equivalent method. The results obtained are the value of the bending moment and area of reinforcement and the number of reinforcement. Based on the analysis, the equivalent skeletal method is superior in several factors. From the ultimate moment factor obtained by a deviation of 74.12%. From the ratio of rates has a deviation of 13.08% and is based on the number of reinforcement that is more or less simple.

**Keywords**—*Two-Way Concrete Plates, Direct Planning Method, Equivalent Frame Method*

## I. INTRODUCTION

In the slab design, SK SNI-2847-2013 requires using the direct planning method and equivalent framework in planning the two-way slabs[1]. The direct planning method has special requirements for its use. In direct planning, the required load is even, whereas in the equivalent order method, it can be used at any load by fulfilling the required assumptions. Because planning cannot yet know the most effective method, it is necessary to design that can facilitate planning. So in research will make a practical design of the plates with both methods. The practical design is made based on new regulations, namely SNI 2847: 2013, which will later produce a useful design table plate. This plate design will provide moments and the distance of reinforcement that will be used so that it is expected to be used and used as a reference in planning in the field.[2]

Direct design method

the spacing between the plates supporting the plates is also uniform or not much different. Apart from these two conditions, the direct planning method will not produce satisfactory results [3]. The immediate design method is a method used in determining the moments of the plan, in the calculation of two-way plates. But it must meet the following requirements:

- a. There must be a minimum of three continuous ranges in each direction.
- b. The panel plate must be square, with a ratio between the longer span and the shorter center to center of the pedestal in a panel no more significant than two.
- c. The length of a sequence in the center to the center of the pedestal in each direction must not be different from more than a third of the longer span
- d. The column position is permitted to experience a maximum offset as far as 10% of the span length (in the direction of shift) from either axes between successive column center lines are permitted.
- e. The only calculated load is the gravity load and is distributed evenly across the entire plate panel. Unactuated live load must not exceed twice the punctured dead load.
- f. Panels with beams between supports on all sides, along with the equation that must be met for beams in two perpendicular directions.

### Direct Planning Method

Equivalent Frame Method (EFM), formulated in SNI 2847: 2013 Article 13.7. The 3-dimensional building structure divided into several two-dimensional equivalents, the division is done by cutting along the centerline between the two columns. The skeletal structure is analyzed floor separately by floor in an elongated and transverse direction. The equivalent frame method is a method of calculating the moments in which can be used for a variety of two-way plates. So that it can be said that the technique is

full. In this equivalent frame method, moment determination is done by analyzing the frame structure, for example, the moment distribution method.[4] The equivalent frame method is carried out by dividing the frame of the space portal into a 2-dimensional plane frame, which centered on the column line or pedestal line[5]. The resulting field frames are then analyzed separately in the longitudinal and transverse direction of the building and analyzed separately per building floor.[6]

## II. METHODS

This research method is a literature study, namely structural modeling using direct planning methods that refer to existing rules, namely SNI 2847-2013[1]. In this plate design, the Microsoft Excel program is used and compares the results with the analysis results of the SAP 2000 Version 14[1].

Case study

The development of the engineering faculty building design is prioritize in the proposed classroom development area in areas A and B.

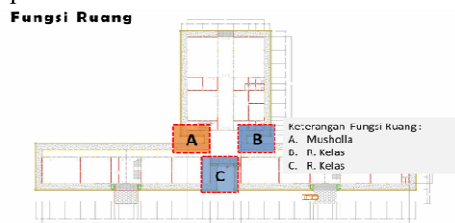


Fig. 1 1st Floor Development Location

Based on data in the 2016 civil accreditation forms, it located that the development of engineering buildings is the need for classrooms and prayer rooms. Therefore, in this case, plan. Mosque development located in area A, classroom development is located in area B, while for Main Entrance (Lobby Utama) development is located in area C. It is designing reinforcement for a panel in the two-way plate of 3 panels for each direction. The panel size is 4 x 4 m, the mounting column is 400 x 400 mm, with a column length of 3.6 m. live working load taken at 4.5 kN / m<sup>2</sup>, and additional dead load at 0.8 kN / m<sup>2</sup>, f<sub>c</sub> = 20 MPa, f<sub>y</sub> = 400 MPa.

## III. RESULT AND DISCUSSION

For the plate plan model used is a plate with a span of more than three that will be analyzed in the inner plate. Following is the calculation of one of the two-way plate design variations with the direct design method:

Plate thickness is 150 mm

Calculate the amount of factored load:

$$q_d = 0.7 + \text{plate weight} = 0.7 + 0.2 (24) = 5.5 \text{ kN / m}^2$$

$$q_u = 1.2 (5.5) + 1.6 (4.5) = 13.8 \text{ kN / m}^2$$

Shear strength is examined at the critical cross-section location, which is located d distance from the face of the beam, for a plate width of 1 m, with:

$$d = h - \text{concrete blanket} - d_b / 2 = 200 - 20 - 13 / 2 = 123.5 \text{ mm}$$

$$V_u = q_u (3.0 - \frac{1}{2} \text{ beam width} - d) \times 1 \text{ m} = 36.2457 \text{ kN}$$

$$\Phi V_c = \Phi (0.17 \lambda \sqrt{f'_c}) b d = 98,9292 \text{ N} = 98.93 > V_u$$

Calculate total static moments in the long and short directions:

$$M_{ol} = \frac{q_u l^2 (l_1 + l_2)}{8} = 84.424 \text{ kN.m}$$

Calculate the plan moment in the long direction, l<sub>1</sub> = 4.0 m

Distribution of total static moments in one plate panel:

$$\text{Negative moment (M}_n) = 0.65 M_{ol} = -0.65 (89.424) = -58.126 \text{ kN.m}$$

$$\text{Positive moment (M}_p) = 0.35 M_{ol} = +0.35 (89.424) = +31.2984 \text{ kN.m}$$

Calculate the l<sub>2</sub> / l<sub>1</sub> ratio and the αf<sub>1</sub> value:

$$\frac{l_2}{l_1} = \frac{4}{4} = 1 \quad \alpha f_1 = \frac{F_{1b}}{F_{1s}} = 2.893$$

$$\alpha f_1 = \frac{l_2}{l_1} = 4.34 > 1.0$$

• Negative moment distribution <M<sub>n</sub>. The percentage of negative moments held by the column lane, using interpolation (for values of l<sub>2</sub> / l<sub>1</sub> = 1 and αf<sub>1</sub> = 4.34) is 75%, then:

$$\text{Column lane} = 0.75 M_n = -0.8 (58.1) = -43.59 \text{ kN.m}$$

$$\text{Middle lane} = 0.25 M_n = -0.2 (58.1) = -14.53 \text{ kN.m}$$

Because αf<sub>1</sub> (l<sub>2</sub> / l<sub>1</sub>) > 1.0, according to the regulations in SNI 2847: 2013 article 13.6.5, 85% of the moments in the column lane can be overturned, and the remaining 15% is borne by the plates in the column lane.

$$\text{Beam} = 0.85 (-43.6) = -37.06 \text{ kN.m}$$

$$\text{Column columns} = 0.15 (-43.6) = -6,539 \text{ kN.m}$$

$$\text{Middle lane} = -14.53 \text{ kN.m}$$

• Positive moment distribution, M<sub>p</sub>. The percentage of negative moments held by the column lane, using interpolation (for values of l<sub>2</sub> / l<sub>1</sub> = 1 and αf<sub>1</sub> = 4.34) is 75%, then:

$$\text{Column path} = 0.75 M_n = 0.8 (+31.3) = 23.47 \text{ kN.m}$$

$$\text{Middle lane} = 0.25 M_n = 0.2 (+31.3) = 7.82 \text{ kN.m}$$

Because αf<sub>1</sub> (l<sub>2</sub> / l<sub>1</sub>) > 1.0, according to the regulations in SNI 2847: 2013 article 13.6.5, 85% of the moments in the column lane can be overturned, and the remaining 15% is borne by the plates in the column lane. Then:

$$\text{Beam} = 0.85 (23.5) = 19,953 \text{ kN.m}$$

$$\text{Column columns} = 0.15 (23.5) = 3.5211 \text{ kN.m}$$

$$\text{Middle lane} = 7.82 \text{ kN.m}$$

Calculate the plan moment in the long direction,  $l_2 = 4.0$  m

Distribution of total static moments in one plate panel:

Negative moment ( $M_n$ ) = 0.65 MOS = -0.65 (89.42) = -58,126 kN.m

Positive moment ( $M_p$ ) = 0.35 Mos = +0.35 (89.42) = +31.2984 kN.m

Calculate the  $l_2 / l_1$  ratio, and the value of  $\alpha f_1$ :

$l_2 / l_1 = 4/4 = 1$   $\alpha f_1 = E_{lb} / E_{ls} = 2,893$   $\alpha f_1 = l_2 / l_1 = 4.34 > 1.0$

Negative moment distribution,  $M_n$ . The percentage of negative moments held by the column lane, obtained by interpolation (for values of  $l_2 / l_1 = 1$  and  $\alpha f_1 = 4.34$ ) is obtained at 75%, then:

Column lane = 0.75  $M_n = -0.8$  (58.1) = -43.59 kN.m

Middle lane = 0.25  $M_n = -0.2$  (58.1) = -14.53 kN.m

Because  $\alpha f_1$  ( $l_2 / l_1$ ) > 1.0, according to the regulations in SNI 2847: 2013 article 13.6.5, 85% of the moments in the column lane can be transferred to the beam, and the remaining 15% is borne by the plates in the column lane. Then:

Beam = 0.85 (-43.6) = -37.06 kN.m

Column columns = 0.15 (-43.6) = -6,539 kN.m

Middle lane = -14.53 kN.m

Distribution of positive moments,  $M_p$ . The percentage of negative moments held by the column lane, obtained by interpolation (for values of  $l_2 / l_1 = 1.2$  and  $\alpha f_1 = 2.976$ ) is obtained at 75%, then:

Column path = 0.75  $M_n = 0.8$  (+31.3) = 23.47 kN.m

Middle lane = 0.25  $M_n = 0.2$  (+31.3) = 7.82 kN.m

Because  $\alpha f_1$  ( $l_2 / l_1$ ) > 1.0, according to the regulations in SNI 2847: 2013 article 13.6.5, 85% of the moments in the column lane can be overturned, and the remaining 15% is borne by the plates in the column lane. Then:

Beam = 0.85 (23.5) = 19,953 kN.m

Column columns = 0.15 (23.5) = 3.5211 kN.m

Middle lane = 7.82 kN.m

Table 1. Reinforcement of the long direction plate

Direction length	Lane column		Middle Lane	
	Negative	Positive	Negative	Positive
Mu (kN.m)	6.53913	3.52107	14.53	7.82
Strip width, b (mm)	2000	2000	2000	2000
Efektif height, d (mm)	129.4	129.4	129.4	129.4
Ru (=Mu/bd <sup>2</sup> , Mpa)	0.19526	0.10514	0.43392	0.23365
Reinforcement ratio, $\rho$ (%)	0.0864	0.0463	0.1447	0.0774
As = $\rho b d$ (mm <sup>2</sup> )	223.6032	119.8244	374.4836	200.3112
As min= 0.0018 bh (mm <sup>2</sup> )	792	540	540	540

Reinforcement bar D12	3	3	5	3
The distance between reinforcement	667	667	400	667
Maximum distance. 2h	300	300	300	300
Installed distance, mm	300	300	300	300

## 2. Analysis Equivalent Frame Methods

1. Plate thickness: 150 mm.

2. Determine the stiffness of the  $K_s$ :

$$K_s = K \frac{E I_s}{l_s}$$

Where K is a factor of stiffness, and

$$I_s = \frac{I_2 h s^3}{12} = \frac{4000 \times 150^3}{12} = 1125 \times 10^6 \text{ mm}^4$$

If the moment of inertia of the  $I_s$  plate is considered as a reference and is considered as 1.0 unit, then the commercial moment between the axis of the column to the column face is:

$$\frac{1,0}{\left(1 - \frac{c^2}{l^2}\right)^2} = \frac{1,0}{\left(1 - \frac{400}{4000}\right)^2} = 1,235$$

The width of the analogy column varies with  $1 / L$ , that is equal to  $(1 / 1.235) = 0.81$

$$K = I^1 = \left(\frac{1}{Aa} + \frac{Mc}{Ia}\right)$$

With:

Aa = analytical column cross-sectional area = 4000 + 2 (200) (0.81) = 4724

Ia = the commercial moment of the analogy column.

M = moment in the middle of the plate due to the load of 1 unit in the outer fiber cross section of the analogy column

$$c = \frac{l_1}{2} = \frac{5500}{2} = 2750 = 1,0 \times \frac{l_1}{2} = 1,0 \times \frac{4000}{2} = 2000$$

So that:

$$K = I_1 \left(\frac{1}{Aa} + \frac{Mc}{Ia}\right) = 4000 \left(\frac{1}{4724} + \frac{2000 \times 2000}{8812626667}\right) =$$

2,66

Whereas the plate stiffness is:

$$K_s = K \frac{E I_s}{l_s} = 2,6623E \frac{1125 \times 10^6}{4000} = 748776.598 \text{ E}$$

3. Determine column stiffness,  $K_c$ :

$$K_c = K' \frac{E I_s}{l_s} \times 2$$



$$I_c = \frac{400^4}{12} = 2133333333$$

Stiffness factor,  $K'$  is determined as follows:

$$K' = I_c \left( \frac{1}{A_c} + \frac{M_c}{I_c} \right)$$

With:

$I_c$  = column length = 3600 mm.

$C = I_c / 2 = 3500/2 = 1800$  mm.

$A_a = I_c$  - plate thickness = 3600 - 150 = 3450 mm.

$$I_a = \frac{(I_c - t_s)^3}{12} = \frac{(3450)^3}{12} = 3421968750$$

$M = 1.0 (I_c / 2) = 1750$  mm.

$$K' = I_c \left( \frac{1}{A_c} + \frac{M_c}{I_c} \right) = 3.600 \left( \frac{1}{3450} + \frac{2133333333}{1.500} \right) \times 2 = 4,452$$

So that:

Determine the torsional stiffness,  $K_t$ , from the plate side of the column:

$$K_t = \sum \frac{9E_s t_c^3}{12 \left(1 - \frac{t_c}{I_c}\right)} \text{ dengan } C = \sum \left(1 - 0,63 \frac{x}{y}\right) \left(\frac{x^3 y}{3}\right)$$

In this case  $x = 110$  mm T plate thickness on the side of the column:

$$c = \left(1 - \frac{0,63 \times 150}{400}\right) \left(\frac{3,375000^3 \times 400}{3}\right) = 3436687500$$

$$K_t = \frac{9E \times 3436687500}{4000 \left(1 - \frac{400}{4000}\right)} = 859218,75 E$$

For inner plates, two plates are close together, so that:

$$K_t = 2 (859218,75 E) = 1718437,5 E$$

Calculate the equivalent column stiffness,  $K_{ec}$

$$K_{ec} = 1296270,801$$

Calculates the moment distribution factor (DF).

$$\frac{1}{k_{ec}} = \frac{1}{\sum K_c} + \frac{1}{K_t} = \frac{1}{1671709,76E} + \frac{1}{195996,83E} =$$

0,000003149, so  $K_{ec} = 1296270,801$

$$Df_{column} = \frac{K_{ec}}{K_s + K_{ec}} = 0,63$$

$$Df_{slab} = \frac{K_c}{K_s + K_{ec}} = 0,37$$

Because the columns at the top and bottom of the plate have the same dimensions, the DF value is divided equally into the second to the two columns, so the DF value = 0.32

For the interior (interior):

$$c = \left(1 - \frac{0,63 \times 150}{400}\right) \left(\frac{3,375000^3 \times 400}{3}\right) = 3436687500$$

$$Df_{slab} = \frac{K_s}{2K_s + K_{ec}} = 0,27$$

$$Df_{column} = \frac{K_{ec}}{2K_s + K_{ec}} = 0,46$$

Because the columns above and below the plate have the same dimensions, the DF value is equally divided into the two columns, so the value of  $Df = 0.232$

Calculate fixed end moments:

$$q_u = 1,2 (0,8) + 1,6 (4,5) = 8,16 \text{ kN / m}^2$$

$$= \frac{1}{12} q_u \cdot l^2 \cdot (l)^2 = -\frac{1}{12} \cdot 8,16 \cdot 4 \cdot (4)^2 = -$$

43,52

Equivalent order analysis is then carried out by using the moment distribution method or often known as the cross method.

Table2. Equivalent Frame Methods

Direction length	Lane column		Middle Lane	
	Negative	Positive	Negative	Positive
Mu (kN.m)	3.5503	2.59449	3.76	2.99
Strip width, b (mm)	2000	2000	2000	2000
Efektif height, d (mm)	117.4	129.4	129.4	129.4
Ru (=Mu/bd <sup>2</sup> , Mpa)	0.23722	0.10514	1.30176	0.23365
Reinforcement ratio, ρ (%)	0.0751	0.0403	0.1620	0.0867
As = ρbd (mm <sup>2</sup> )	176.3348	104.2964	419.256	224.3796
As min= 0.0018 bh (mm <sup>2</sup> )	792	540	540	540
Reinforcement bar D12	3	2	4	4
The distance between reinforcement	667	1000	400	667
Maximum distance. 2h	300	300	300	300
Installed distance, mm	300	300	300	300

The following is a comparison table of Ultimate Moment values from Direct Planning to Equivalent frame methods Reaction Ratio

Table 3. Comparison table of Ultimate Moment values from Direct Planning to Equivalent Frame methods Reaction Ratio

Mu (kN.m)	Lane column		Middle Lane	
	Positive	Negative	Positive	Negative
Direct Planning Method	6.53913	3.52107	14.53	7.82
Equivalent Frame Method	3.5503	2.59449	3.76	2.99
Difference	45.71%	26.31%	74.12%	45.71%

From the results of the moment analysis using the direct planning method and the equivalent order in the elongated direction, a maximum deviation of 74.12% is obtained at the negative middle lane moment whereas the minimum difference is 26.31% at the moment of the positive column lane. This result proves that using equivalent framework results in a lower ultimate moment compared to the direct planning method.

The following is a comparison table of the value of the Retirement Ratio from Direct Planning to Equivalent Frame methods

Table 4. Comparison table of the value of the Retirement Ratio from Direct Planning to Equivalent Frame methods

Reinforcement ratio $\rho$ (%)	Lane column		Middle Lane	
	Positive	Negative	Positive	Negative
Direct Planning Method	0.0864	0.0463	0.1447	0.0774
Equivalent Frame Method	0.0751	0.0403	0.1620	0.0867
Difference	13.08%	12.96%	11.95%	13.07%

From the results of the moment analysis using the direct planning method and equivalent order in the elongated direction, a maximum deviation of 13.08% is obtained in the negative column lane moments. Whereas the minimum difference is 11.95% at negative middle lane moments. This result proves that using equivalent framework results in a lower ultimate moment compared to the direct planning method.

The following is a comparison table of the amount of reinforcement used in the Direct Planning Equivalent Frame methods.

Table 5. Comparison table of the amount of reinforcement used in the Direct Planning Equivalent Frame methods.

Installed distance	Lajur Kolom		Lajur Tengah	
	Negatif	Positif	Negatif	Positif
Direct Planning Method	3 D12	3 D12	5 D12	3 D12
Equivalent Frame Method	3 D12	2 D12	4 D12	4 D12

From the results of the moment analysis with the direct planning method and the equivalent order in the elongated direction, the number of reinforcement is

more than the equivalent order method compared to the direct planning method. This result proves that using equivalent framework results in a lower ultimate moment compared to the direct planning method.

#### IV. CONCLUSIONS

Based on moment ultimate, quantifier of reinforcements, and the ratio of reinforcement, the equivalent frame method is superior. the ultimate moment obtained by a deviation of 74.12%. The ratio of reinforcement has a difference of 13.08%. based on a quantifier of reinforcement that is more similar.

#### ACKNOWLEDGMENT

Gratitude to the Ministry of Research, Technology and Higher Education of Indonesia and Public Works and Housing Ministry had Rakyat Indonesia.

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# *K-Nearest Neighbor Implementation in the application of Appraisal Comparison Data Search*

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**Abstract** - Appraisal is an activity to estimate the price of an object. This activity is often used to get a fair price for a property. The approach that is often used in property valuation is to compare objects that are valued with market data as a comparison. This study aims to obtain comparative data on appraisal. The method used is the K-Nearest Neighbor (K-NN) and eclidean distance classification method to find the proximity of the object being assessed with market data around the object to be assessed. The finding of this study is in the form of a comparative data search application using the K-NN method with a total K = 3.

**Keywords** - Appraisal Comparison Data; K-Nearest Neighbor; simple property

## I. INTRODUCTION

Appraisal is the estimated price of a property. Appraisal activities are often carried out by the Office of Public Appraisal Services (KJPP). Appraisal is also used by internal banks to find out how much the value of the property to be used as collateral for financing. According to the regulation of the Minister of Finance of the Republic of Indonesia, there are 3 types of property valuations carried out by appraisers, including simple property valuations, property valuations and business valuations [1]. In valuing simple property, there are 4 approaches that can be used by appraisers, namely the market approach, the cost approach, the income approach and the price hedonic approach [1], [2]. From these 4 approaches, the market data approach is often chosen by the appraiser to get a fair price for a property.

Appraisal using the market data approach is done by considering the sale of similar or substitute property and related market data, and producing estimated values through a comparison process. In general, the property being valued (the object of valuation) is compared with comparable property transactions, both those that have occurred and properties that are still in the bidding stage of the sale and purchase process [4]. The approach to the market data comparison method assumes that properties that have a high degree of similarity will have similarities in price and benefits.

This study will discuss the search for simple property comparison data in the form of land and buildings that refer to the Regulation of the Minister of Finance (PMK) number 101 of 2014 [1]. Search for simple property comparison data so far is still done using the experience and intuition of the assessor. Subjectivity arising from the evaluator has a big influence on the determination of comparison data, so that the results of the assessment are not consistent and raise questions for users of the report [5].

The concept of comparing data search is through comparative analysis of the nearest neighbors, and the degree of similarity of 2 objects. This is in accordance with the basic concept of the K-Nearest Neighbor (K-NN) method where this method classifies data based on the degree of similarity [6]. The K-NN method is one of the 10 most popular data mining methods [7]. This method is simple, reduces training time and has good performance [8].

Many fields and problems have been solved using the K-NN method, including those for prediction [9], [10] classification and identification [11], [12] and many other related studies using these methods.

In this study, K-NN is used to classify comparable data that is suitable or similar to the object property to be assessed. For each object being assessed, at least 3 comparative data are needed from surrounding locations that have similar criteria.

## II. RESEARCH METHODOLOGY

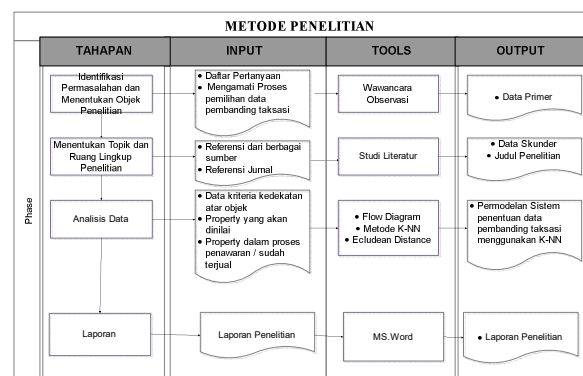


Figure 1. Reasearch Methodology

This research begins with the identification of the problems that exist in the process of valuing a simple property, especially at the stage of selecting comparative data to be used to assess a simple property. Identifying the problem and determining the object of research was done by interviewing and observing, namely observing a simple property valuation process. At this stage, the research data obtained in the form of criteria in the determination of comparative data valuation of simple property.

The next process is to look for references in the form of journals, books, reports related to the process of selecting appraisal comparison data and a simple property valuation process. This reference is used to support this research.

The data used in this study are 45 property data that are in the process of bidding and some data that have been sold in the city of Pekanbaru. Initial data was then carried out the data cleaning process. Data cleaning was done by looking for criteria that affect the level of similarity between the comparison data with the data to be assessed. The criteria were then valued between 0 and 1 using the following formula.

$$W_j = \frac{W_0}{\sum W_0} \dots \dots \dots (1)$$

W<sub>j</sub> = Value improvement  
W<sub>0</sub> = Initial value  
∑W<sub>0</sub> = Total value

The analysis was performed using the K-NN method to find similarities with the nearest neighbors or the most similar to the property data to be assessed. In calculating the distance for the degree of similarity, the euclidean distance formula is used, with the following formula [13]:

$$d_{ij} = \sqrt{\sum_{k=1}^n (x_{ik} - x_{jk})^2} \dots \dots \dots (2)$$

Notes:

d<sub>ij</sub> = Degree of difference  
n = Number of vectors  
x<sub>ik</sub> = Vector citra input  
x<sub>jk</sub> = Comparison vector citra /output.

### III. RESULTS AND DISCUSSION

At this stage an analysis of data on property sales in the city of Pekanbaru was carried out to get the criteria as a reference to calculate the level of similarity between objects to be assessed with the nearest comparable data. The architecture of this research is as follows:

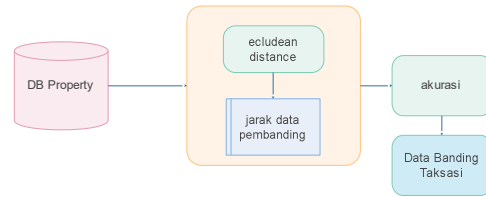


Figure 2. System Architecture

### Data Collection

This research uses primary data and secondary data. Perimer data in this study were taken directly in the field in the form of house properties that are being offered and house properties that have been sold. Furthermore, secondary data in this study are data on home property sales in Pekanbaru which are offered via the olx.co.id web marketplace and rumah123.com. The data used are data on the sale of home properties offered or sold in the January 2018 to July 2019 period.

### Data Analysis

The first analysis is to look for criteria to be used in calculating closeness between objects. From the results of interviews and observations conducted, criteria and sub-criteria and their value were obtained. Value calculation uses formula number 1. Criteria data for sub-criteria and value are presented in the following table

Table.1 Appraisal Data Criteria

No	Criteria	Sub Criteria	Value
1.	Type of Asset	Vacant Land	0.17
		Housing	0.33
		Shop house	0.50
2.	Legality	Cutting down	0.10
		SKGR	0.20
		SHGB	0.30
		SHM	0.40
3.	Land Size	< 100	0.04
		100 s/d 199	0.07
		200 s/d 499	0.11
		500 s/d 999	0.14
		1000 s/d 4999	0.18
		5000 s/d 6999	0.21
		>7000	0.25
4.	Distance to Security Center	<100	0.07
		100 s/d 499	0.13
		500 s/d 999	0.20
		1000 s/d 2999	0.27
		>3000	0.33
5.	Front Path Width of the Object	<1	0.07
		1 s/d 2	0.13
		3 s/d 4	0.20
		5 s/d 6	0.27
		>6	0.33
6.	Road Quality	Asphalt	0.10
		Hardening	0.20
		Cement	0.30
		Soil	0.40

		Others	0.30																																																																							
		None	0.40																																																																							
7.	Ease of Transportation	Very Easy	0.07	18.	Garden																																																																					
		Easy	0.13		Any																																																																					
		Quite Easy	0.20		None																																																																					
		Difficult	0.27	19.	Canopy																																																																					
		None	0.33		Any																																																																					
					None																																																																					
8.	Surrounding Area	Very Prestigious	0.17	20.	Fence																																																																					
		Quite Prestigious	0.33		Any																																																																					
		Less Prestigious	0.50		None																																																																					
9.	Land Development Trend	Very Fast	0.07	21	Carport																																																																					
		Faster	0.13		Any																																																																					
		Do not develop to decrease	0.27		None																																																																					
		Decrease dramatically	0.33	22	Building Size																																																																					
					< 36																																																																					
					36 s/d 38																																																																					
					39 s/d 45																																																																					
					46 s/d 60																																																																					
					60 s/d 70																																																																					
					>70																																																																					
10.	Foundation	Reinforced concrete cast	0.17	<p>Testing is done by calculating the proximity of the training data with a data property to be sold. The distance calculation uses the euclidean distance formula in formula number 2. The similarity results are obtained by displaying K = 3 of the proximity of the distance for each data.</p>																																																																						
		River Stone	0.33																																																																							
		Natural Brick	0.50																																																																							
11.	Floor	Granite	0.17																																																																							
		Ceramics	0.33																																																																							
		Aci Cement	0.50																																																																							
12.	Number of Bathrooms	1	0.05	<p>Table 2. Proximity to test data</p>																																																																						
		2	0.10	<table border="1"> <thead> <tr> <th>No</th> <th>Data Property</th> <th>Proximity</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>x1</td> <td>0,61</td> </tr> <tr> <td>2</td> <td>x2</td> <td>0,67</td> </tr> <tr> <td>3</td> <td>x3</td> <td>0,63</td> </tr> <tr> <td>4</td> <td>x4</td> <td>0,58</td> </tr> <tr> <td>5</td> <td>x5</td> <td>0,45</td> </tr> <tr> <td>6</td> <td>x6</td> <td>0,61</td> </tr> <tr> <td>7</td> <td>x7</td> <td>0,58</td> </tr> <tr> <td>8</td> <td>x8</td> <td>0,43</td> </tr> <tr> <td>9</td> <td>x9</td> <td>0,61</td> </tr> <tr> <td>10</td> <td>x10</td> <td>0,61</td> </tr> <tr> <td>11</td> <td>x11</td> <td>0,58</td> </tr> <tr> <td>12</td> <td>x12</td> <td>0,55</td> </tr> <tr> <td>13</td> <td>x13</td> <td>0,46</td> </tr> <tr> <td>14</td> <td>x14</td> <td>0,51</td> </tr> <tr> <td>15</td> <td>x15</td> <td>0,46</td> </tr> <tr> <td>16</td> <td>x16</td> <td>0,53</td> </tr> <tr> <td>17</td> <td>x17</td> <td>0,54</td> </tr> <tr> <td>18</td> <td>x18</td> <td>0,53</td> </tr> <tr> <td>19</td> <td>x19</td> <td>0,52</td> </tr> <tr> <td>20</td> <td>x20</td> <td>0,53</td> </tr> <tr> <td>21</td> <td>x21</td> <td>0,61</td> </tr> <tr> <td>22</td> <td>x22</td> <td>0,46</td> </tr> </tbody> </table>		No	Data Property	Proximity	1	x1	0,61	2	x2	0,67	3	x3	0,63	4	x4	0,58	5	x5	0,45	6	x6	0,61	7	x7	0,58	8	x8	0,43	9	x9	0,61	10	x10	0,61	11	x11	0,58	12	x12	0,55	13	x13	0,46	14	x14	0,51	15	x15	0,46	16	x16	0,53	17	x17	0,54	18	x18	0,53	19	x19	0,52	20	x20	0,53	21	x21	0,61	22	x22	0,46
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		>5	0.29																																																																							
13.	Number of Bedrooms	1	0.05																																																																							
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		4	0.19																																																																							
		5	0.24																																																																							
		>5	0.29																																																																							
14.	Ceiling	Sunda Plafon	0.07																																																																							
		Gypsum	0.13																																																																							
		Plywood	0.20																																																																							
		Others	0.27																																																																							
		None	0.33																																																																							
15.	Roof	Tile	0.10																																																																							
		Multiroof	0.20																																																																							
		Galvalum roof	0.30																																																																							
		Asbes	0.40																																																																							
16.	Water Sources	Artesian Well	0.10																																																																							
		Ring Well	0.20																																																																							
		PAM	0.30																																																																							
		None	0.40																																																																							
17.	Electricity Sources	PLN	0.10																																																																							
		Genset	0.20																																																																							

23	x23	0,17
24	x24	0,44
25	x25	0,61
26	x26	0,10
27	x27	0,52
28	x28	0,49
29	x29	0,50
30	x30	0,57
31	x31	0,56
32	x32	0,56
33	x33	0,62
34	x34	0,52
35	x35	0,51
36	x36	0,56
37	x37	0,50
38	x38	0,60
39	x39	0,47
40	x40	0,54
41	x41	0,46
42	x42	0,47
43	x43	0,48
44	x44	0,51

From the calculations in table 1, it is found that the proximity of the 3 closest neighbors is data number 26, 23 and data number 8. The distance for each nearest neighbor is presented in the following table.

Table 3. The closest neighbor is K=3

Data Number	Data Property	Proximity
26	x26	0,10
23	x23	0,17
8	x8	0,43

### Implementation

The system was developed using PHP programming language and design using bootstrap 3.3.7. The local server uses the XAMPP application which includes Apache server and MySQL Data Base Management Systems (DBMS). The process of finding appraisal comparison data was carried out through the following user interface (UI).

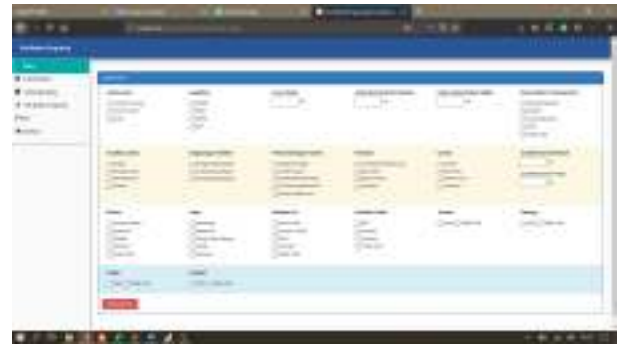


Figure 3. UI Process of Appraisal Comparison Data



Figure 4. UI Calculation Results of Appraisal Comparison Data

### IV. CONCLUSION

From the research conducted by KNN, it can be used to find and determine appraisal comparative data. But KNN requires a long processing time because KNN will calculate the distance of each data with each data having 22 criteria.

### ACKNOWLEDGEMENT

The series of thanks to those who have played a role in this research, especially to the Ministry of Research, Technology and Higher Education that have funded this research through contract number: 7/E/KPT/2019 19 February 2019. Our gratitude also goes to the Institute for Research and Community Services of Universitas Muhammadiyah Riau.

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# Implementation of Data Mining to Measure Informatic Engineering Graduation Using K-Means Clustering Method

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**Abstract**—The Faculty of Computer Science at Lancang Kuning University is one of the favorite faculties among the faculties at Lancang Kuning University today. With a good graduation rate every year with the predicate graduation score is very satisfying. Each Study Program is obliged to monitor the progress of studies of its students. Then the study program also has the duty to pay attention to groups of students who have the potential to graduate on time and students who have the potential to experience a setback for the study period and even experience dropping out. To predict it can be done by using data mining techniques with the K-Means Clustering method. In this study, the use of Rapidminer software can be done to build a pattern of grouping the results of student graduation rates using the K-Means Clustering method of data analysis grouping the graduation rate of 2016 academic year informatics students who have conducted lectures up to semester 6 (VI) using data Semester 2 to Semester 5 GPA and total credits taken previously. Prevention of failure is very important for management of study programs. New knowledge gained in this study was used to assist study programs to better understand the situation of their students and to be able to anticipate drop-out students, to improve student achievement, to improve curriculum, improve the process of learning and teaching activities and many other benefits that could be obtained from the results of mining the data.

**Keywords**— *Data Mining, K-Means, Clustering, Graduation Rate, Student*

## I. INTRODUCTION

Faculty of Computer Science at Lancang Kuning University is one of the favorite faculties among the faculties at Lancang Kuning University today. With a good graduation rate every year with the predicate graduation score is very satisfying. Each Study Program is obliged to monitor the progress of studies of its students. Then the study program also has the duty to pay attention to groups of students who have the potential to graduate on time and students who have the potential to experience a setback for the study period and even experience dropping out. To predict it can be done by using data mining techniques with the K-Means Clustering method.

Understanding information about students who are potentially exposed to drop outs is important to know and understand. Understanding can be done by digging up the data that is owned and then grouping the results

of data mining so as to create a pattern or group of students who are potentially exposed to drop outs. Prevention of failure is very important for the management of study programs. This knowledge can be used in helping study programs to find out the situation of their students and can anticipate drop-out students, to improve student achievement, to improve curriculum, improve the process of teaching and learning activities and many other benefits that can be obtained from the results of data mining.

## II. METHOD

### A. Data Mining

Data mining is a process that uses one or more computer learning techniques (machine learning) to analyze and extract knowledge automatically [3]. The basic concept of data mining is finding hidden information in a database and is part of Knowledge Discovery in Database (KDD) to find useful information and patterns from data. Data mining looks for new, valuable, and useful information in datasets involving computers and humans and is iterative either through automated or manual processes [11].

### B. K-Means Clustering

K-Means Clustering is the simplest grouping method that groups data into groups based on the centroid of each group. It's just that the K-Means results are strongly influenced by the k parameters and centroid initialization. In general, K-Means initializes centroids randomly. But the proposed method will modify K-Means in centroid initialization especially in improving performance in document grouping. Following are the steps found in the K-Means algorithm [13]:

1. Determine k as the number of clusters formed.
2. Generate the initial centroid (cluster center point) randomly. Determination of the initial centroid is done randomly from the available objects as many as k clusters, then to calculate the next centroid cluster, the following formula is used :

$$v = \frac{\sum_{i=1}^n x_i}{n}; i = 1, 2, 3, \dots, n$$

Explanation :  $v$  : centroid on the cluster  
 $x_i$  : object to- $i$



$n$  : the number of objects who is  
a member of the cluster

3. Calculate the distance of each object to each centroid of each cluster. To calculate the distance between objects and centroids, you can use the Euclidian Distance calculation as follows :

$$d(x,y) = \|x - y\| = \sqrt{\sum_{i=1}^n (x_i - y_i)^2} ; i =$$

1,2,3,...,n

Explanation :  $x_i$  : object x to- $i$

$y_i$  : centroid y to- $i$

$n$  : the number of objects

4. Allocate each object to the closest centroid.
5. Do the iteration, then specify the position of the new centroid using equation (2).
6. Repeat step 3 if the position of the new centroid is not the same.

### C. Rapidminer

Rapidminer is a software that is open (open source). Rapidminer is a solution for analyzing data mining, text mining and prediction analysis. Rapidminer uses a variety of descriptive and predictive techniques to provide insight to users so that they can make the best decisions. Rapidminer has approximately 500 data mining operators, including operators for input, output, data preprocessing and visualization. Rapidminer is a stand-alone software for data analysis and as a data mining machine that can be integrated into its own products. Rapidminer is written by using the java language so that it can work on all operating systems.



Picture 1. Interface Rapidminer

## III. RESULTS AND DISCUSSION

### A. Data Preprocessing

In preprocessing this data, it can be done by collecting raw data from the Faculty of Computer Science at Lancang Kuning University in the form of data stored in Excel format (.xls), which will be used as new data consisting of GPA data for semester 2 to semester 5 and total credit taken by Lancang University Informatics Engineering Students in the 2016 academic year which is still active in lectures to date. The process carried out at the data preprocessing stage is data integration, data cleaning, and data transformation.

Preprocessed data consists of 4 attributes to be grouped, namely Informatics Engineering GPA from semester 2 to semester 5 and total credits taken with a total of 22 data samples from a total of 134 data. Students who are active in lectures to date. The following table describes the attributes that will be used for grouping and displaying some of the processed data that has been done.

### B. Clustering Analysis with K-Means Algorithm

Table 1. Sample Calculation Data

COD E	NIM	Name	GPA - Semester				CREDITS TOTAL
			II	III	IV	V	
M010	165520101	LUPITA SRI REZEKI	3,7	3,6	3,6	3,4	107
M020	165520103	TEGUH RIAN TO	3,1	2,9	2,9	2,9	62
M030	165520104	SISILIA TRIANI BR. MANULANG	3	3	3	3	20
M040	165520105	YUKHRIZUL ALMUFARI	2,8	2,8	2,8	2,8	42
M050	165520107	DEBORA KATARINA SIMAMORA	3,2	3,2	3,2	3,2	128
M060	165520108	TAUFIK KURRAHMAN	3,1	3,0	3,0	3,0	127
M070	165520109	ANGGA DANA PRATAMA	1	1	1	1	20
M080	165520111	MUHAMMAD FUAD FAHRI	1,7	1,7	1,7	1,7	20
M090	165520113	DENDY NOFRIZAL	2,9	2,8	2,9	2,9	79
M100	165520114	RYAN BAPTISTA HUTASOIT	2,2	2,2	2,2	2,2	37
M110	165520115	MAULANA PRAYOGO PANGESTU	3,0	2,9	2,8	2,8	91
M120	165520117	DHEA ANISYA	2,5	2,8	2,9	2,9	122
M130	165520118	NUZWARDANA FIKRI	1,5	1,5	1,5	1,5	32
M011	165520101	ADE SAPUTRA	3,7	3,7	3,7	3,7	130
M022	165520103	RONI SAFRIYADI	3,6	3,4	3,4	3,5	130
M033	165520104	RAMADHAN SAPUTRA	2,2	2,2	2,2	2,2	35
M044	165520106	SYAHRUL RAMADHAN	3,5	3,4	3,4	3,4	129
M055	165520107	RIRI KUSHENDAR	2,9	2,8	2,8	2,9	127
M066	165520109	REYNAL SATRIO	1,9	1,9	1,9	1,9	20
M077	165520110	NOPEBRIN DUY PUTRA MANIK	2,5	2,5	2,4	2,4	66
M088	165520112	SYAHRUN NUR	3,0	2,9	3,0	3,0	126
M099	165520114	SISKA FERONIKA SIRINGO-RINGO	3,3	3,2	3,3	3,3	130

### 1. Analysis and Process of K-Means Clustering

#### a. Determine the Initial Cluster Center

Determining the initial centroid is randomly determined from the available data / objects in the number of clusters  $k$ . Where the initial number of centroids is determined as 3 initial centroids, the value for  $C_1$  is taken from the data line M020, the value of  $C_2$  is taken from row M010, the value of  $C_3$  is taken from the data line M070. Following this is the initial centroid value in the study,  $C$  is a cluster :

$$C_1 = (3.1 ; 2.96 ; 2.96 ; 2.93 ; 62)$$

$$C_2 = (1.5 ; 1.5 ; 1.5 ; 1.5 ; 107)$$

$$C_3 = (1.92 ; 1.92 ; 1.92 ; 1.92 ; 20)$$

#### b. Calculating Distance with the Cluster Center

The following is the calculation of distance with Euclidean Distance for iteration 1 with centroid 1 :

$$M010 = \sqrt{(3.74 - 3.1)^2 + (3.65 - 2.96)^2 + (3.61 - 2.96)^2 + (3.44 - 2.96)^2 + (107 - 62)^2} = 45.02$$

$$M020 = \sqrt{(3.1 - 3.1)^2 + (2.96 - 2.96)^2 + (2.96 - 2.96)^2 + (2.96 - 2.96)^2 + (62 - 62)^2} = 0.00$$

$$M030 = \sqrt{(3 - 3.1)^2 + (3 - 2.96)^2 + (3 - 2.96)^2 + (3 - 2.96)^2 + (20 - 62)^2} = 42.00$$

$$M040 = \sqrt{(2.81 - 3.1)^2 + (2.81 - 2.96)^2 + (2.81 - 2.96)^2 + (2.81 - 2.96)^2 + (42 - 62)^2} = 20.00$$

$$M050 = \sqrt{(3.25 - 3.1)^2 + (3.21 - 2.96)^2 + (3.26 - 2.96)^2 + (3.23 - 2.96)^2 + (128 - 62)^2} = 66.00$$

.....

$$M099 = \sqrt{(3.34 - 3.1)^2 + (3.27 - 2.96)^2 + (3.32 - 2.96)^2 + (3.32 - 2.96)^2 + (107 - 62)^2} = 68.00$$

After calculating the distance with Euclidean Distance for iteration 1 with centroid 1 is

done, then the next step is to calculate with centroid 2, and 3 with the same formula with the calculation above.

c. Data Grouping

Allocate each data to the closest centroid. In reallocating data into each cluster based on a comparison of the distance between the data with the centroid of each cluster, data is explicitly allocated into the cluster that has the distance to the nearest centroid to that data. The following is the result of a comparison of the distance between the data with the centroid of each existing cluster based on the calculation of distance with Euclidean Distance for iterations 1, C (cluster) and M (data).

Table 2. Data Grouping in Iteration-1

CODE	C1	C2	C3	Clustering
M010	45.02	0.00	87.16	2
M020	0.00	45.02	42.19	1
M030	42.00	87.01	4.00	3
M040	20.00	65.02	22.30	1
M050	66.00	21.01	108.09	2
M060	65.00	20.03	107.08	2
M070	42.19	87.16	0.00	3
M080	42.07	87.08	1.52	3
M090	17.00	28.04	59.12	1
M100	25.05	70.06	17.17	3
M110	29.00	16.06	71.11	2
M120	60.00	15.09	102.07	2
M130	30.15	75.12	12.04	3
M011	68.02	23.00	110.14	2
M022	68.01	23.00	110.12	2
M033	27.04	72.05	15.21	3
M044	67.01	22.00	109.11	2
M055	65.00	20.05	107.07	2
M066	42.06	87.07	1.84	3
M077	4.13	41.06	46.10	1
M088	64.00	19.04	106.08	2
M099	68.00	23.01	110.10	2

d. Determination of New Cluster Centers

Determine the position of the new centroid by calculating the average value of the data in the same centroid.

$$C1 = \left( \frac{3.1+2.81+2.9+2.59}{4}, \frac{2.96+2.81+2.88+2.54}{4}, \frac{2.96+2.81+2.92+2.4}{4} \right) = (2.85; 2.80; 2.77; 2.77; 62.25)$$

$$C2 = \left( \frac{3.74+3.25+3.13+3.03+2.59+3.73+3.68+3.52+2.91+3.09+3.34}{11}, \frac{3.65+3.21+3.08+2.98+2.82+3.73+3.48+3.49+2.8+2.92+3.27}{11}, \frac{3.61+3.26+3.04+2.88+2.92+3.79+3.47+3.47+2.89+3.01+3.32}{11} \right) = (3.27; 3.22; 3.24; 3.24; 122.45)$$

$$C3 = \left( \frac{3+1+1.76+2.22+1.5+2.25+1.92}{7}, \frac{3+1+1.76+2.22+1.5+2.25+1.92}{7}, \frac{3+1+1.76+2.22+1.5+2.25+1.92}{7} \right) = (13.65; 13.65; 13.65; 13.65; 184)$$

$$C3 = \left( \frac{20+20+20+37+32+35+20}{7} \right)$$

Repeat the 4 steps above until the cluster position does not change again (Iteration-n). Then do a comparison of the results of grouping data in each iteration.

e. Comparison of Iteration Grouping Results

Determine the position of the new centroid by calculating the average value of existing data.

Table 3. Comparison of Data Grouping Each Iteration

CODE	Iteration-1	Iteration-2	Iteration-3
M010	2	2	2
M020	1	1	1
M030	3	3	3
M040	1	3	3
M050	2	2	2
M060	2	2	2
M070	3	3	3
M080	3	3	3
M090	1	1	1
M100	3	3	3
M110	2	1	1
M120	2	2	2
M130	3	3	3
M011	2	2	2
M022	2	2	2
M033	3	3	3
M044	2	2	2
M055	2	2	2
M066	3	3	3
M077	1	1	1
M088	2	2	2
M099	2	2	2

In iteration-1 and iteration-2 there is still a cluster position that is still changing, it is necessary to recalculate the iteration-3. Then do a comparison between iterations-2 and iterations-3. Because the 3rd iteration of the cluster position has not changed / the same as the position of the cluster in the 2nd iteration then the next iteration process does not need to be done, it can be concluded that the iteration process can be stopped at the 3rd iteration with the results :

Cluster 1 member (C1) : {M020, M090, M110, M077} = 4 data

Cluster 2 member (C2) : {M010, M050, M060, M120, M011, M022, M044, M055, M088, M099} = 10 data

Cluster 3 member (C3) : {M030, M040, M070, M080, M100, M130, M033, M066} = 8 data

data

Table 4. Cluster Data Processing Results

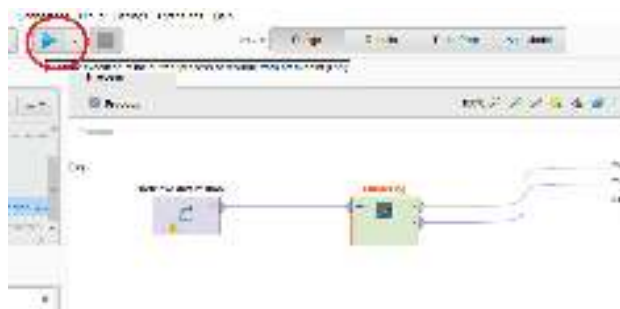
CLUSTER 1 - NUMBER OF MEMBERS = 4 STUDENTS. CONSISTS OF :						
CODE	STUDENTS NAME	GPA SMT 2	GPA SMT 3	GPA SMT 4	GPA SMT 5	CREDIT S TOTAL
M020	TEGUH RIAN TO	3.1	2.96	2.96	2.96	62
M090	DENDY NOFRIZAL	2.9	2.88	2.92	2.92	79
M110	MAULANA PRAYOGO PANGESTU	3.03	2.98	2.88	2.89	91
M077	NOPEBRIN DU Y PUTRA MANIK	2.59	2.54	2.4	2.4	66
	NILAI RATA-RATA	2.91	2.84	2.79	2.79	74.50
	NILAI MINIMUM	2.59	2.54	2.40	2.40	62.00
	NILAI MAXIMUM	3.10	2.98	2.96	2.96	91.00
CLUSTER 2 - NUMBER OF MEMBERS = 10 STUDENTS. CONSISTS OF :						
CODE	STUDENTS NAME	GPA SMT 2	GPA SMT 3	GPA SMT 4	GPA SMT 5	CREDIT S TOTAL
M010	LUPITA SRI REZEKI	3.74	3.65	3.61	3.44	107
M050	DEBORA KATARINA SIMAMORA	3.25	3.21	3.26	3.23	128

M060	TAUFIK KURRAHMAN	3.13	3.08	3.04	3.06	127
M120	DHEA ANISYA	2.59	2.82	2.92	2.95	122
M011	ADE SAPUTRA	3.73	3.73	3.79	3.77	130
M022	RONI SAFRIYADI	3.68	3.48	3.47	3.57	130
M044	SYAHRUL RAMADHAN	3.52	3.49	3.47	3.48	129
M055	RIRI KUSHENDAR	2.91	2.8	2.89	2.94	127
M088	SYAHRUN NUR	3.09	2.92	3.01	3.01	126
M099	SISKA FERONIKA SIRINGO-RINGO	3.34	3.27	3.32	3.32	130
NILAI RATA-RATA		3.30	3.25	3.28	3.28	125.6
NILAI MINIMUM		2.59	2.80	2.89	2.94	107.0
NILAI MAXIMUM		3.74	3.73	3.79	3.77	130.0
<b>CLUSTER 3 - NUMBER OF MEMBERS = 8 STUDENTS. CONSISTS OF :</b>						
CODE	STUDENTS NAME	GPA SMT 2	GPA SMT 3	GPA SMT 4	GPA SMT 5	CREDIT S TOTAL
M030	SISILIA TRIANI BR. MANULANG	3	3	3	3	20
M040	YUKHRIZUL ALMUFARI	2.81	2.81	2.81	2.81	42
M070	ANGGA DANA PRATAMA	1	1	1	1	20
M080	MUHAMMAD FUAD FAHRI	1.76	1.76	1.76	1.76	20
M100	RYAN BAPTISTA HUTASOIT	2.22	2.22	2.22	2.22	37
M130	NUZWARDANA FIKRI	1.5	1.5	1.5	1.5	32
M033	RAMADHAN SAPUTRA	2.25	2.25	2.25	2.25	35
M066	REYNAL SATRIO	1.92	1.92	1.92	1.92	20
NILAI RATA-RATA		2.06	2.06	2.06	2.06	28.25
NILAI MINIMUM		1.00	1.00	1.00	1.00	20.00
NILAI MAXIMUM		3.00	3.00	3.00	3.00	42.00

From the table above it can be concluded that based on the average value of each attribute in each cluster can be seen a comparison of the average number, then the group graduation rate of students who have the potential to graduate with a decline in study period is in Cluster 1 with an average grade point average Semester 2 to Semester 5 and total credits = 2.91; 2.84; 2.79; 2.79; 74.50 and consists of 4 data. For groups the graduation rate of students who have the potential to graduate on time is in Cluster 2 with the average grade of GPA of Semester 2 to Semester 5 and total credits = 3.30; 3.25; 3.28; 3.28; 125.6 and consists of 10 members. For groups of student graduation rates that have the potential to drop out can be found in Cluster 3 with the average scores of Semester 2 to Semester 5 and credits total = 2.06; 2.06; 2.06; 2.06; 28.25 and consists of 8 members.

## 2. Testing with the Rapidminer Tool

The testing process is a very important process to determine the extent to which the design of Data Mining can be tested using a software.



Picture 2. Testing with the Rapidminer Tool

After entering the data and operators needed to run the testing process, it will display some forms of display produced by Rapidminer on the

K-Means process that has been carried out previously. The results are as follows :

### a. ExampleSet

Picture 3. Display of Cluster Results (Data View)

### b. Cluster Model (Clustering)



Picture 4. Display of Cluster Results (Description)

## 3. Comparison of Calculation Results

Based on the results of testing sample data using Rapidminer Tools, it can be concluded that the results of manual calculations and calculations using Rapidminer Tools, the results are the same. Members of each cluster in manual calculations are the same as cluster members in the test results.

Table 5. Comparison of Calculations Results

Manual Calculations			RapidminerTools		
Cluster	Members	Total	Cluster	Members	Total
1	M020, M090, M110, M077	4	0	M020, M090, M110, M077	4
2	M010, M050, M060, M120, M011, M022, M044, M055, M088, M099	10	1	M010, M050, M060, M120, M011, M022, M044, M055, M088, M099	10
3	M030, M040, M070, M080, M100, M130, M033, M066	8	2	M030, M040, M070, M080, M100, M130, M033, M066	8

From the tests conducted above, it can be concluded that there are similarities between the results of manual processing and testing using Rapidminer Tools. The only difference lies in the number of clusters produced and the number of cluster members. Based on testing the entire data, cluster 0 is the graduation rate of students who have the potential to graduate with a decrease in study period, cluster 1 is the graduation rate of students who have the potential to graduate on time and cluster 2 is a group of students who have the potential to break up. This can be read on the centroid of each cluster in the attribute of the average value.

#### IV. CONCLUSION

In this study, the grouping of student graduation results using the K-Means Clustering method from the data analysis process grouping student graduation rates up to semester 6 (VI) using data on GPA and total credit values taken previously, succeeded in producing 3 clusters namely, for groups of students who had the potential to graduate on time has the potential to pass with a decrease in study period and potentially drop out. The use of Rapidminer tools can be done to build a pattern of grouping the results of student graduation rates with data from the Faculty of Computer Science at Lancang Kuning University and as a comparison with manual calculations. In this study, this can also help study programs to recognize the situation of their students and be able to anticipate students who drop out of lecture, to improve student achievement, to improve the curriculum, improve the process of teaching and learning activities and many others benefits that can be obtained from data mining.

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