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# JURNAL SISTEM INFORMASI

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# ASSESSMENT OF BUSINESS PROCESS MANAGEMENT FOR MSMEs IN EAST JAVA

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**Abstract**

The role of micro, small and medium enterprises (MSMEs) for the economies of many countries, especially Indonesia is very important. The garment industry is one of the industries of one of the processing sectors. The company needs understanding, documenting, modeling, analyzing, simulating, and implementing in order to increase value and achieve operational efficiency and survive business competition. Therefore it is necessary to know the level of management maturity of MSME business processes. The purpose of this study is to assess the level of maturity of business process management from MSMEs. First, the relevant literature is reviewed to gain insight into general business process management practices, the context of MSMEs in Indonesia and previous studies related to business process management in the context of MSMEs. The type of research used is qualitative. The research method in this research study is a case study. In this research study, the techniques used to obtain data were carried out through interviews and observations. Twelve samples in this study were garment MSMEs in East Java. The results of this study that the researcher can be concluded are six of MSMEs are included in the maturity level of adhoc BPM and six other MSMEs in definedpositions.

**Keywords:** *Business process management, micro, small, medium enterprise, the garment industry*

**Abstrak**

*Peran usaha mikro, kecil dan menengah (UMKM) bagi perekonomian banyak negara, terutama Indonesia sangat penting. Industri garmen adalah salah satu industri dari salah satu sektor pengolahan. Perusahaan memerlukan memahami, mendokumentasikan, memodelkan, menganalisis, mensimulasikan, mengimplementasikan, untuk meningkatkan nilai dan mencapai efisiensi operasional dan bertahan dari persaingan bisnis. Oleh karena itu perlu diketahui tingkat kematangan manajemen proses bisnis UMKM. Tujuan dari penelitian ini adalah untuk menilai tingkat kematangan manajemen proses bisnis dari UMKM. Pertama, literatur yang relevan ditinjau untuk mendapatkan wawasan tentang praktik manajemen proses bisnis secara umum, konteks UMKM di Indonesia dan studi sebelumnya terkait dengan manajemen proses bisnis dalam konteks UMKM. Jenis penelitian yang digunakan kualitatif. Metode penelitian dalam studi penelitian ini adalah studi kasus. Dalam studi penelitian ini, teknik yang digunakan untuk mendapatkan data dilakukan melalui wawancara dan observasi. Dua belas sampel pada penelitian ini yaitu UMKM garmen yang berada di Jawa Timur. Hasil dari penelitian ini diketahui enam UMKM di tingkat kematangan BPM* ad-hoc *dan enam UMKM yang lain di posisi* defined*.*

**Kata Kunci:** *Manajemen proses bisnis, usaha, mikro, kecil, menengah, industri garmen*

## 1. Introduction

Competition in the current global economy is based on ability, or skills and accumulation of knowledge, which is carried out through organizational processes[1]. Every organization manages a large number of business processes. The business process determines what will be done, when and how, which enables companies to achieve their strategic goals[2]. The business process of an organization describes the ability of work carried out by all the resources involved in creating value results for customers and interested parties (suppliers, IT consultants, distributors, government policies, markets)[3].

BPM is a management discipline that focuses on improving organizational performance through improving, managing and controlling business processes[4]. In the past few years BPM has been much noticed because of its potential that significantly increase productivity and save costs, in managing business processes. BPM is process automation and process analysis for operations management and work organization [5].The characteristics of completeness of BPM have a negative side because it covers a variety of practices without many guidelines for how to implement them [6].

BPM must consider the different characteristics of the company. One of the main characteristics considered important context is the size of the company. Based on literature studies,

most of the recent BPM empirical studies have been focused on large companies. An MSME has a type that is not the same as a large company[4].

There are several studies that focus on several aspects of BPM implementation in MSMEs. Previous research conducted by Chong (2006) explored the structure and main issues of BPM adoption and their implementation using empirical studies on 10 MSMEs in the wine industry in Australia. Imanipour et al. (2012) conducted a research with mixed methods to examine the main inhibiting factors in implementing business process management in MSMEs. They used 28 e-retail sector businesses in Iran. While Bhazenova et al. (2012) investigated the use of BPM and technology adoption in MSMEs in developing countries. Dallas and Wynn (2014) conducted BPM initiative research in a single case study of small businesses in Australia. These literatures provide a good basis on the potential for BPM implementation in MSMEs. However, studies mainly focus on one particular industry in a particular country, which means that the results may not applicable to other companies, types of industries and other countries. There is a need for similar studies from different industries and different countries. According to the Central Bureau of Statistics, it was stated that one of the developing processing industries in Indonesia in 2016 with an increase of 15% from 2015 was in the garment industry sector for micro and small businesses.

Some literatures state that the ability of MSMEs to compete in the global era depends on the internal aspects of MSMEs and external MSMEs [7]. Internal aspects of MSMEs include business scale, personality of business owners, educational background of business owners, and corporate culture can affect the amount of productivity and innovation of the company. The external aspects of MSMEs include market pressures, business competitors, access to capital and policies, both government policies and economic conditions of a country. Both aspects affect the development and growth of MSMEs [8].

In Indonesia, the potential of MSMEs as a driver of the economy, limited by resources, finance, less professional organizations, weak marketing, knowledge related to the utilization of business processes and ICT[9]. Our research previously attempted to measure the value of BPM in micro-enterprises in three sectors, namely food, furniture and garment in East Java[10].It was found that most MSMEs had a low maturity level of BPM so that it was still at the adhoc level.

This paper follows up our previous research, entitled the assessment of the maturity level of BPM in MSMEs. So that it can be seen at what level of maturity twelve cases of MSMEs in the garment industry sector in the East Java region and whether internal factors and external factors of MSMEs are the drivers for the maturity of business processes for organizations.

## 2. Literature

### 2.1 Business Process Management (BPM)

The study of literature on business process management is widely publicized. There are several BPM classification topics, among others: 1) Ways of Thinking, which focus on the ontology of BPM as an important foundation that creates guiding principles; 2) How to work, which is a critical discipline that translates strategic planning and effective implementation. These topics include the BPM life cycle, business process Maturity Model, BPM role, process template, evidence-based BPM; 3) Modeling methods that discuss traditional modeling concepts to BPMN; 4) Ways of Implementation and Governance Methods address issues such as BPM change management, agile BPM, business process outsourcing, etc. [11].

One of the main areas of BPM that has received much attention is the development of maturity models related to business processes. Maturity levels allow organizations to understand their current process management and identify potential areas to increase their maturity. The business process orientation maturity model was first introduced by McCormack and Johnson (2001). In their model, they combine three basic components including process display, process work, process and management system measurement and two supporting components namely process structure and customer-focused process values and beliefs. Each component is further elaborated into several statements. Organizations are assessed based on their level of accuracy with statements (on five Likert scale points).

BPM practices can be grouped based on nine aspects, among others: 1) Strategic Views; 2) Process Definition; 3) Process Measurement; 4) Process Organizational Structure; 5) Management of employees; 6) Culture; 7) Market Orientation; 8) Supplier Relations; 9) Application of IS.

McCormack et al (2009) describes 4 (four) systematic stages of BPM maturity level, namely ad hoc, defined, linked, and integrated. Each step has attributes in it, and attributes at the next stage are based on the previous steps to create an increase in maturity level. The following

definitions are given for the stage where an organization is business process oriented:
***Ad-Hoc***: The processes are unstructured and ill defined. Process measures are not in place and the jobs and organizational structures are based upon the traditional functions, not horizontal processes.
***Defined***: The basic processes are defined, documented and available in flow charts. Changes to these processes must now go through a formal procedure. Jobs and organizational structures include a process aspect, but remain basically functional. Representatives from functional areas (sales, manufacturing, etc.) meet regularly to coordinate with each other, but only as representatives of their traditional functions.
Perubahan proses harus melalui prosedur formal, pekerjaan dan organisasi ttruktur termasuk aspek proses, dan memiliki pertemuan rutin untuk berkoordinasi satu sama lain.
***Linked***:The breakthrough level. Managers employ process management with strategic intent and results. Broad process jobs, and structures are put in place outside of traditional functions.
***Integrated***:The company, its vendors and suppliers, take cooperation to the process level. Organizational structures and jobs are based on processes, and traditional functions begin to be equal or sometimes subordinate to process. Process measures and management systems are deeply imbedded in the organization.

Based on the four maturity levels according to McCormack and Johnson which can be seen in the following table:

TABLE 1
LEVEL OF BPMM

| Average | Level of BMPP |
|---|---|
| 0 – 4 | Ad hoc |
| 4 – 5,5 | Defined |
| 5,55 – 6,5 | Linked |
| 6,5 – 7 | Integrated |

### 2.2 MSMEs in Indonesia

Business is an economic unit that carries out activities with the aim of producing goods or services to be sold or exchanged for other goods and there is someone or more who is responsible and has the authority to manage the business [12]. According to Law Number 20 of 2008 concerning Micro, Small and Medium Enterprises, MSMEs are defined as productive businesses that are independent and carried out by individuals or small groups of people or business entities that are not subsidiaries or not branches owned, controlled or part of either directly or indirectly from a medium-sized business or large business with a certain amount of wealth and income in accordance with criteria determined by law and according to annual sales / turnover as shown in table 2.

TABLE 2
DEFINITION OF MSME

| Constructs | Annual Sales/Turnover (Rupiah) | Fixed/productive assets (Rupiah) |
|---|---|---|
| Micro enterprise | <= 300m | <= 50m |
| Small enterprise | >300m - <=2500m | > 50m - <= 500m |
| Medium enterprise | >2500m - <= 50bn | > 500m - <= 10bn |

## 3. Methodology

The first step in this study refers to the framework developed in our previous research [11], the next step is the development of research instruments based on research made by Skrinjar and Trkman (2013) regarding the measurement of BPM maturity of an organization [13]. Then the assessment rubric is made for BPM assessment criteria.

This research is a type of qualitative research. The research method used by researchers in this research study is a case study. In this research study, the techniques used to obtain data were carried out through interviews. In collecting data, researchers used a purposive sampling technique to determine who would be used as informants. To test the credibility of the data in this study, membercheck techniques were used. This study uses descriptive analysis techniques to analyze data by explaining or describing the data that has been collected. This descriptive analysis technique consists of three stages, namely: data reduction (data reduction), data display (data presentation), and conclusion drawing / verification (conclusion drawing). Respondents from this study were owners of garment / garment processing sector companies. Interviews and observations on each visit conducted by researchers to each informant with a duration of 2 hours to 3 hours. The researcher conducted 2 to 3 visits to each informant. The study was conducted from February 2018 to July 2018. The evaluation of the results of the interview was based on the level of accuracy of the answers to the informants with the assessment rubric that had been made using seven Likert scale points.

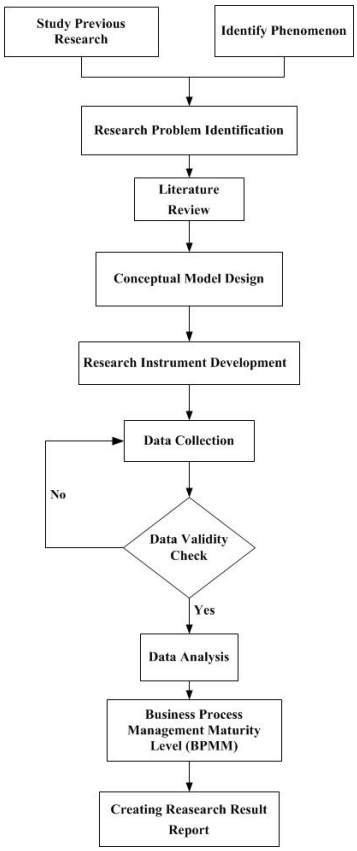


FIGURE 1 RESEARCH STAGES

Table 3 below is a semi-structured question protocol used by researchers to interview business owners. The results of the interviews are then given a score of 1 to 7 based on the rubric that has been made.

TABLE 3
QUESTIONNAIRE OF SEMI-STRUCTURED

| Constructs | Questionnaire |
|---|---|
| BPM Implementation | |
| Strategic View | Is top management actively involved in efforts to improve processes and improve and redesign business processes often on the agenda at meetings with top management? |
| Process View | Are the processes in the organization documented with clear input and output and have used standard methodologies to describe business processes? |
| Process Organizational Structure | Does the organizational structure support the smooth implementation of the process in the department? |
| Process Performance Measurement | Have process performance been measured in the organization? |
| Culture, Values, Belief | When members of several departments gather, tension often occurs? |
| People Management | Are employees who have creative talent enhanced and made a breakthrough in improvement? |
| Supplier Orientation | Are changes to business processes officially communicated to suppliers? |
| Customer Orientation | Is customer satisfaction measured systematically and often? |
| Internal aspect of MSMEs | |
| Top Management (Owner) | Does the CEO have experience related to the business being done now? |
| Organizational Characteristics | Does your company have a clearly defined organizational structure and division of work tasks? |
| External aspect of MSMEs | |
| Market, social, business pressures | Is there pressure from the market to improve business processes ? |
| Environmental competitiveness | Can improving business processes survive in a competitive business environment? |
| New entrants | Is it easy for newcompanies to enter the market? |

Respondents' profiles are displayed in Table 4.

TABLE 4
PROFILE OF INFORMANTS

| Case | Gender | Age (yeras) | Education | Business Experience (years) |
|---|---|---|---|---|
| A | Female | 39 | Bachelor's degree | >10 |
| B | Male | 55 | Senior High School | >10 |
| C | Female | 61 | Bachelor's degree | >10 |
| D | Female | 48 | Primary School | >10 |
| E | Female | 30 | Senior High School | 6 - 10 |
| F | Male | 43 | Bachelor's degree | >10 |
| G | Male | 62 | Senior High School | >10 |
| H | Male | 29 | Senior High School | 1 - 5 |
| I | Female | 40 | Bachelor's degree | >10 |
| J | Male | 50 | Senior High School | >10 |
| K | Male | 62 | Junior High School | >10 |
| L | Female | 28 | Bachelor's degree | >10 |

## 4. Results and Analysis

This section presents findings from case studies. First, a description of the case presented is followed by an analysis of the implementation of BPM, internal aspects of MSMEs and external aspects of MSMEs.

### 4.1 Case Description

First, the twelve cases were MSMEs based on the turnover obtained and the number of workers. Based on general information obtained from twelve MSME case studies, the following are Table 5 that show the characteristics of the general description of each MSME. For purposes of confidentiality, the company is presented in

this paper as case A, case B, case C, case D, case E, case F, case G, case H, case I, case J, case K and case L.

TABLE 5
CASE DESCRIPTION

| Case | Annual Sales/Turnover (Rupiah) | Fixed/productive assets (Rupiah) | Number of employees | Production Method |
|---|---|---|---|---|
| A | >Rp 2,5 Billion - Rp 50 Billion | >Rp 500 Million - Rp10 Billion | > 100 People | Make-to-order& Make-to-stock |
| B | Maximum Rp 300 Million | >Rp 50 Million - Rp 500 Million | 1 - 4 People | Make-to-order |
| C | >Rp 2,5 Billion - Rp 50 Billion | >Rp 500 Million - Rp10 Billion | 20 - 99 People | Make-to-order& Make-to-stock |
| D | >Rp 2,5 Billion - Rp 50 Billion | >Rp 500 Million - Rp10 Billion | 20 - 99 People | Make-to-order& Make-to-stock |
| E | Maximum Rp 300 Million | Maximum Rp 50 Million | 5 - 19 People | Make-to-order& Make-to-stock |
| F | >Rp 300 Million - Rp 2,5 Billion | >Rp 50 Million - Rp 500 Million | 5 - 19 People | Make-to-order& Make-to-stock |
| G | Maximum Rp 300 Million | >Rp 50 Million - Rp 500 Million | 5 - 19 People | Make-to-order |
| H | >Rp 300 Million - Rp 2,5 Billion | >Rp 50 Million - Rp 500 Million | 5 - 19 People | Make-to-order |
| I | >Rp 300 Million - Rp 2,5 Billion | >Rp 50 Million - Rp 500 Million | 5 - 19 People | Make-to-order |
| J | >Rp 300 Million - Rp 2,5 Billion | >Rp 500 Million - Rp10 Billion | 20 - 99 People | Make-to-order& Make-to-stock |
| K | >Rp 300 Million - Rp 2,5 Billion | >Rp 500 Million - Rp10 Billion | 5 - 19 People | Make-to-order |
| L | ≥ Rp 300 Million | ≥ Rp 5 Million | 1 - 4 People | Make-to-stock |

Assessments for the BPMM assessment process are based on the assessment criteria rubric in accordance with the development of previously made instruments. Scores for BPM with points 1 to 7.

### 4.2 Analysis of BPMM in every Dimension

In this section we will discuss the results of assessing the level of business process maturity in each dimension of BPMM assessment which is seen from the final average obtained in each dimension.

1) The dimensions of the strategic views of each case are shown in Table 6 below. In case A the average value is highest because the size of the medium business causes an increase and redesign of the business process and efforts to improve organizational processes and strategies are often discussed in meetings with top management. Whereas in other cases (micro-enterprises and small businesses) the agenda of such meetings is not there.

TABLE 6
DIMENSION OF STRATEGIC VIEW

| Case | Stategic View | | | | | Total | Average |
|---|---|---|---|---|---|---|---|
| | SV1 | SV2 | SV3 | SV4 | SV5 | | |
| A | 6 | 6 | 6 | 7 | 6 | 31 | 6,2 |
| B | 7 | 3 | 3 | 2 | 5 | 20 | 4,0 |
| C | 6 | 7 | 6 | 6 | 3 | 28 | 5,6 |
| D | 7 | 7 | 4 | 6 | 5 | 29 | 5,8 |
| E | 7 | 1 | 1 | 6 | 3 | 18 | 3,6 |
| F | 6 | 5 | 4 | 6 | 6 | 27 | 5,4 |
| G | 7 | 1 | 2 | 3 | 3 | 16 | 3,2 |
| H | 6 | 3 | 3 | 2 | 6 | 20 | 4,0 |
| I | 5 | 5 | 4 | 6 | 6 | 2,6 | 5,2 |
| J | 6 | 3 | 4 | 2 | 5 | 20 | 4,0 |
| K | 6 | 3 | 2 | 5 | 5 | 21 | 4,2 |
| L | 6 | 5 | 2 | 5 | 2 | 20 | 4,0 |

2) The dimensions of the process view of each case are shown in table 7 below. There are 3 cases that have a high average rating on this dimension, namely cases A, C, and I. Case A is a medium business while case C and I are small businesses. The three cases have well defined the main business processes and supporting business processes in their organization, so that the whole process has been documented with clear input and output. Description of business processes (models) are available for each employee in each part of the work. Standard methodologies such as flowcharts have been used to describe their business processes. However, in

nine other cases business processes, business process descriptions, and standard methodologies did not yet exist.

TABLE 7
DIMENSION OF PROCESS VIEW

| Case | Process View | | | | | | Total | Average |
|---|---|---|---|---|---|---|---|---|
| | PV1 | PV2 | PV3 | PV4 | PV5 | PV6 | | |
| A | 6 | 6 | 6 | 6 | 5 | 5 | 34 | 5,7 |
| B | 3 | 3 | 3 | 3 | 2 | 3 | 17 | 2,8 |
| C | 7 | 7 | 7 | 6 | 5 | 5 | 37 | 6,2 |
| D | 5 | 5 | 5 | 5 | 4 | 3 | 27 | 4,5 |
| E | 3 | 2 | 2 | 3 | 5 | 2 | 17 | 2,8 |
| F | 5 | 5 | 5 | 5 | 4 | 3 | 27 | 4,5 |
| G | 3 | 2 | 2 | 4 | 3 | 3 | 17 | 2,8 |
| H | 6 | 2 | 3 | 6 | 3 | 2 | 22 | 3,7 |
| I | 6 | 6 | 6 | 6 | 6 | 6 | 36 | 6,0 |
| J | 3 | 2 | 4 | 3 | 2 | 2 | 16 | 2,7 |
| K | 2 | 4 | 2 | 5 | 4 | 2 | 19 | 3,2 |
| L | 5 | 2 | 5 | 5 | 2 | 2 | 21 | 3,5 |

3) The dimensions of the organizational structure of the process of each case are shown in table 8 below. Case C, has the highest average because there is already an organizational structure that can support the implementation of the process and responsibility for ownership of the process has been defined and made. In cases A, D, and F also have a fairly high average rating because the three cases have similarities, namely business processes that are also not simple, therefore the organizational structure has been formed as the responsibility of ownership in the implementation of processes in the organization. Whereas in other cases there is no formal organizational structure and only consists of two parts: owner and worker. The owner and his family handle most strategic and administrative tasks while workers handle production.

TABLE 8
DIMENSION OF PROCESS ORGANIZATIONAL STRUCTURE

| Case | Process Organizational Structure | | | | | | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|
| | POS1 | POS2 | POS3 | POS4 | POS5 | POS6 | POS7 | | |
| A | 6 | 6 | 2 | 6 | 6 | 6 | 6 | 38 | 5,4 |
| B | 6 | 3 | 4 | 5 | 3 | 3 | 3 | 27 | 3,9 |
| C | 5 | 7 | 5 | 7 | 5 | 7 | 7 | 43 | 6,1 |
| D | 6 | 6 | 5 | 5 | 5 | 5 | 5 | 37 | 5,3 |
| E | 2 | 3 | 7 | 3 | 3 | 3 | 3 | 24 | 3,4 |
| F | 5 | 6 | 5 | 5 | 4 | 7 | 6 | 38 | 5,4 |
| G | 5 | 1 | 4 | 3 | 6 | 5 | 1 | 25 | 3,6 |
| H | 3 | 6 | 2 | 2 | 2 | 5 | 3 | 23 | 3,3 |
| I | 3 | 6 | 2 | 6 | 4 | 5 | 5 | 31 | 4,4 |
| J | 3 | 6 | 2 | 2 | 2 | 5 | 2 | 22 | 3,1 |
| K | 2 | 6 | 2 | 2 | 2 | 2 | 5 | 21 | 3,0 |
| L | 2 | 5 | 2 | 4 | 2 | 3 | 3 | 21 | 3,0 |

4) The dimensions of the process performance assessment of each case are shown in table 9 below. Case A, C, I, obtained a high average rating because the three cases besides defining and documenting the process steps for each existing process, making it easier to measure process performance. Whereas in other cases because the process and organizational structure are still simple, so business operations are very dependent on the owner. In addition, measurement and performance indicators are always measured but only limited to the production process.

TABLE 9
DIMENSION OF PROCESS PERFORMANCE MEASUREMENT

| Case | Process Performance Measurement | | | | | | | Total | Average |
|---|---|---|---|---|---|---|---|---|---|
| | PPM1 | PPM2 | PPM3 | PPM4 | PPM5 | PPM6 | PPM7 | | |
| A | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 42 | 6,0 |
| B | 2 | 5 | 4 | 4 | 3 | 3 | 7 | 28 | 4,0 |
| C | 5 | 7 | 5 | 5 | 6 | 6 | 7 | 41 | 5,9 |
| D | 5 | 6 | 6 | 5 | 6 | 3 | 5 | 36 | 5,1 |
| E | 3 | 6 | 7 | 7 | 7 | 2 | 6 | 38 | 5,4 |
| F | 5 | 5 | 6 | 6 | 6 | 5 | 6 | 39 | 5,6 |
| G | 2 | 4 | 2 | 2 | 2 | 2 | 2 | 16 | 2,3 |
| H | 3 | 2 | 2 | 2 | 2 | 3 | 6 | 20 | 2,9 |
| I | 6 | 6 | 6 | 5 | 6 | 5 | 6 | 40 | 5,7 |
| J | 3 | 2 | 3 | 2 | 2 | 2 | 6 | 20 | 2,9 |
| K | 2 | 2 | 6 | 2 | 2 | 2 | 6 | 22 | 3,1 |
| L | 2 | 2 | 5 | 5 | 5 | 2 | 5 | 26 | 3,7 |

5) The dimensions of culture, values, and beliefs of each case are shown in table 10 below. The highest average assessment for cases I and A. Organizational culture has been well developed, such as regular meetings between company owners and managers from various departments to discuss scheduled business process issues.

TABLE 10
DIMENSION OF CULTURE, VALUES AND BELIEFS

| Case | Culture, Values and Beliefs | | | | | | Total | Average |
|---|---|---|---|---|---|---|---|---|
| | CVB1 | CVB2 | CVB3 | CVB4 | CVB5 | CVB6 | | |
| A | 5 | 6 | 4 | 5 | 7 | 3 | 30 | 5,0 |
| B | 5 | 3 | 2 | 3 | 3 | 2 | 18 | 3,0 |
| C | 3 | 5 | 2 | 5 | 7 | 7 | 29 | 4,8 |
| D | 2 | 5 | 3 | 5 | 4 | 5 | 24 | 4,0 |
| E | 3 | 7 | 4 | 6 | 4 | 3 | 27 | 4,5 |
| F | 2 | 5 | 3 | 5 | 4 | 5 | 24 | 4,0 |
| G | 1 | 3 | 2 | 1 | 1 | 1 | 9 | 1,5 |
| H | 4 | 6 | 3 | 6 | 3 | 6 | 28 | 4,7 |
| I | 5 | 6 | 6 | 6 | 6 | 3 | 32 | 5,3 |
| J | 2 | 4 | 6 | 6 | 4 | 5 | 27 | 4,5 |
| K | 2 | 6 | 2 | 6 | 2 | 6 | 24 | 4,0 |
| L | 2 | 5 | 2 | 5 | 6 | 5 | 25 | 4,2 |

6) The dimensions of employee management in each case are shown in table 11 below. In case

C the highest average score is 5.8 (five point eight) because this company often provides training and debriefing to its employees both in terms of production processes and other business processes. Whereas in other cases, employees are not formally trained. However, training is provided by direct owners or fellow professional workers.

TABLE 11
DIMENSION OF PEOPLE MANAGEMENT

| Case | People Management | | | | | Total | Average |
|---|---|---|---|---|---|---|---|
| | PM1 | PM2 | PM3 | PM4 | PM5 | | |
| A | 5 | 5 | 4 | 6 | 3 | 23 | 4,6 |
| B | 4 | 6 | 6 | 3 | 4 | 23 | 4,6 |
| C | 7 | 5 | 7 | 7 | 3 | 29 | 5,8 |
| D | 5 | 5 | 5 | 6 | 2 | 23 | 4,6 |
| E | 4 | 3 | 4 | 7 | 4 | 22 | 4,4 |
| F | 5 | 4 | 3 | 6 | 2 | 20 | 4,0 |
| G | 3 | 1 | 1 | 6 | 5 | 16 | 3,2 |
| H | 5 | 3 | 5 | 5 | 5 | 23 | 4,6 |
| I | 5 | 5 | 5 | 6 | 2 | 23 | 4,6 |
| J | 2 | 3 | 5 | 5 | 2 | 17 | 3,4 |
| K | 2 | 2 | 2 | 5 | 4 | 16 | 3,2 |
| L | 2 | 2 | 1 | 2 | 2 | 9 | 1,8 |

7) The dimensions of supplier orientation in each case are shown in table 12 below. Cases that get the highest average rating are A, C, and I. That is because they do partners (long-term relationships) with the main suppliers. Whereas in other case companies, they do not partner with major suppliers.

TABLE 12
DIMENSION OF SUPPLIER ORIENTATION

| Case | Supplier Orientation | | | Total | Average |
|---|---|---|---|---|---|
| | SO1 | SO2 | SO3 | | |
| A | 6 | 6 | 3 | 15 | 5,0 |
| B | 1 | 5 | 1 | 7 | 2,3 |
| C | 7 | 7 | 1 | 15 | 5,0 |
| D | 3 | 6 | 2 | 11 | 3,7 |
| E | 2 | 2 | 3 | 7 | 2,3 |
| F | 3 | 3 | 1 | 7 | 2,3 |
| G | 3 | 3 | 2 | 8 | 2,7 |
| H | 6 | 3 | 2 | 11 | 3,7 |
| I | 6 | 6 | 6 | 18 | 6,0 |
| J | 5 | 3 | 2 | 10 | 3,3 |
| K | 2 | 2 | 2 | 6 | 2,0 |
| L | 1 | 2 | 2 | 5 | 1,7 |

8) The dimensions of customer orientation in each case are shown in table 13 below. Case I and J get the highest average rating. Both cases design and develop products and services based on customer needs and expectations, because they conduct market studies first, besides that customer satisfaction measurements are measured systematically. Whereas in other cases because it is not supported by information technology or information systems so that measurement of customer satisfaction is not systematically measured, besides that market studies are also not conducted.

TABLE 13
DIMENSION OF CUSTOMER ORIENTATION

| Case | Customer Orientation | | | | | Total | Average |
|---|---|---|---|---|---|---|---|
| | CO1 | CO2 | CO3 | CO4 | CO5 | | |
| A | 5 | 6 | 4 | 1 | 5 | 21 | 4,2 |
| B | 3 | 2 | 5 | 3 | 6 | 19 | 3,8 |
| C | 5 | 7 | 2 | 1 | 5 | 20 | 4,0 |
| D | 5 | 4 | 1 | 1 | 5 | 16 | 3,2 |
| E | 3 | 4 | 1 | 1 | 1 | 10 | 2,0 |
| F | 5 | 4 | 1 | 1 | 5 | 16 | 3,2 |
| G | 4 | 1 | 4 | 5 | 4 | 18 | 3,6 |
| H | 4 | 2 | 2 | 2 | 6 | 16 | 3,2 |
| I | 5 | 5 | 5 | 6 | 2 | 23 | 4,6 |
| J | 6 | 3 | 4 | 4 | 6 | 23 | 4,6 |
| K | 2 | 2 | 2 | 6 | 4 | 16 | 3,2 |
| L | 2 | 2 | 1 | 2 | 2 | 9 | 1,8 |

Twelve cases with detailed mean values for each BPM dimension are shown in the graph below.

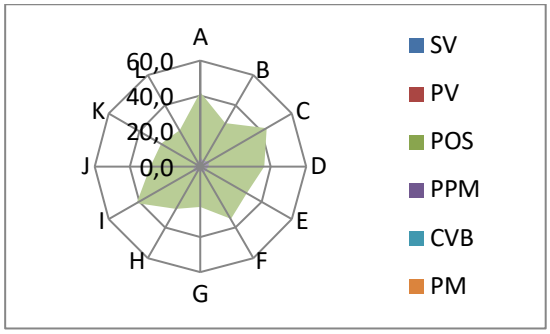


Figure 1. Dimension of BPM in Case

From the average of each dimension in the twelve cases, then it will be summed and calculated the average value to find out the BPMM level as in table 14 brought this.

TABLE 14
LEVEL OF BPMM EVERY CASE

| Case | Average | Level |
|---|---|---|
| A | 5,3 | *Defined* |
| B | 3,6 | *Adhoc* |
| C | 5,4 | *Defined* |
| D | 4,5 | *Defined* |
| E | 3,8 | *Adhoc* |
| F | 4,3 | *Defined* |
| G | 2,9 | *Adhoc* |
| H | 3,5 | *Adhoc* |
| I | 5,2 | *Defined* |
| J | 3,6 | *Adhoc* |
| K | 3,2 | *Adhoc* |
| L | 3,0 | *Adhoc* |

## 5. Conclusions, implications and limitations

The research findings support previous findings regarding the characteristics of small companies, the driving aspects and potential barriers to implementing BPM. The case companies involved in this preliminary study largely indicated the central role of owners in business, although there were a small number of companies that already had an organizational structure and functional assignment of tasks and were appointed to be responsible for the company's business processes. Garment companies, relatively simple businesses make owners limit business processes to order production and fulfillment. Overall, six case companies are at the adhoc level and the other six case companies are at defined levels. However, they have internal powers that can enlarge their business. On the external aspect, they also face pressure from their business competitors so they need to increase their competitive advantage. Case companies will benefit from BPM practices related to organizational structure, process modeling and documentation, performance measurement and more that involve managing culture and society.

This paper is limited in several aspects. The sample in this study was only twelve MSMEs and thus the results may be very dependent on this case. A survey to enable quantitative analysis of more questions related to the nature and extent of BPM implementation in MSMEs in East Java, Indonesia, factors that can drive the implementation of BPM in MSMEs in East Java, Indonesia and the BPM concept can benefit MSMEs. Furthermore, additional studies need to be conducted on MSMEs engaged in industries that have the same characteristics or different industries to obtain more optimal results.

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# IT GOVERNANCE EVALUATION USING COBIT 5 FRAMEWORK ON THE NATIONAL LIBRARY

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**Abstract**

National Library of Indonesia (NLI) is a public library located in Jakarta, established by the decree of Ministry of Education and Culture in 1980. This day NLI has already applied digitalization of its contents and its management with IT, IT has been an important aspect in an organization. The objective of IT implementation is to increase effectivity and performance in organization. In order to get maximum results, good IT Governance is important in order to get good alignment between the IT and the business, the better IT Governance the greater outcome that the organization will get. This research will use qualitative method using COBIT 5 framework, interview and observation as research instruments, the reason of these method usage because authors can collect data as accurate as possible based on the actual condition. The objective of this research is to get an overview about the level of IT Governance on going, the analysis tool will be used is COBIT 5 focusing on DSS domain. The average score of DSS01, DSS02 and DSS03 is in 1.2 to 1.6 and for the DSS04, DSS05 and DSS06 domain the average score is between 2.1 and 2.3.

**Keywords:** *National Library of Indonesia, IT Governance, COBIT 5*

***Abstrak***

*Perpustakaan Nasional Republik Indonesia (NLI) adalah perpustakaan publik yang terletak di Jakarta yang didirikan pada tahun 1980, berdasarkan keputusan dari kementrian pendidikan dan kebudayaan. Saat ini dalam operasionalnya NLI telah menerapkan digitalisasi konten-konten dan pengelolaannya dengan menerapkan Teknologi Informasi (TI). TI telah menjadi aspek penting dalam suatu organisasi, tujuan dalam penerapan TI adalah untuk meningkatkan keefektifan dan meningkatkan kinerja dalam suatu organisasi. Namun demi mendapatkan hasil yang maksimal IT Governance (tata kelola TI) yang baik sangatlah diperlukan dalam rangka menyelaraskan TI dengan bisnis, semakin baiknya IT Governance maka hasilnya yang didapat organisasi akan semakin maksimal. Metode yang digunakan dalam penelitian ini adalah metode kualtitatif menggunakan kerangka kerja COBIT 5, instrumen yang digunakan adalah observasi dan wawancara, alasan dipilihnya metode ini adalah agar penulis dapat mengumpulkan data seakurat mungkin sesuai dengan kondisi yang ada. Penelitian ini bertujuan untuk mendapatkan gambaran tentang tata kelola teknologi informasi yang sedang berjalan, alat analisis yang digunakan adalah COBIT 5 berfokus pada domain DSS. Hasil rata-rata yang didapatkan adalah domain DSS01, DSS02 dan DSS03 mimiliki rata-rata antara 1.2 sampai 1.6 dan untuk domain DSS04, DSS05 dan DSS06 memiliki rata-rata antara 2.1 sampai 2.3.*

**Kata Kunci:** Perpustakaan Nasional Republik Indonesia, *IT Governance, COBIT 5*

## 1. Introduction

Library is an organization whose aim is to build and maintain knowledge and collection to provide information for research, educational, cultural etc. [1]. Public library is a center of information and knowledge, public library can be accessed by any users regardless their race, age, sex religion, language or social status. The public library is free of charge as the public library is the responsibility of the local governments. Its funding and operation must be supported and financed by local governments [2].

National Library of Indonesia (NLI) is a non-ministry government institution located at Gambir, south side of Merdeka Square, Jakarta. The national library was established in 1980 by the decree of Ministry of Education and Culture [3]. One of the NLI mission is to develop a modern national library infrastructure, modern library means that most of the content will be digitalized and can be accessed widely through the internet. In order to provide maximum service, effective and efficient IT governance is mandatory. Good IT governance ensure that the IT sustain and extends the NLI strategy and goals [4] [5].

In this era the needs for Information Technology is high because IT offers efficiency and effectiveness to support organization in achieving it goals. and because of the benefits many organizations make huge investments in IT [6] [7]. The success of IT implementation depends on the how well organization manages and monitor the IT, these action is to ensure that the IT implementation will generates benefits for the organization [8]. Poor management and monitoring can lead organization's IT investments will go in vain [9], In order to get maximum benefits from the IT investments organization must evaluate its IT Governance periodically.

This action is needed to oversee that the IT management is running well and optimum.

Organizations should adopt and implement IT Governance as its implementation is useful to ensure that the IT supports and aligns consistenly with the organizations objectives [5]. IT Governance concerns on how the IT in the organization is managed and structured, it provides practices that enable the alignment between business and IT to enhance their performance and governance [10] [11] [12]. COBIT (Control Objectives for Information and related Technology) is a framework developed and published by ISACA (Information Systems Audit and Control Association). COBIT has proven it reliability and has become worldwide leader in IT Governance, control security and assurance [13].

In this research authors will try to evaluate IT governance in NLI, the purpose of this research is to get an overview of the IT governance and performance in order to determine the capability levels of IT governance in NLI. COBIT 5 will be used as a guidance in assessing all processes within the IT function [14]. COBIT 5 helps the organization to create an optimal IT value by creating and maintaining the balance between benefits, optimizing the level of the risk and achieving goals through effective IT governance and IT management [14]. The domain that will be used in this research is Deliver, Service and Support, DSS focuses on delivery aspects of IT and support process that enables effective and efficient execution of IT.

## 2. Literature Review

### IT Governance

Governance in business context is a series of rules, processes and actions that organization undertakes to determine organization strategies and operate the organization in a determined manner to help organization achieve it goals. While IT Governance refers to organizational structures and processes to ensure that the organization's IT fully support the organization goals [4] [15] [16].

IT Governance Institute (ITGI) defines that IT Governance can be applied into almost all kind of organizations, including aligning IT strategies with organization's strategies. Efficient IT resource allocation can help the organization to achieve its goals and in addition organization can carry out performance measurements to get an overview and assess how far the organizations has fulfilled their goals [15] [17]. The IT Governance definition can be seen on Figure 1. IT Governance Definition.

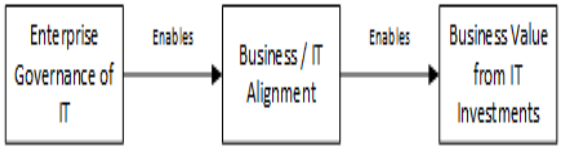


Figure 1. IT Governance Definition [13]

### COBIT 5

COBIT (Control Objectives for Information and related Technology) is a set of documentation and guidelines for implementation of IT Governance. COBIT is a framework that helps auditors. Management and users to bridge the gap between business risk, needs, control and technical issues [15-16]. COBIT has experienced the evolution that is long enough to create best framework that can be used in implementation of the Enterprise IT Governance [18] [19].

COBIT 5 is a framework developed and published by ISACA (Information Systems Audit and Control Association) on 2012 [20]. It provides guidance for organizations in order to achieve organization's goals related to IT Governance and IT management. COBIT 5 provides comprehensive framework to support the establishment for an alignment between IT with the business itself. COBIT 5 enables information and related technology to be governed and managed in a holistic manner for the entire organization, it covers the overall business process and functional areas of responsibility and considering the IT related interests of internal or external stakeholders [21] [22].

COBIT 5 allows organization to develop system and procedures for good IT control and management, the development is useful to provide management of Enterprise IT. COBIT 5 includes a set of 37 divided into two main processes shown in Figure 2 Governance and Management Key Areas.

*Governance Processes*

Governance processes is to ensure that enterprise objectives are optimally achieved by evaluating stakeholder needs, condition, option and set the direction through prioritization and monitoring the performance against agreed sets of goals.

*Management Processes*

Management processes is to manage plans, builds, runs and monitors working to ensure that the process set by the governance body will achieve the organizations objectives [24].

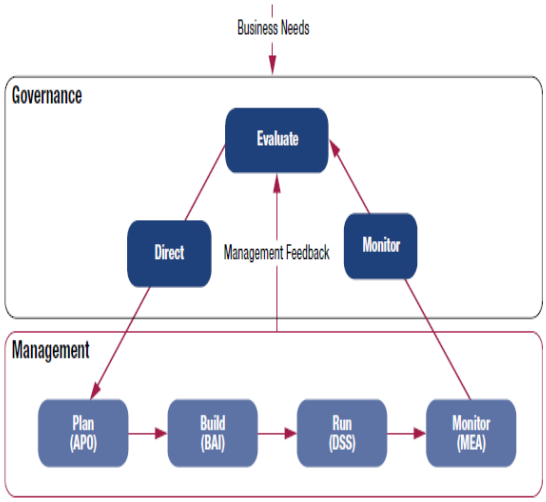


Figure 2. Governance and Management Key Areas [23]

## 3. Methods

This research is conducted by using qualitative method, the research instruments chosen are interview and observation because these instruments allows authors to gather and collect data simultaneously within the current situation [25]. The research flowchart can be seen on Figure 3 Research Flowchart.

Data from the observation were gathered by interviewing respondents, there are 3 respondents in total. the first one is the head of automation sub-field, the second and the third are the computer institution expert. Based on Figure 4 is the Interview Flowchart.

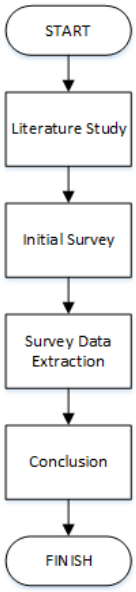


Figure 3. Research Flowchart [7]

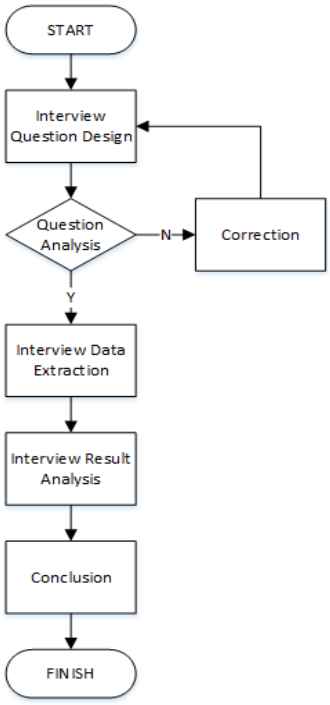


Figure 4. Interview Flowchart [7]

Report as the final result from the observation and interview is processed and calculated based on COBIT 5 capability levels model as seen on Table 1 COBIT 5 Capability Levels Model. The result will contain current capability level and expected capability level, after the calculation the next step is to do gap analysis in order to analyze the interpretation of the current and expected level and to provide recommendation and corrective action needed to overcome the gap and to achieve improvements in IT Governance.

TABLE 1
COBIT 5 CAPABILITY LEVELS MODEL [26]

| Level | Description |
|---|---|
| Level 0: Incomplete | The process is not implemented or fails to achieve its purpose. At this level there is little or no evidence of any systematic achievement of the purpose. |
| Level 1: Performed | The implemented process already achieved its purpose. This process has one process attribute that is Process Performance. |
| Level 2: Managed | The performed process is now implemented and managed (planned, monitored and adjusted). This process has two process attributes that are Performance Management and Work Product Management. |
| Level 3: Established | The managed process is now implemented in a defined process that is capable of achieving its process outcomes. This process has two process attributes that are Process Definition and Process Deployment. |
| Level 4: Predictable | The established process now operates within defined limits to achieve its process |

| Level | Description |
|---|---|
| | outcomes. This process has two process attributes that are Process Management and Process Control. |
| Level 5: Optimizing | The predictable process is now continuously improved to meet relevant current and projected business goals. This process has two process attributes that are Process Innovation and Process Optimization. |

## 4. Result and Analysis

In this step authors analyze the overall process with the COBIT 5 framework. Our analysis will be focusing on the IT department at the National Library of Indonesia (NLI). the analysis will include its employees, equipment, standard operational procedure etc. The domain that will be used in this process is Delivery, Service and Support (DSS).

### DSS01 Manage Operations

The purpose of this sub-domain is to assess the coordination and the execution of the activities including the operational procedures that are important and required for the optimum delivery of internal and outsourced IT services. This sub-domain also includes the execution of pre-defined standard operating procedures and the required monitoring activities.

Most of the operations at the NLI is already running well, and the IT facilities are already being taken care and treated well. But there are lack of documentation to support the operations, the average score for this sub-domain is 1.2. the details of this sub-domain can be seen on table 2 Capability Levels of DSS01 Manage Operations.

TABLE 2
CAPABILITY LEVELS OF DSS01 MANAGE OPERATIONS

| No. | Sub Domain | Current | Expected |
|---|---|---|---|
| DSS01.01 | Perform Operational Procedures | 1 | 3 |
| DSS01.02 | Manage Outsourced IT Services | 1 | 3 |
| DSS01.03 | Monitor IT Infrastructure | 1 | 3 |
| DSS01.04 | Manage the Environment | 1 | 3 |
| DSS01.05 | Manage Facilities | 2 | 3 |

### DSS02 Manage Service Requests and Incidents

TABLE 3
CAPABILITY LEVELS OF DSS02 MANAGE SERVICE REQUESTS AND INCIDENTS

| No. | Sub Domain | Current | Expected |
|---|---|---|---|
| DSS02.01 | Define Incident & Service Requests Classification Schemes | 1 | 3 |
| DSS02.02 | Record, Classify and Prioritize Requests and Incidents | 1 | 3 |
| DSS02.03 | Verify, Approve and Fulfil Service Requests | 2 | 3 |
| DSS02.04 | Investigate, Diagnose and Allocate Incidents | 2 | 3 |
| DSS02.05 | Resolve and Recover from Incidents | 2 | 3 |
| DSS02.06 | Close Service Requests and Incidents | 0 | 3 |
| DSS02.07 | Track Status and Produce Reports | 1 | 3 |

The purpose of this sub-domain is to assess the timeliness and effectiveness of the response given based on the user requests and resolution of all types of incidents, in order to increase productivity and minimize disruptions through quick resolution for the incidents.

Identification of user needs and recovery activities are already existing, all of the incident is already solved and already handled by experts in their field, reports is already being generated in timely manner and online reporting is already being implemented. But there is still no incident definition, escalation analysis and documentation about the incident. The average score for this sub-domain is 1.3. The details of this sub-domain can be seen on table 3 Capability Levels of DSS02 Manage Service Requests and Incidents.

### DSS03 Manage Problems

The main purpose of this sub-domain is to assess the identification, classification of incidents and their root cause in order to provide best resolution in timely manner to prevent the incidents reoccur, also to enhance improvements from the recommendations composed in this sub-domain. the objective of this sub-domain are improvement of service levels, costs reduction and improvement of service by reduction the number of operational problems.

Identification of incidents are already done, known-error and its solutions are already made, problem, costs monitoring and progress reports for communication is already being implemented

supported by meetings to discuss occurring problems and upcoming problems. But there is still no IT service desk and system to support the recording and problem management. The average score for this sub-domain is 1.6. The details of this sub-domain can be seen on table 4 Capability Levels of DSS03 Manage Problems.

TABLE 4
CAPABILITY LEVELS OF DSS03 MANAGE PROBLEMS

| No. | Sub Domain | Current | Expected |
|---|---|---|---|
| DSS03.01 | Identify & Classify Problems | 1 | 3 |
| DSS03.02 | Investigate & Diagnose Problems | 1 | 3 |
| DSS03.03 | Raise Known Errors | 3 | 3 |
| DSS03.04 | Resolve and Close Problems | 1 | 3 |
| DSS03.05 | Perform Proactive Problem Management | 2 | 3 |

**DSS04 Manage Continuity**

The purpose of this sub-domain is to assess the establishment and the maintenance of a plan that will enable the business and IT respond to an incident in a harmony and in timely manner, this action purpose is to ensure the operation of critical business process and required IT services goes well when incidents occurring, also to maintain the availability of information when incidents ocurring. The objective of this sub-domain is to continue critical business operations and maintain, provide availability of data & information in the event of a disruption.

Identification of internal, outsourced service, key stakeholder, business process and scenario is already done. Backup of data is already done regularly. Business analysis is already implemented and business continuity plan and the response is also already being made supported by regular review, maintenance and improvement of the continuity plan. But the Business Continuity Plan (BCP) hasn't tested yet, so the training and its review could not be done. The average score for this sub-domain is 2.1. The details of this sub-domain can be seen on table 5 Capability Levels of DSS04 Manage Continuity.

TABLE 5
CAPABILITY LEVELS OF DSS04 MANAGE CONTINUITY

| No. | Sub Domain | Current | Expected |
|---|---|---|---|
| DSS04.01 | Define the BCP, Objectives & Scope | 3 | 3 |
| DSS04.02 | Maintain a Continuity Strategy | 3 | 3 |
| DSS04.03 | Develop and Implement a Business Continuity Response | 3 | 3 |
| DSS04.04 | Exercise, Test & Review BCP | 0 | 3 |
| DSS04.05 | Review, Maintain & Improved the Continuity Plan | 2 | 3 |
| DSS04.06 | Conduct Continuity Plan Training | 2 | 3 |
| DSS04.07 | Manage Backup Arrangements | 3 | 3 |
| DSS04.08 | Conduct Post-resumption Review | 1 | 3 |

**DSS05 Manage Security Services**

The purpose of this sub-domain is to assess the protection of organization information in order to maintain the information security according to the security policy, and the establishment alongside with the maintenance of IT security roles, access privileges and performance of security monitoring.

Every policy is already made based on the risk and business evaluation there is already activities to protect devices against malware and the software used is already updated regularly. Network security and its protocol already exist and network filtering is already implemented, endpoint devices is already managed and configured well. Management of user identity, logical access, management of sensitive documents and outputs device alongside with physical access management is already managed well. But the anti-malware software distribution is still done manually and there is no security events review, internal or external audit to audit the access of sensitive information is still not implemented. The average score for this sub-domain is 2.1. The details of this sub-domain can be seen on table 6 Capability Levels of DSS05 Manage Security Services.

TABLE 6
CAPABILITY LEVELS OF DSS05 MANAGE SECURITY SERVICES

| No. | Sub Domain | Current | Expected |
|---|---|---|---|
| DSS05.01 | Protect Against Malware | 1 | 3 |

| No. | Sub Domain | Current | Expected |
|---|---|---|---|
| DSS05.02 | Manage Network and Connectivity Security | 2 | 3 |
| DSS05.03 | Manage Endpoint Security | 2 | 3 |
| DSS05.04 | Manage User Identity & Logical Access | 3 | 3 |
| DSS05.05 | Manage Physical Access to IT Assets | 3 | 3 |
| DSS05.06 | Manage Sensitive Documents & Output Devices | 3 | 3 |
| DSS05.07 | Monitor the Infrastructure for Security Related-Events | 1 | 3 |

**DSS06 Manage Business Process Controls**

The purpose of this sub-domain is to assess the definition and maintenance of business process controls to ensure the information needed satisfies all relevant control requirement. The objective of this sub-domain is to maintain information integrity and security within business process either processed internally or outsourced.

TABLE 7
CAPABILITY LEVELS OF DSS06 MANAGE BUSINESS PROCESS CONTROLS

| No. | Sub Domain | Current | Expected |
|---|---|---|---|
| DSS06.01 | Align Control Activities Embedded in Business Processes with Enterprise Objectives | 2 | 3 |
| DSS06.02 | Control the Processing Information | 3 | 3 |
| DSS06.03 | Manage Roles, Responsibilities, Access Privileges and Levels of Authority | 2 | 3 |
| DSS06.04 | Manage Errors & Exceptions | 2 | 3 |
| DSS06.05 | Ensure Traceability of Information Events & Accountabilities | 2 | 3 |
| DSS06.06 | Secure Information Assets | 3 | 3 |

There is already identification and documentation done about control activity, monitoring is already implemented to enhance improvement. Every information transaction is made according to procedure and its verified to ensure its accuracy, information asset is already classified and training is already conducted alongside with good security, error correction procedure and review. But access control is still not reviewed periodically. The average score for this sub-domain is 2.3. The details of this sub-domain can be seen on table 7 Capability Levels of DSS06 Manage Business Process Control.

Based on the research conducted, improvements is needed in order to improve the performance level that are below the expected level. these are the recommendations for the improvements are:

**Recommendation based on DSS01 Manage Operations**

In this domain, lack of documentation is the major problem. Definition and documentation is still not done thoroughly, NLI should document and define all of the SOP so all of the activity is well documented and can be monitored or revised periodically.

**Recommendation based on DSS02 Manage Service Requests and Incidents**

These domains, lack of definition, documentation and escalation analysis are the major problem. Definition and documentation is still not done thoroughly, NLI should document and define all of the SOP so all of the activity is well documented and can be monitored or revised periodically. NLI should also do escalation analysis, escalation analysis useful to keep track of the problem that frequently occur. the analysis also can be used for the reference to produce solutions for the problems.

**Recommendation based on DSS03 Manage Problems**

In this domain the major problem is there is no IT service desk and the system. NLI should implement IT service desk and system, this implementation is needed to create incidents ticket, incidents recording and incidents progress monitoring.

**Recommendation based on DSS04 Manage Continuity**

In this domain the major problem is the BCP is never tested, trained or reviewed. NLI should test, train and review the BCP regularly, this actions is needed in order to improve, maximize and to detect flaws from the BCP and to provide the corrections needed.

**Recommendation based on DSS05 Manage Security Services**

In this domain the major problem are anti-malware software distribution is still done manually, no security events review and internal audit on sensitive information is still not conducted. NLI should distribute anti-malware software centrally so all of the anti-malware software on devices can be installed and updated at the same time. NLI also should review security events regularly in order to make sure there is no severe security events occurring without the NLI knowledge. NLI should also conduct internal audit on sensitive information regularly, this action is needed to prevent sensitive information accessed by unwanted party.

**Recommendation based on DSS06 Manage Business Process Controls**

These domains the major problem is access control is still not reviewed periodically, NLI should do this action in order to prevent unauthorized user can modify or access sensitive information.

TABLE 8
SUMMARY OF PERFORMANCE LEVEL ON DSS DOMAIN

| No. | Current | Expected |
|---|---|---|
| DSS01 Manage Operations | 1.2 | 3 |
| DSS02 Manage Service Requests & Incident | 1.3 | 3 |
| DSS03 Manage Problems | 1.6 | 3 |
| DSS04 Manage Continuity | 2.1 | 3 |
| DSS05 Manage Security Services | 2.1 | 3 |
| DSS06 Manage Business Process Controls | 2.3 | 3 |

The summary of the performance level can be seen on table 8 summary of performance level on DSS domain and figure 5 Radar chart of the Summary of the Performance Level on DSS Domain.

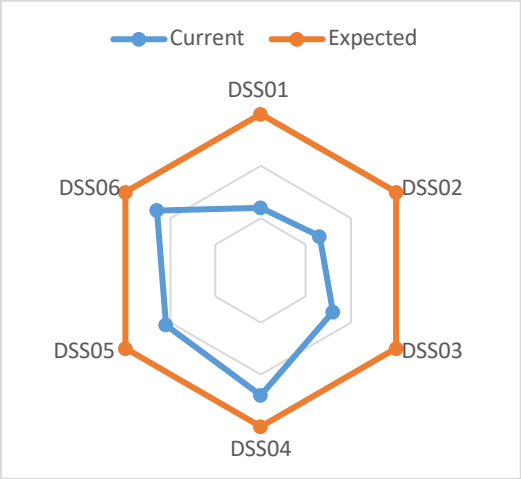


Figure 5. Radar chart of the Summary of Performance Level on DSS Domain

## 5. Conclusion

The conclusion of this research is that the IT governance at the NLI has already implemented but most of them still not run optimally because they have not reached the expected level.
on DSS01 manage operations the average score is 1.2, on DSS02 manage service requests and incident the average score is 1.3, on DSS03 manage problems the average score is 1.6, on DSS04 manage continuity the average score is 2.3, on DSS05 manage security services the average score is 2.1, on DSS06 manage business process controls the average score is 2.3.

The performance level of DSS01, DSS02 and DSS03, they are still at level 1 performed process, on the DSS04, DSS05 and DSS06 the performance level is still at level 2 managed process. Result of this research is the performance of IT Governance in NLI has already performed, but most of it is still not defined, formalized and documented. We hope this research and recommendations can be used by NLI as reference for the improvement of their IT Governance.

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# MASTER DATA MANAGEMENT IMPLEMENTATION IN DISTRIBUTED INFORMATION SYSTEM CASE STUDY DIRECTORATE GENERAL OF TAX, MINISTRY OF FINANCE OF REPUBLIC OF INDONESIA

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***Abstrak***

*Direktorat Jenderal Pajak (DJP) memiliki arsitektur sistem yang tersentralisasi dengan data yang terdistribusi. Permasalahan utama terdapat pada replikasi data master dan referensi pada database di beberapa aplikasi, mencakup juga struktur yang berbeda-beda dan proses sinkronisasi yang tersebar. Untuk itu perlu dilakukan master data management (MDM) dalam mendukung sistem informasi terdistribusi. Pengukuran tingkat kematangan pengelolaan master data di DJP telah dilakukan menggunakan MDM maturity model (MD3M) Spruit dan Pietzka dengan hasil topik Data Protection, Data Quality dan Maintenance berada pada level 3 atau tahap defined process, sedangkan topik Data Model, Usage and Ownership berada pada level 2 atau tahap repeatable. Untuk meningkatkan master data maturity, MDM, penanganan permasalahan pada MDM mengacu pada Data Management Body of Knowledge (DMBOK). Permasalahan pada MDM ditemukan berkaitan dengan kebijakan dan arsitektur yang belum mendukung. Kebijakan dan pendekatan arsitektur sistem MDM terpusat diperlukan untuk mengatasi permasalahan tersebut. Salah satu solusi permasalahan arsitektur adalah dengan menerapkan Data Virtualization, sehingga memungkinkan DJP menggunakan arsitektur sistem MDM yang terpusat tanpa harus mengkonsolidasikan seluruh data master dan referensi dalam satu database khusus*.

**Abstract**

Information system architecture of Directorate General of Tax (DGT) is centralized with distributed data. The main problems are replication of master and reference data which spread among applications which vary on data structure. Beside that, the synchronization jobs that spread in many locations and not well managed. Therefore, Master Data Management (MDM) needs to be implemented with accordance to characteristic of centralized distributed information system. Master data management maturity evaluation is conducted using MDM maturity model (MD3M) Spruit dan Pietzka, the result is Data Protection, Data Quality and Maintenance topic have maturity level 3 or defined process stage, while Data Model, Usage and Ownership topic have maturity level 2 or repeatable stage. Solutions to solve MDM issues and to enhance the master data management maturity level are proposed based on Data Management Body of Knowledge (DMBOK). DGT's MDM issues are related to insufficiency of policy and architecture of MDM system. Policy and architectural approach of centralized MDM system is required to solve that issues. Proposed solution involves the use of data virtualization to enable implementation of centralized system of MDM without consolidate all master and reference data into new database.

**Keywords:** *Master Data Management, Distributed Information System, DMBOK, Data Virtualization*

## 1. Introduction

Information system with distributed type of architecture has consequence of the spread of master and reference data in many databases. Each application requires entity of master and reference data in same structure or with some modification. Hence, integration and interoperability are needed to make the master and reference could be shared and reusable.

Information system of Directorate General of Tax (DGT) is centralized with distributed data.

Service Oriented Architecture (SOA) is applied by implements SOA middleware which gives capability to develop atomic services, and to compose complex services through modelling tools. All services which represent the main business function of taxation are published through Enterprise Service Bus (ESB).

MDM system development project has been initiated in 2013, centralized database was created for manage master and reference data, but, limited only for entities that related to taxpayer, it is called DB Master. Updating process and synchronization to core tax system (SIDJP) has been defined. However, in 2014 the development of SIDJP is changed from single big system to modular and distributed system. Each of new module of SIDJP are developed separately, so that each application has their own database. Common master and reference data from DB Master are accessed through web services.

Replication of master and reference data still has some problem on data synchronization between main database and specific application database. The synchronization process not in centralized system, so it is hard to monitor those background processes. That condition leads to master data inconsistence problem in several applications.

Poor documentation of application specification is one of factor that causes difficulty in identifying the occurrence of master and reference data replication. Those condition will make synchronization process more complex when master and reference data is changed. Hence, the master and reference data need to be managed in centralized manner.

DGT has concern about those MDM issues. MDM becomes one of application platform of SIDJP in DGT's IT Blueprint for 2015 – 2019 [1]. MDM implementation is not only about technology, but requires comprehensive approach which cover process, governance policy, and implementation of related technology [2]. Based on it, the research question is "how to approach master data management implementation at Indonesian DGT?"

This study aimed to propose an approach to enhance the MDM in DGT which cover governance policy and appropriate architecture of MDM system that support master, reference and transaction data integration and interoperability in distributed system environment. Therefore, it could improve the DGT's MDM capacity. MDM maturity model (MD3M) from Spruit and Pietzka is used to evaluate DGT's MDM maturity level [3]. While activities to enhance maturity level, MDM, and solution are proposed based on Data Management Body of Knowledge (DMBOK) [4].

## 2. Literature Study

### A. Master Data Management Definition

Master Data Management (MDM) is set of processes to maintenance, to integrate, and to align master data, therefore the information produced from information system become consistent. MDM is control over value of master data to enable consistent and common use across multiple systems. While Reference Data Management is activity to control dictionary of terminology which include standard definition, business process object codification, relationship of references across domain, and consistently shared use of references from multiple sources [4].

Principles of reference and master data management activities based on DMBOK are below[4]:

1) Reference and master data are shared data which used across business functions, therefore, provision of those data need to be well managed;
2) Reference and master data are owned by the organization, and don't belong to certain application or unit. Because it has broader usage, including all functions in organization, so it should be managed appropriately and based on standard;
3) Business data steward is responsible for controlling and monitoring quality of reference data;
4) Master data must be real time and updated. Every change in reference and master data must be authorized, logged, and communicated before it is applied;
5) Replication of master data allowed only from defined source. Some reference system is needed to enable shared use of data.

Recently, master data management has become part of enterprise information management, that is driven by need of better quality of data [5], especially in distributed information system environment. Master data is category of data which related to shared business entities that used across business processes. Master data is representing primary entities which have important role to fulfil strategic business requirement [5].

### B. Master Data Maturity Assessment

Master data maturity assessment required by organization to measure the level of master data integration across multiple units or areas. Maturity model is an artefact which aimed to defining current, target and improvement of capability status of organization. MDM maturity assessment requires some model which could be used to measures all of the MDM processes, including view of data and operational aspect [3]. Maturity assessment could help organization to improve

capabilities of data management system component and adapting changes.

DAMA [4] also emphasizes about importance of maturity assessment of each data management section. The need to accommodate changes in regulation, standard, organization, business and technology are the reasons why maturity assessment is important in data management.

Literatures have been reviewed to choose the MDM maturity model which will be used to assess DGT's MDM maturity level in this study. Spruit and Pietzka propose model for assess MDM maturity level, it is called MDM maturity model (MD3M). Those model uses 5 maturity levels which adopted from COBIT [3], the levels are below:

1) Initial, means there are awareness about MDM in operational level;
2) Repeatable, means MDM activity has been conducted to solve individual problems, still in operational level;
3) Defined-process, means there are collaboration in tactical level;
4) Managed and measurable, means best practices has been used to implement MDM. Processes is clearly defined in tactical level;
5) Optimized, means MDM processes has been optimized, affecting to organization efficiency improvement.

Assessment including 5 main topics which consist of 13 MDM areas. The topics which play as indicator of MDM maturity are: 1) Data model, 2) Data quality, 3) Data ownership and usage, 4) Data protection, 5) Data maintenance.

Zuniga et al. on 2018 conducted literature review to define MDM maturity model for micro finance in Peru. Those study comparing the existing models, they are MD3M which proposed by Spruit dan Pietzka, Dataflux's model, Standford University's model, Oracle's model and others model from previous research. All topics of MD3M is adopted on the model resulted from those study [6].

MD3M that proposed by Spruit dan Pietzka is fundamental, comprehensive, and general, so it could be used in many business sectors. The journal of MD3M has high H-index and categorized as Q1-best quartile. Hence, this study will use MD3M to conduct MDM maturity assessment and to get insight about MDM processes in DGT.

C. Master Data Management Activity

DAMA [4] provide guidelines for define steps in implementing MDM. When implementing MDM, organization will arrange it in step by step and iteration processes. Each organization will have different beginning maturity level of MDM, therefore, the approach will vary depending on theirs beginning condition. According to DMBOK, MDM activities for each category are below:

1. P – Planning
   - Identify driver and requirement;
   - Evaluation and assessment of data sources.
2. D – Development
   - Define architectural approach;
   - Define data model;
   - Implement data sharing/ integration services mechanism.
3. C – Control
   - Define stewardship and maintenance process;
   - Establish governance policy.
4. O – Operational
   - Implement data sharing/ integration services mechanism.

MDM system architecture is important part of solution. Architecture is basic composition of system which represent its components, relationship of components, and principles to create system design [4]. Defining an architectural approach is a part of MDM development activity. MDM system architecture will be defined based on result of data sources evaluation and identification of driver and requirement. DAMA provides detailed explanation about factors that need to be considered in defining architecture type of MDM system, that is: (1) Business strategy, (2) Platform of existing data sources; (3) Characteristic of data, especially about its lineage and volatility, (4) Implication of latency level.

D. Recent Technology Concept which Could Improve MDM

DAMA published DMBOK V.2 as a refinement to respond to technological changes. Those version of DMBOK added one section about data integration and interoperability. That section explains data movement and consolidation both in same location or between different locations. Data integration and interoperability is important things for data warehousing, and also important for reference and master data management, because in providing data to user or systems, they have requirement to transforming data and integrate data from multiple sources [4].

Data virtualization is a new concept that is introduced in section data integration and interoperability on DMBOK V.2. It is a mechanism that could be implemented in MDM and data quality management projects and will help to gain benefit from that projects. It enables to provide single layer from multiple data sources in different platform. Since the data sources seems in single layer of virtual database, so data transformation, data ownership administration, and data access

control could be centralized managed without move data to new location.

Implementing concept of data-service driven organization, the organization need to be transformed, in order to build capability in providing data access over multiple heterogeneous data sources in timely and conveniently way. Data distribution or data access provision is part of data integration architecture. It refers to process of organization in provide business view of data in virtual layer [7]. Therefore, data will become services which serves organization in achieving their mission.

All of literatures mentioned above will be used to build MDM solution in this study. The theoretical framework is depicted in Figure 1.

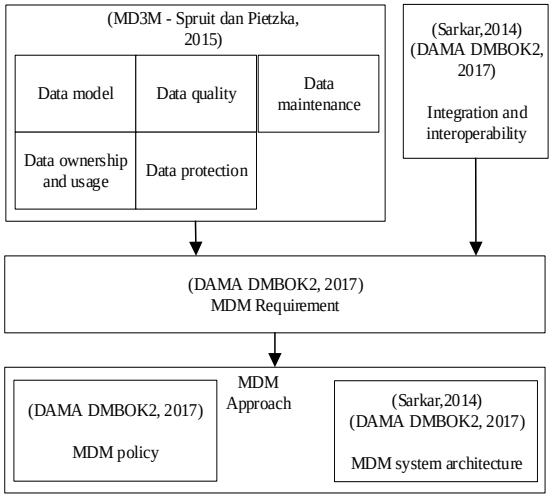


Figure. 1. Theoretical Framework

## 3. Research Methodolgy

This study uses primary data which collected through interview and observation. The data is used to assess the beginning MDM maturity level, and to get insight about existing MDM system that has been implemented by DGT. Literature review also conducted to find appropriate model for MDM maturity evaluation, and to propose solution of MDM issues.

List of question or check list of condition is arranged for each topics and areas according to MD3M, then interview is performed based on it. Observation is also conducted to collect information about data sources and the existing integration architecture that has been implemented in DGT. Requirement of MDM system solution is defined according to information about business process, existing data sources, existing data integration architecture, and master data issues which identified.

MDM policy and refinement of MDM system architecture will be proposed based on MDM system requirement, data model, and integration pattern. Existing MDM system architecture and MDM issues which identified are considered in proposing appropriate MDM system architecture.

Proposed solution for improvement MDM will be validated by checking availability of relevant technology such as middleware which could fulfil the requirement. The working prototype will be built based on it. Steps in this research are refer to literatures such as journal and DMBOK. Summary of research methodology is depicted as Figure 2.

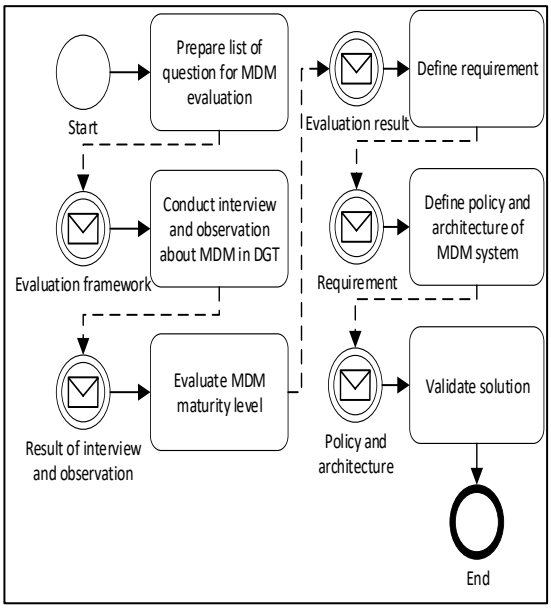


Figure. 2. Research Methodology

## 4. Results

A. Master Data Management Maturity Assessment

The MDM maturity assessment is conducted through interviews with 5 key persons who involved in the project of MDM on 2013, the respondent profile is shown in Table 1.

Table.1. RESPONDENTS OF MDM MATURITY ASSESSMENT

| Respondent | Role | Experience |
|---|---|---|
| A | Data Warehouse Developer | 8 years |
| B | Data Warehouse Developer | 8 years |
| C | Database Designer | 3 years |
| D | Database Designer | 5 years |
| E | Manager at Application Development Unit | >10 years |

We conduct the interview with all respondents guided by question list that arranged according to MD3M. The answer from all respondents then reconcile, if contradiction occurred then we clarify by observe the document and the information system. Based on the results of those process, the maturity level of MDM is calculated according to MD3M. It is found that data protection, data quality, and data maintenance are at level 3 or defined process stage, while data model, and data ownership and usage are at level 2 or repeatable stage. Details of assessment result for every areas of each MDM topic are shown in table 2.

Table.2. RESULT OF MDM ASSESMENT IN DGT

| Area | Level |
|---|---|
| ***Data Model*** | **2** |
| *Data landscape* | 2 |
| *Definition of master data* | 3 |
| *Master data model* | 3 |
| ***Data Protection*** | **3** |
| *Data protection* | 3 |
| ***Data Quality*** | **3** |
| *Assessment of data quality* | 2 |
| *Impact on business* | 3 |
| *Improvement* | 3 |
| *Reason/sources for poor quality* | 4 |
| ***Maintenance*** | **3** |
| *Data lifecycle* | 2 |
| *Storage* | 4 |
| ***Usage and Ownership*** | **2** |
| *Data access* | 3 |
| *Data ownership* | 1 |
| *Data usage* | 4 |

B. Identification of Sources and Contributors of Master Data

Identification of sources and contributors of master data in DGT is conducted through interview and observation. Information about databases which stored master data and business processes that contribute to master data are collected in this step, the results are below:

1. Taxpayer registration

Master data and reference which related to this business process such as taxpayer, region code, business field classification code, taxpayer type and others have been managed in DB Master. Any data changes that occur in e-registration will also updated to this database directly.

2. Staffing and organization

Master data related to staff, office, organization unit and theirs reference are managed in DB SIKKA which is part of Information System of Finance, Staffing, and Asset (SIKKA).

3. Finance and assets management

Master data related to this business process such as chart of account and government asset managed in DB SIKKA.

4. Object of property tax administration

Master data related to this business process are managed in SIDJP-NINE property tax module. This data has not been consolidated into DB Master.

C. Identification of MDM Problem

According to the result of MDM maturity assessment, it has level between 2 and 3. Main problems of MDM in DGT which identified during the assessment are as follows:

1. Replication of reference and master data across applications which not well managed cause maintenance difficulties;
2. Master data is spread over 3 different locations, that are DB Master, DB SIKKA, and Integrated Data Warehouse. Because there is still poor solution to integrate the master data, so the application developer still replicates master data when needed;
3. Data quality examination still performed in each data sources, so quality monitoring of master data become difficult;
4. Data access management still performed in each application, that makes difficult to manage privilege of master data consistently;
5. Metadata of master data has not consolidated, it is spread over data sources, that makes difficult to understand all the master data;
6. Policy and procedure in application development have not consider MDM, so there are chance that master data entity is fully replicated to another database, even though it could be created with inheritance, and the main entity is reused;
7. Policy and procedure of access right to master data have not aligned with job requirement of function, unit or position in organization;
8. Stewardship of master data has been defined, unit which responsible for manages database especially DB Master is pointed to be a data steward. However, because there are no regulations regarding master data, so several master data are still managed by certain business unit.

D. Define Master Data Management Requirement

Based on problems identified in previous section, MDM requirement will be defined. The requirements to improve MDM in DGT are as follows:

1. Requirements related to governance policy
   a. Policy and procedure to support integration of master data;
   b. Procedure that govern MDM must be included in application development policy;
   c. Data access right must be included in jobs description, therefore access control over

master data could be defined clearly and implemented;

d. Unit that responsible for stewardship of master data must be determined and included in jobs description.

2. Requirements related to MDM system architecture
   a. Integration of data sources of master data which spread in several databases;
   b. Data access provision for target applications which use master data, therefore those application could access master, reference and transaction data simultaneously, just like in the single database;
   c. Data quality examination could be performed centrally;
   d. Metadata of master data could be managed and accessed centrally.

E. Data Model Identification

Sources and entities relationship of master data are identified through interview and observation. Locations of master data spread in 3 different databases, however master data entities have clear relationship. There are master data that still replicated in different structure, such as entity of taxpayer, tax office, and property tax object. Conceptual model of master data in DGT is as depicted in Figure 3.

F. The Main Points of MDM Governance Policy

Governance policy is one of key requirements to improve MDM in DGT. Main points of governance policy proposed for DGT are as follows:

1. Determine business data stewardship, in this case unit which responsible for analysis and design information system is the most appropriate unit pointed as data steward for master data. The reason for that determination is because those unit has authority in application and database design, other than that, it has knowledge and capability to understand whole business processes in DGT;
2. Procedure of System Requirement Specification (SRS) definition must be including identification of master data;
3. Logical layer or data virtual layer should be implemented in providing access to databases, so users or applications don't need to know complexity of physical database, they only need to connect to logical layer according to their needs;
4. Operational of MDM should centralized, database development activities related to master data requirement are performed by unit which has authority in database development in Directorate of Transformation of Information and Communication Technology. Centralized MDM could improve quality and availability of master data;
5. Access rights of master data granted to users based on job description and authority of theirs position and unit. While access rights for applications granted based on business scope of each application.

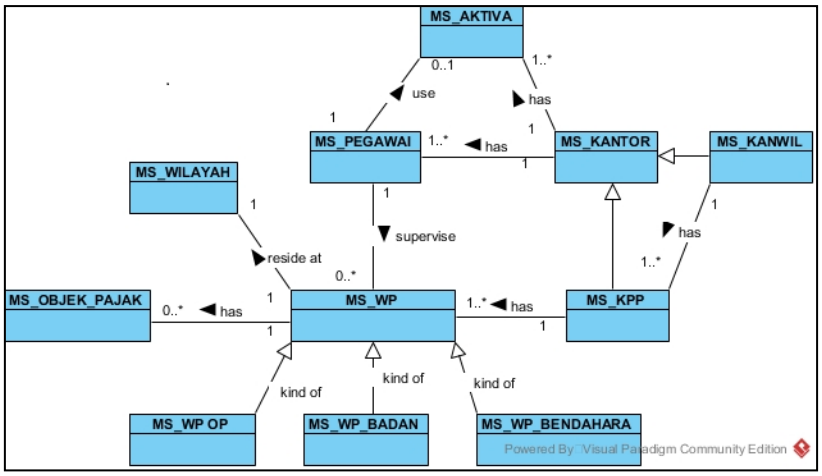


Figure. 3. Conceptual model of master data of DGT

G. Define Architectural Approach for MDM System

DGT's MDM system is toward centralized system and apply Service Oriented Architecture (SOA) to distributing master data to target applications. However, master data related to staffing, finance and assets still managed in SIKKA which is the leading system of that business

processes. MDM with leading system pattern is frequently encountered in practice [5].

According to theoretical framework as shown in Figure 1, in proposing architectural approach for MDM system, this study will consider requirements of MDM, MDM policy, and technology advancement which could improve the effectiveness and efficiency of MDM. Other than that, the advantage and disadvantage of every architecture pattern of MDM is also taken as consideration, refers to the study about decision model for MDM architecture which has been conducted in previous.

The entire architectural pattern has advantage and disadvantage. Centralized, leading system and SOA pattern are good in data quality, but poor in flexibility and interoperability. While connection hub and registry pattern are good in flexibility and business optimization, but poor in data quality [5].

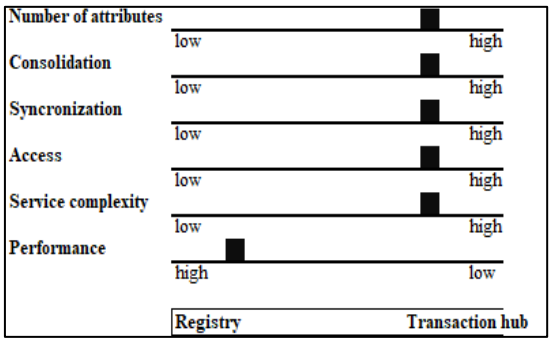


Figure. 4. MDM Architecture Selection

MDM architecture should be chosen based on requirement as selection criteria. At least there are six criteria that must be considered when choosing MDM architecture style[8]. Based on it, we analyse the requirement of MDM in DGT as depicted in Figure 4.

Almost all the criteria except performance lead the decision to transactional hub. However, transactional hub has limitation in performance because single consolidated master data repository often raises performance issue[8]. Other limitation of transactional hub is about poor data quality[5]. The complexity of data consolidation and data distribution which involving data movement between locations increase the risk of incomplete and inconsistence data on target application.

According to advantage and disadvantage of transactional hub style and consider performance and data quality requirement as mentioned before, we prefer to use federative approach as MDM architecture style for DGT. Federative approach more focus on data interoperability[14], the use of shared attribute will reduce the need of moving data into another location. Data virtualization also need to be used to enable centralized maintenance and implementation of data governance.

Based on requirement related to MDM system architecture described in previous section, it can be understood that centralized MDM system needs to be implemented in DGT to ensure the data quality, and to govern data ownership, data access, and metadata of master data that's used across unit and function in organization. Besides that, there are also requirement to integrate master data with transaction data with simple and timely mechanism. The use of Extract Transform Load (ETL) for moving data to a new data source has high complexity and can causes delay. ETL job failures becomes a risk in the timeliness of data provision to target applications.

Data virtualization could make multiple data sources with different platform seem to be in one layer, therefore data transformation, data ownership management, and control over data access could be performed centrally through those data virtual layer, without having to move data to new location. Hence, this study will involve the use of data virtualization concept as part of architectural approach for MDM. The proposed MDM system architecture for DGT is as depicted in Figure 5.

Each virtual database has data schemas which arranged based on requirement of each application. Every tables or views in virtual database represent the logical model of tables in multiple and heterogeneous data sources. Connection to virtual database could be created in several mechanisms, there are query execution through JDBC or ODBC protocol, and web services such as SOAP, REST, or OData. Security policy could be implemented in virtual database in form of authentication and authorization which integrated with enterprise authentication provider or Active Directory (AD) that is used in DGT. Caching could be used both in memory or materialized to improve performance while accessing reference data which rarely changed.

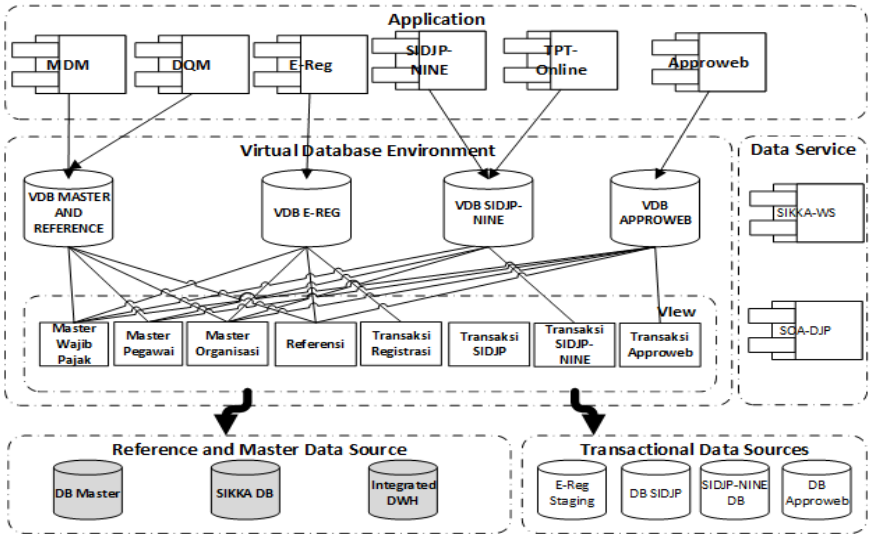


Figure. 5. MDM Architectural Framework with Data Virtualization

## 5. Discussion

Nowadays, data virtualization is supported by middleware from many credible principals. It has capability for data integration of multiple data sources in different format and enable system interoperability. It provides universal access to virtual database through JDBC and ODBC connectivity, and also provides web service channel with standard mechanism such as SOAP, REST and OData and standard data format like XML and JSON. Almost all middleware has centralized system administration such as facility for deployment management, metadata, versioning, data access monitoring and activity log.

Data integration and interoperability are important in MDM [4]. Data virtualization could realize benefit of MDM project, because with those mechanism, master data in single source of truth could be combined with operational data in real time to get common understanding of business process over all units in organization[9]. Data virtualization also could facilitate data quality management by provide monitoring data quality centrally and data normalization in virtual layer. Besides that, it could be a catalogue of master data [9].

This study will validate the possibility of data virtualization usage as proposed solution to improve MDM in DGT. The validation performed by learning several middleware products of data virtualization both commercial and open sources.

Based information collected from product data sheets or product home page, this study will summarize capabilities of data virtualization middleware as follows [10][11][12][13]:

1. Data sources federation, that is capability to consolidate many data sources in different format, therefore it could be accessed in one location in form of data virtual;
2. Data transformation, capability to transform data into new structure without move the data into new location, so it make data transformation become easier;
3. Data expose, capability to provide reusable data services which could be accessed through different data access protocol such as JDBC, ODBC and web service through HTTP;
4. Performance improvement, capability to improve performance while accessing data by reducing resources usage in database server;
5. Availability, capability to maintain availability of data services;
6. Security control, capability to perform user authentication and authorization and implementation of rule-based access control;
7. Development tools, available integrated development environment (IDE) which support to develop and maintenance virtual database;
8. System management, facility for configuration, deployment, resources monitoring, access monitoring and activity logging.

Virtual database prototype will be developed in this study to validate MDM architectural approach. It will be built using open source product, that is JBoss Teiid. The prototype of virtual database stores metadata of data sources both master, reference and transaction data as shown in Figure 6.

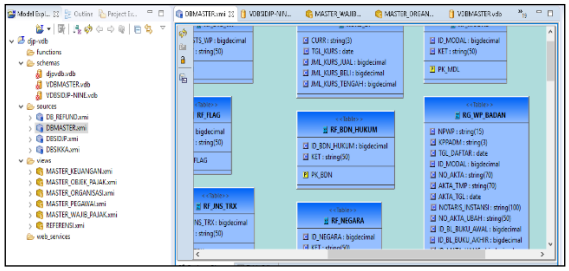

Figure. 6. Virtual Database Modeling (Teiid Designer)

Inheritance of master data entities could be accommodated by creating view. For example, if some entity is specialized from main entity, then it could be created with transformation in form of view at virtual layer, as shown in Figure 7.

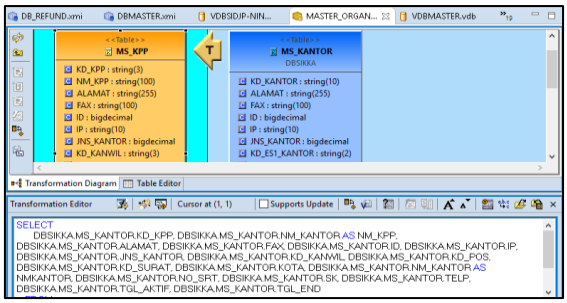


Figure. 7. Data Transformation

There is management console in web based which facilitate system administration of virtual databases including deployment, versioning, privilege, data access control and monitor, as shown in Figure 8.

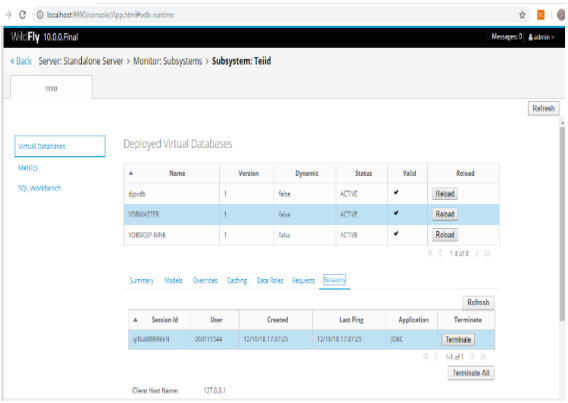


Figure. 8. Data Virtualization System Administration (Wildfly-Teiid)

## 6. Conclusion

MDM implementation is iteration and step by step process, it will take quite a long time be completed. DGT has started MDM project since 2013. Changes in business and organization affects the MDM that has been applied. Hence, MDM maturity level assessment is needed as first step in MDM improvement project. The assessment could give insight to MDM and become a starting point in MDM improvement activities in this study.

MDM enhancement could be arranged based on requirements. Master data maturity assessment provides systematic approach to get better understanding of current condition of MDM in DGT and to define the target condition of MDM which turn into requirements. Then the requirement will be a reference for define the governance and design of the MDM architecture.

Data virtualization is one of new concepts which introduced in DMBOK V.2 to supports system integration and interoperability. It could make multiple and heterogeneous data sources which spread in many locations seems in one database and accessed at single point, however, that is not replace data warehousing [4]. Hence, the use of data virtualization in MDM project, will makes DGT able to take advantages of centralized MDM system architecture, without having to consolidate all master and reference data into new database, and still able to take advantage from flexibility as in hub and registry architecture.

This study expected to give contribution to the organization by giving recommendation about steps in enhance the MDM. Several previous studies demonstrated MDM in different views. Most of studies focus on developing architecture and practices of MDM. Other studies are proposing MDM maturity model to assess the maturity level of MDM. This study gives more comprehensive view about MDM activities by combines both assessing maturity level and developing architecture and practice of MDM to help organization enhance their MDM system.

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# EVALUATION OF INFRASTRUCTURE READINESS IN SUPPORTING THE IMPLEMENTATION OF E-GOVERNMENT USING THE COBIT 5 FRAMEWORK. CASE STUDY: PADANGSIDIMPUAN CITY GOVERNMENT

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**Abstract**

The application of information technology (IT) has now become a necessity in all aspects of both individuals, groups or organizations and even government institutions. The implementation of IT in government is a form of execution of the President's instruction No. 3 of 2003 concerning national policies and strategies for the development of e-government. IT infrastructure itself is a foundation and framework that supports a system or organization. Excellent IT infrastructure support will contribute to accelerating the achievement of organizational goals. Evaluation of IT infrastructure readiness in Diskominfo in Padangsidimpuan City is done using the COBIT framework, by measuring the maturity level of IT infrastructure governance that refers to IT management goals number 10 and 11 in COBIT that are mapped on 13 COBIT process domains. The results of the evaluation of the level of achievement in each process there are eight processes at the completion of levels 1 and five are at the achievement of level 0. The level of hope for achieving the whole process is at level 3 and the gap consists of 2 degrees and 3 levels of achievement. The recommendations given in the form of a SWOT in this study aim to increase the level of maturity of IT infrastructure governance to support the implementation of e-government in the city government of Padangsidimpuan.

**Keywords:** *Capability level, COBIT 5, E-Government, Infrastructure*

***Abstrak***

*Penerapan teknologi informasi (TI) saat ini telah menjadi kebutuhan di segala aspek baik individual, kelompok atau organisasi bahkan lembaga pemerintahan. Penerapan TI di pemerintahan merupakan bentuk pelaksanaan instruksi Presiden (Inpres) Nomor 3 Tahun 2003 tentang kebijakan dan strategi nasional pengembangan e-government. Infrastruktur TI sendiri adalah suatu pondasi dan kerangka kerja yang mendukung suatu sistem atau organisasi. Dukungan infrastruktur TI yang baik akan memberikan kontribusi pada percepatan pencapaian tujuan organisasi. Evaluasi kesiapan infrastruktur TI di Diskominfo Kota Padangsidimpuan dilakukan menggunakan framework COBIT, dengan mengukur tingkat kematangan tata kelola infrastruktur TI yang mengacu pada tujuan manajemen TI nomor 10 dan 11 dalam COBIT yang dipetakan pada 13 domain proses COBIT. Hasil evaluasi tingkat pencapaian pada setiap proses terdapat 8 proses berada pada pencapaian level 1 dan 5 berada pada pencapaian level 0. Tingkat harapan untuk mencapai keseluruhan proses berada pada level 3 dan kesenjangan terdiri dari 2 level dan 3 level pencapaian. Rekomendasi yang diberikan dalam bentuk SWOT pada penelitian ini bertujuan untuk meningkatkan tingkat kematangan tata kelola infrastruktur TI untuk mendukung penerapan e-government di pemerintah kota Padangsidimpuan*.

**Kata Kunci:** *COBIT 5, E-Government, Infrastruktur*, *Tingkat pencapaian*

## 1. Introduction

The application of information technology (IT) has now become a necessity in all aspects of both individuals, groups or organizations and even government institutions [1]. The implementation of IT in government is a form of implementation of the President's instruction (Inpres) No. 3 of 2003 concerning national policies and strategies for the development of e-government. This Instruction has mandated, to the Governor and Regents / Mayors to take the necessary concrete steps by their respective duties, functions, and authorities, for the implementation of national e-government development [2].

IT infrastructure is the foundation or framework that supports a system or organization. Excellent IT infrastructure support will contribute to accelerating the achievement of organizational goals, whereas if the infrastructure is not right it

can hamper the performance of goals. The foundation itself supports the completion of the organization's general goals by facilitating collaboration and integration of resources [3].

The city of Padangsidimpuan was formed in 2001 and currently has six sub-districts consisting of 42 villages and 37 sub-districts [4]. The population of Padangsidimpuan City in 2016 was 212,917 people, male population was 103,709 people, and the female population was 109,208 [5]. Based on the 2016 national socio-economic survey (Susenas) data, the percentage of the population of the city of Padangsidimpuan, aged five years and over, amounting to 190,694 people has accessed the internet. Accessing the internet by residents of the City of Padangsidimpuan per 3 months in 2016 aims to get information or news as much as 95.85% and only 4.15% use it for commercial facilities [6]. Based on the high desire of the residents of Padangsidimpuan City to use IT as a means of information in this case the Padangsidimpuan City government is one of the government institutions that are in the process of transformation towards the implementation of IT or what is called e-government to carry out its duties and functions. The application of e-government which will later serve the people of Padangsidimpuan City to get information or news primarily from the Government. The implementation of e-government certainly has constraints that become obstacles to improving the quality of e-government, including the low level of readiness of IT infrastructure from the Government to implement e-government itself.

Evaluation of the readiness of IT infrastructure in the City Government of Padangsidimpuan is done to provide recommendations in supporting the implementation of e-government. Evaluation is done by measuring the maturity level of IT infrastructure governance. Measures from the achievement of right information technology (infrastructure) management can be done with a scientific approach, one of them is by using the COBIT framework reference (control objectives for information and related technology). COBIT is an IT management guide standard and a set of documentation for IT governance best practices. COBIT can help auditors, leaders, and users to bridge the gap between business risk, control needs, and technical issues. The recommendations in this study are compiled based on the results of measurement of the maturity level of IT governance. Then a SWOT analysis was carried out [7] to determine the strengths, weaknesses, opportunities, and threats of IT infrastructure in the city government in the enumeration area.

## 2. Literature Review

### Padangsidimpuan City

Related to the research that will be conducted is based on mission number 4 of the Padangsidimpuan City Government on improving the quality and infrastructure addressed to Diskominfo based on the leading performance indicators of the Padangsidimpuan City Government in 2014-2020 can be seen in Table 1.

TABLE 1
MAIN PERFORMANCE INDICATORS

| Mission | Target | Goals | Person in charge |
|---|---|---|---|
| Number 4 | Realizing quality infrastruc-ture | • Increasing sources of information to the community<br>• Produce recommendations for information and communication studies and research | Disko-minfo |

### IT infrastructure

IT infrastructure is infrastructure and facilities that involve networks, computers, hardware, and other software. IT infrastructure is also the foundation of IT services, without an IT infrastructure the service will not work correctly. How high the IT capabilities of an organization can be seen from how far the organization can deploy its infrastructure.

The concept of developing e-government infrastructure based on Presidential Instruction number 3 of 2003 [8], the development of e-government in a government institution is based on four central foundations, including:

a. The e-government superstructure which includes, among others, institutional management leadership (e-leadership), human resources and regulations at the institutional level related to e-government (regulation) development.
b. Infrastruktur jaringan yang memuat antara lain protokol komunikasi, topologi, teknologi dan keamanan.
c. Network infrastructure that includes communication protocols, topology, technology, and security.
d. Application infrastructure includes applications for public services, interface applications, and back-office applications.

The evaluation conducted in this study focuses on knowing the level of readiness of IT infrastructure in the City Government of Padangsidimpuan towards the four main foundations above.

## COBIT 5

COBIT 5 is the latest generation of ISACA guidelines that discuss IT governance and management [9]. COBIT 5 defines and explains in detail many governances and process management. COBIT 5 also provides a framework for measuring and monitoring IT performance.

TABLE 2
COBIT 5 IT-RELATED GOALS (ISACAb 21012)

| | | IT Related Goals |
|---|---|---|
| Finance | 01 | Alignment of IT and business strategies. |
| | 02 | IT adjustment and support for business suitability with external laws and regulations. |
| | 03 | Executive management commitment to making decisions related to IT. |
| | 04 | Managed IT related to business risks. |
| | 05 | Benefits realized from investments and portfolio of services supported by IT. |
| | 06 | Transparency of IT costs, benefits and risks. |
| User | 07 | Submission of IT services in accordance with business requirements. |
| | 08 | Adequate use of applications, information and technology solutions. |
| Internal | 09 | IT intelligence. |
| | 10 | Information security, infrastructure and application processing. |
| | 11 | Optimization of assets, resources, and IT capabilities. |
| | 12 | Empowering and supporting business processes by integrating applications and technology into business processes. |
| | 13 | Submission of programs that provide benefits, on time, on budget, and meet quality requirements and standards. |
| | 14 | Availability of reliable and useful information for decision making. |
| | 15 | IT compliance with internal policies. |
| Learning and developm ent | 16 | Business and IT personnel who are competent and motivated. |
| | 17 | Knowledge, expertise initiatives for business innovation. |

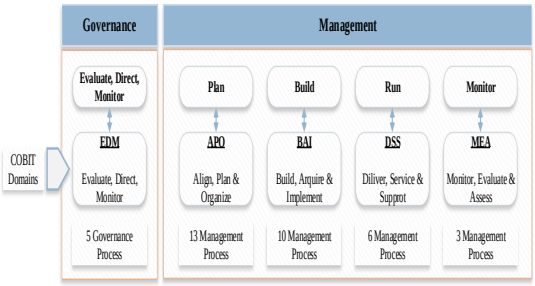


Figure 1. process in COBIT 5 (ISACAb 2012)

COBIT 5 establishes 17 IT-related Goals targets can be seen in Table 2 and identifies 37 IT processes seen in Figure 1 where the governance domain of 5 methods and management as many as 32 means to support the utilization of IT in an organization to align with the organization's business objectives [10].

## Related research

Research related to IT infrastructure has been conducted by Hadi (2014) measuring the level of governance capabilities of the Gorontalo Provincial Government network infrastructure that was built in 2013 to connect 51 points consisting of 31 agency points, 10 points of regional service units, 3 Regency / City points and 6 hotspot points in public places using the COBIT 5 framework framework [11]. Subsequent research was conducted by Rahma (2017) which aims to evaluate the level of readiness of integrated sub-district administrative service infrastructure (PATEN) to support local e-government in the Bogor City government using the COBIT 5 framework [12]. Research on IT infrastructure was also carried out by Friyonanda (2017) evaluating the governance of IPB's information technology infrastructure by measuring the level of IT maturity using the COBIT 5 framework [13].

## 3. Method

This research was carried out following the frame of mind shown in Figure 2.

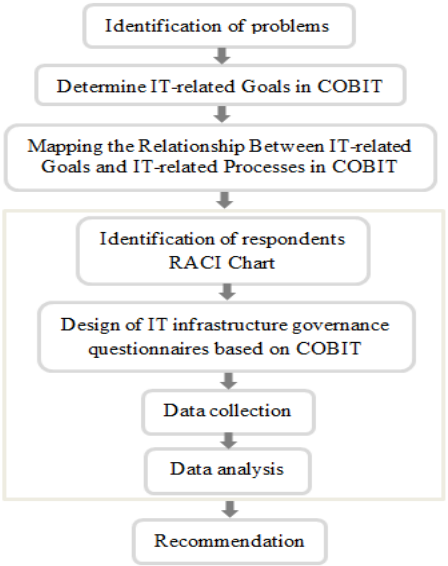


Figure 2. Framework of thinking

**Mapping the Relationship Between IT-related Goals and IT-related Processes in COBIT**

The processes related to IT-related goals 10 and 11 are based on COBIT enabling processes (ISACA 2012) [14] shown in Table 3. They are then mapped to the process that fits the research needs carried out, concerning mission number 4 Padangsidimpuan City Government which aims to realize quality infrastructure. The planned process can be seen in Table 4.

TABLE 3
IT-RELATED GOALS AND IT-RELATED PROCESS

| *IT-related Goals* | *IT-related Process* |
|---|---|
| 10 | EDM03, APO12, APO13, BAI06, DSS05 |
| 11 | EDM04, APO01, APO03, APO04, APO07, BAI04, BAI09, BAI10, DSS01, DSS03, MEA01 |

TABLE 4
MAPPING IT RELATED-GOALS WITH IT-RELATED PROCESS

| No | Area | Domain | Process | |
|---|---|---|---|---|
| 1 | *G* | *Evaluate, Direct and Monitor* | EDM04 | Ensure Resource Optimisation |
| 2 | *M* | *Align, Plan and Organise* | APO01 | Manage the IT Managemen Framework |
| | | | APO07 | Manage Human Resources |
| | | | APO12 | Manage Risk |
| | | | APO13 | Manage Security |
| | | *Build, Acquire and Implement* | BAI04 | Manage Availability and Capacity |
| | | | BAI06 | Manage Changes |
| | | | BAI09 | Manage Assets |
| | | | BAI10 | Manage Configuration |
| | | *Deliver, Service and Support* | DSS01 | Manage Operations |
| | | | DSS03 | Manage Problems |
| | | | DSS05 | Manage Continuity |
| | | *Monitor, Evaluate And Assess* | MEA01 | Control assessment and performance evaluation |

Description: G = *Governance* dan M = *Management*

**Level Achievement**

The level of governance of IT infrastructure is measured to determine the extent of management of IT infrastructure. Measuring scale uses PAM (process assessment model) at COBIT 5. Maturity levels are divided into six levels from 0 to 5. Each level has different criteria; the assessment carried out based on achievement (output) of Process Attribute (PA) is shown in Table 5.

Each process attribute is measured using an ISO / IEC 15504 rating scale which is divided into four scales, as shown in Table 6. A process can be stated to have reached maturity value, just by obtaining an achieved total criteria value of 50-85% achievement or fully completed with an amount of 85-100% achievement. Then to be declared able to proceed to the next capability level, it must fulfill the fully achieved category of 100% achievement from the previous level determined by the ISO / IEC 15504 criteria.

TABLE 5
LEVEL OF MATURITY PROCESS (ISACAB 2012)

| L | Description | Attribute Process | |
|---|---|---|---|
| | | PA.1 | PA.2 |
| 0 | The process is not implemented or there is no effort to reach the goal. | - | - |
| 1 | The process is implemented on an ad-hoc basis to achieve the process objectives. | *Process Performance* | - |
| 2 | he process has been implemented and managed with planned and monitored.. | *Performance Management* | *Work Product Management* |
| 3 | The process is implemented by default and has been standardized. | *Process Definition* | *Process Deployment* |
| 4 | he process is implemented with certain limitations in order to be consistent in achieving the results that have been set. | *Process Measurement* | *Process Control* |
| 5 | he process is continuously evaluated and corrected. | *Process Innovation* | *Process Optimisation* |

Description: L = level, 0 = *Incomplete*, 1 = *Performed*, 2 = *Managed*, 3 = *Established*, 4 = *Predictable dan* 5 *Optimizing*

TABLE 6
ASSESSMENT SCALA ISO/IEC 15504 (ISACAC 2012)

| Scale | Information | Achievement % |
|---|---|---|
| N | *Not Achieved* | 0 - 14 |
| P | *Partially Achieved* | 15 - 49 |
| L | *Largely Achieved* | 50 - 84 |
| F | *Fully Achieved* | 85 - 100 |

Criteria assessment uses the Guttman scale approach with the answer "Yes" if the process has been run the same as the score 1 and the answer "No" equals the score 0. Determination of maturity level is used with the approach of Equation 1.

$$CC = \frac{\Sigma CLa}{\Sigma Po} \times 100\% \quad (1)$$

Description:
CC : Value of achievement at each level or process attribute at each level.
ΣCLa : The total value for each level or processattribute at each level.
ΣPo : Number of criteria for questions at each level or process attributes at each level.

**Identification RACI Chart**

Stakeholders selected as respondents in this study who represent RACI tables (responsible, accountable, consulted, and informed) [15] which are determined based on the Padomidimpuan City Diskominfo organizational structure.

**Infrastruktur Infrastructure Governance Questionnaire**

The questionnaire in this research was designed to determine the level of maturity and expectation in each process of managing IT infrastructure by looking at Stakeholder responses. So that it can be seen the comparison between the conditions experienced at this time in the hope of achieving the desired in the future. The preparation of this questionnaire is based on the COBIT 5 framework guide (ISACAd 2012) [16].

**Data collection**

Data collection was done by distributing questionnaires according to respondents who had been identified based on the respondent's RACI chart. Data collection was conducted at the Office of communication and informatics (Diskominfo) in the City of Padangsidimpuan. Data collected based on questionnaires that have been distributed to determine the level of readiness of IT infrastructure in Diskominfo, Padangsidimpuan City.

## 4. Results and Discussion

**Level Achievement**

The results of measuring the maturity level of IT infrastructure management in Diskominfo in Padangsidimpuan City are determined from the achievement of each process shown in Table 7. They are measuring the level of performance of maturity using the ISO / IEC 15504 criteria according to the COBIT process and scale calculation using Equation 1.

**Achievement Expectation Level**

Table 8 shows the achievement values in each process where APO01, APO07, APO13, BAI09, BAI10, DSS01, DSS03 and DSS05 are at level 1. Achievements in the EDM04, APO12, BAI04, BAI06, and MEA 01 processes are at level achievement 0. The expected value of progress in all means is at level 3.

**Level of Gap**

This level of inequality is derived from the comparison of the current process position (As is) and future expectations (To be). Comparison of the process with the level of the gap is in the values 2, and three can be seen in Figure 3. The gap value is obtained from the value of the current position minus the expectation value. This level of disparity is carried out to determine the extent to which the process needs to be improved to achieve the desired level of maturity. The level of the gap (GAP) in this study can be seen in Table 9.

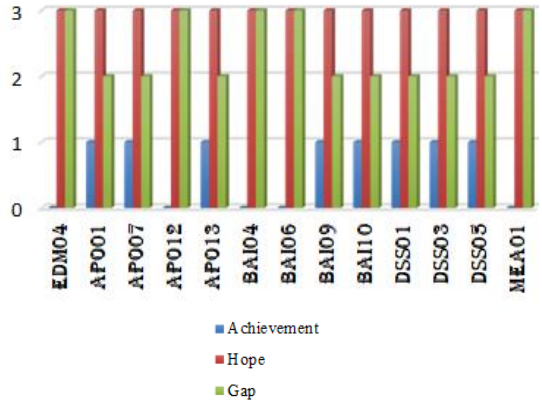


Figure 3. Gaps level

**Recommendation**

Recommendations are made by compiling a series of activities to improve the IT service process based on the level of achievement obtained from the method of achieving the maturity level of IT infrastructure governance in Padomidimpuan City Diskominfo using COBIT. Recommendations, in general, are arranged in the form of a SWOT matrix [17] which separates strengths, weaknesses, opportunities, and threats to the implementation of e-government, especially in Diskominfo, Padangsidimpuan City can be seen in Table 10.

Based on the results of the achievements in Table 7 with the gaps obtained in Table 9, some strengths and weaknesses will be used to be used as references in providing recommendations. Develop a series of strategies to improve the opportunities that can be done to improve the quality of management related to IT infrastructure and several threats that will be obtained. Determine the strengths and weaknesses based on the management process that has been carried out by Diskominfo in Padangsidimpuan City. A series of management processes related to IT infrastructure was asked in the form of a questionnaire. Determine opportunities that can be done based on management processes that have not yet been implemented and determine threats based on the weaknesses obtained. Then from the results of the SWOT analysis of the strengths, weaknesses, opportunities, and threats of eating, a series of recommendations or improvements is made between the strengths of opportunities, weaknesses in opportunities, strengths of threats and weaknesses of threats. Recommendations or strategies are given to become recommendations for Padangsidimpuan City Diskominfo to support the implementation of IT or what is called e-government.

TABLE 7
LEVEL ACHIEVEMENT

| **Level** | **0** | **1** | **2** | | **3** | | **4** | | **5** | | **CP** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **PA** | | **1** | **2.1** | **2.2** | **3.1** | **3.2** | **4.1** | **4.2** | **5.1** | **5.2** | |
| **EDM 04** | *False* | 67% | 50% | 25% | 0% | 0% | 0% | 0% | 0% | 0% | **0** |
| | | L | L | P | N | N | N | N | N | N | |
| **APO 01** | *False* | 100% | 80% | 50% | 20% | 0% | 0% | 0% | 0% | 0% | **1** |
| | | F | L | L | P | N | N | N | N | N | |
| **APO 07** | *False* | 100% | 83% | 50% | 0% | 0% | 0% | 0% | 0% | 0% | **1** |
| | | F | L | L | N | N | N | N | N | N | |
| **APO 12** | *False* | 25% | 17% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | **0** |
| | | P | P | N | N | N | N | N | N | N | |
| **APO 13** | *False* | 100% | 50% | 50% | 40% | 33% | 0% | 0% | 0% | 0% | **1** |
| | | F | L | L | P | P | N | N | N | N | |
| **BAI 04** | *False* | 67% | 50% | 25 % | 0% | 0% | 0% | 0% | 0% | 0% | **0** |
| | | L | L | P | N | N | N | N | N | N | |
| **BAI 06** | *False* | 75% | 67% | 25% | 0% | 0% | 0% | 0% | 0% | 0% | **0** |
| | | L | L | P | N | N | N | N | N | N | |
| **BAI 09** | *False* | 100% | 67% | 25% | 0% | 0% | 0% | 0% | 0% | 0% | **1** |
| | | F | L | P | N | N | N | N | N | N | |
| **BAI 10** | *False* | 100% | 67% | 0\% | 0% | 0% | 0% | 0% | 0% | 0% | **1** |
| | | F | L | N | N | N | N | N | N | N | |
| **DSS 01** | *False* | 100% | 50% | 25% | 0% | 0% | 0% | 0% | 0% | 0% | **1** |
| | | F | L | P | N | N | N | N | N | N | |
| **DSS 03** | *False* | 100% | 67% | 25% | 0% | 0% | 0% | 0% | 0% | 0% | **1** |
| | | F | L | P | N | N | N | N | N | N | |
| **DSS 05** | *False* | 100% | 67% | 0% | 0% | 0% | 0% | 0% | 0% | 0% | **1** |
| | | F | L | N | N | N | N | N | N | N | |
| **MEA 01** | *False* | 60% | 50% | 50% | 25% | 0% | 0% | 0% | 0% | 0% | **0** |
| | | L | L | L | P | N | N | N | N | N | |

Dep: PA = proses atribut, CP = *capability*, F = *fully achieved*, L = *largely achieved*, P = *partially achieved*, N = *not achieved.*

TABLE 9
GAPS LEVEL

| Id | Process | Achievement | Hope | Gap |
|---|---|---|---|---|
| EDM04 | Ensure Resource Optimisation | 0 | 3 | **3** |
| APO01 | Manage the IT Managemen Framework | 1 | 3 | **2** |
| APO07 | Manage Human Resources | 1 | 3 | **2** |
| APO12 | Manage Risk | 0 | 3 | **3** |
| APO13 | Manage Security | 1 | 3 | **2** |
| BAI04 | Manage Availability and Capacity | 0 | 3 | **3** |
| BAI06 | Manage Changes | 0 | 3 | **3** |
| BAI09 | Manage Assets | 1 | 3 | **2** |
| BAI10 | Manage Configuration | 1 | 3 | **2** |
| DSS01 | Manage Operations | 1 | 3 | **2** |
| DSS03 | Manage Problems | 1 | 3 | **2** |
| DSS05 | Manage Continuity | 1 | 3 | **2** |
| MEA01 | Control assessment and performance evaluation | 0 | 3 | **3** |

TABLE 8
ACHIEVEMENT EXPECTATION LEVEL

| Process | | Achievement | | | | | | Hope | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **0** | **1** | **2** | **3** | **4** | **5** | **0** | **1** | **2** | **3** | **4** | **5** |
| EDM04 | Ensure Resource Optimisation | ✔ | | | | | | | | | ✔ | | |
| APO01 | Manage the IT Managemen Framework | | ✔ | | | | | | | | ✔ | | |
| APO07 | Manage Human Resources | | ✔ | | | | | | | | ✔ | | |
| APO12 | Manage Risk | ✔ | | | | | | | | | ✔ | | |
| APO13 | Manage Security | | ✔ | | | | | | | | ✔ | | |
| BAI04 | Manage Availability and Capacity | ✔ | | | | | | | | | ✔ | | |
| BAI06 | Manage Changes | ✔ | | | | | | | | | ✔ | | |
| BAI09 | Manage Assets | | ✔ | | | | | | | | ✔ | | |
| BAI10 | Manage Configuration | | ✔ | | | | | | | | ✔ | | |
| DSS01 | Manage Operations | | ✔ | | | | | | | | ✔ | | |
| DSS03 | Manage Problems | | ✔ | | | | | | | | ✔ | | |
| DSS05 | Manage Continuity | | ✔ | | | | | | | | ✔ | | |
| MEA01 | Control assessment and performance evaluation | ✔ | | | | | | | | | ✔ | | |

## 5. Conclusions and recommendations

### Conclusions

The evaluation results of the achievement level of 13 processes in the value of Padangsidimpuan City Diskominfo are eight processes, namely: APO01, APO07, APO13, BAI09, BAI10, DSS01, DSS03, and DSS05 are at level 1. Then five methods are: EDM04, APO12, BAI04, BAI06, and MEA01 are at level 0 achievement. The expected value of progress in the whole process is at level 3 with gaps at two levels and three levels of performance. The recommendations are given in the form of a SWOT in this study aim to provide recommendations to improve the maturity level of IT infrastructure governance to support the implementation of e-government, especially in the City Government of Padangsidimpuan.

### Recommendations

Suggestions that can be given to this research are as follows:

1. Ensuring the results of recommendations given in this study can be used and become input to the Padangsidimpuan City Information Center to improve the level of maturity of governance, especially IT infrastructure.
2. To improve the process for each agency, it can be done with a process that is considered priority by using a priority matrix.

TABLE 10
SWOT RECOMMENDATION

| | ***Strengths*** | ***Weaknesses*** |
|---|---|---|
| INTERNAL<br><br>EXTERNAL | • Management of IT frameworks and resources that are beginning to be improved.<br>• Management of both data and information security and IT security services that are beginning to be improved.<br>• Management of Configuration IT services and problems with IT services are being improved.<br>• Management of human resources that are beginning to be improved.<br>Management of assets that are beginning to be improved. | • Availability of IT resources that are still lacking.<br>• Risk management and changes that are still implicit.<br>Availability and capacity of IT infrastructure are inadequate.<br>• Unmet human resources as a whole in each service.<br>Evaluate the performance of which has not been done on a regular basis. |
| **Opportunities** | **Strategy SO** | **Strategy WO** |
| • Increased improvement of IT Infrastructure, increasing human resources for each service in Diskominfo, Padangsidimpauan City.<br>• Achieving a vision and mission on time and consistent with the goals.<br>• Evaluate and monitor performance regularly to improve performance.<br>• Increase the effectiveness, efficiency of the budget, time and operational activities. | • Compile, control, implement and faithfully evaluate IT processes continuously.<br>• Ensure that all staff understands the SOPs and policies made.<br>• Use IT optimally in every activity, such as utilizing IT services to reduce operating costs.<br>• Carry out the documentation on each operation and improvement on each it up, output and constraints on each activity. | • Analyze and document all possible changes and risks.<br>• Make planning for changes in both the short, medium and long term changes.<br>• Documenting all problems that have occurred including the solution to the problem.<br>• Adding supporting facilities for IT services in Diskominfo Padangsdimpuan City which are widely used by users. |
| **Threats** | **Strategy ST** | **Strategy WT** |
| • Physical security of infrastructure, data, and information.<br>• Increased costs for improving IT infrastructure and operational costs.<br>• Decreased trust in IT users.<br>• Decrease the quality of performance towards HR.. | • Improve security systems both internally and externally.<br>• Control and supervise every operational activity.<br>• Determine priorities that must be achieved first.<br>• Implement shared infrastructure use.<br>• Provide information as needed. | • Document the activities and changes related to security.<br>• Define each process and service.<br>• Determine the scope, limits, minimum achievement standards for each operational operation.<br>• Evaluate and improve each change.<br>• Resolve problems well and on time. |

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# INFORMATION SHARING AND MECHANISM IN ONLINE COMMUNITY: A NETNOGRAPHY STUDY

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**Abstract**

The emergece of C2C (customer to customer) community in e-commerce platform is expected to boost the number of SME moving to online plaform. Since the community could provide information and experience required by new e-commerce players. This study aims to analyse what information is shared by members in C2C community and what is the information sharing mechanism that implemented on it. Netnographic study was conducted by observing 1002 posts from the Bukalapak community for six months. As Bukalapak is one of the largest C2C platfom in Indonesia. The result shows that the information shared could be classified by keyword in to five classes, namely categories of tips and tricks, ideas and problems with third parties, ideas and problems of features, community, and question and answer. The information category that has not been covered by Bukalapak original categories is and problems with third parties which mentioned in many posts by community member. The mechanisms used to share the information are including, standard, policy, status and reward.

**Keywords:** *information sharing, online communities, culture, netnographic*

**Abstrak**

Berkembangnya komunitas C2C pada *platform e-commerce* diharapkan dapat meningkatkan jumlah UKM yang bersedia menjalankan bisnisnya secara *online*. Hal ini dikarenakan, komunitas dapat mendukung dengan menyediaan informasi dan juga pengalaman yang dibutuhkan oleh pemain baru dalam bisnis *online.* Penelitian ini ditujukan untuk menganalis informasi apa saja yang dibagikan dalam komunitas *online* dan mekanisme yang digunakan untuk mendukung penyebarannya. Pendekatan Netnographic digunakan untuk mengobservasi 1002 *post* pada komunitas Bukalapak selama enam bulan. Bukalapak dipilih karena merupakan salah satu *platform e-commerce* terbesar di Indonesia. Hasil penelitian menunjukkan bahwa terdapat lima kelas informasi yang dikelompokkan berdasarkan kata kunci yaitu tips dan trik, ide dan masalah dengan pihak ketiga, ide dan masalah fitur, komunitas serta tanya jawab. Ide dan masalah dengan pihak ketiga kategori yang belum digunakan oleh admin Bukalapak. Mekanisme yang digunakan untuk mendukung proses berbagi informasi adalah standar, aturan, status dan penghargaan.

**Kata Kunci:** *berbagi informasi, komunitas online, budaya, netnographic*

## 1. Introduction

One of the digital tools that can be used by SMEs is e-commerce. E-commerce or electronic commerce is an activity that includes communication, sales, purchases or exchanges of information, goods or services, where the parties involved interact online [1] . E-commerce can be done on e-marketplace, which is a virtual market that supports parties involved in transactions of goods, services or information online [2]. There are several benefits that e-commerce businesses can use by using e-marketplaces, including reducing transaction costs, expanding market share, increasing opportunities to get new customers, strengthening relationships with partners and customers, to increasing reputation [1]. The many benefits obtained from this e-commerce business have led to the emergence of

several e-commerce businesses in Indonesia, one of which is Bukalapak. Bukalapak was chosen for this study because based on observations, Bukalapak has a community that is active in sharing knowledge, especially in buying and selling activities online at Bukalapak. This is evidenced by the crowded forum of the Bukalapak community, with an average of 60 posts in one week, with 10 posts per day. In addition, currently e-commerce provides the community to share knowledge in the form of new two-way communication Bukalapak. Bukalapak is a C2C e-commerce that was built with the aim of encouraging SMEs towards digital business by utilizing digital platforms.

Some SMEs are starting to enter e-commerce businesses and many of them are experiencing difficulties. According to the Minister of Cooperatives and SMEs, these difficulties are related to the use of e-commerce itself and product marketing activities [3]. Bukalapak as an e-commerce platform does not only strive to increase the number of SMEs who enter digital businesses, but also strive to improve the quality of sellers by forming a community. Therefore, Bukalapak formed a community that provided a forum for SMEs involved in Bukalapak to discuss, exchange ideas, share experiences, and learn about tips and tricks on buying and selling online especially at Bukalapak [4]. In this community, sellers always hold various kinds of educational activities between sellers, namely direct meeting or online sharing through community forums.

Based on observations, currently the e-commerce platform provides a forum for discussion in the form of the new two-way communication Bukalapak. This Bukalapak community allows sellers and buyers to respond to topics submitted by other users. Other C2C e-commerce that has the same business process as Bukalapak currently only provides blogs that do not allow users to respond to each other on topics submitted by other users. The existence of this community provides several tangible benefits for sellers at Bukalapak. With the existence of a Community forum, sellers can directly share or ask by creating new topics that they want to share in the Community forum.

Research on knowledge sharing activities in the community in the marketplace has been discussed by [5]. This research was conducted at Etsy.com, an e-marketplace that sells handicraft products and antique products. This study uses a netnographic study, namely the application of ethnographic techniques specifically designed to study culture and online communities [6] (Bowler, 2010). This research shows that there are several things that an organization can do to be able to encourage information sharing activities in the online community or marketplace. These include providing a platform that allows communication between fellow members of the community, allowing members to form small groups that share common interests, encouraging members to work together to improve and promote their online store, rewarding those who help community members, make a clear reward system for all members of the community, providing examples of how workers in organizations also share knowledge with community members, and make regulations to prevent community abuse. This research is limited to Etsy.com vendor respondents who are generally female, most of whom have similar interests in the field of design and handicraft products, and most are domiciled in North America. Other related studies have been discussed by [7]. This study also shows that the usefulness and ease of use of e-services affect knowledge sharing activities. Innovations and knowledge possessed by community members have a stronger influence than e-service in terms of sharing knowledge. Other related research is research conducted by [8]. In the research, [8] distinguish knowledge from specific and general knowledge. General knowledge including general information such as doctor and hospital information, medical care, and medical experience, does not include personal health information, while specific knowledge concerns the privacy of patients.

In this study, the authors also tried to analyze information or knowledge shared in the community. It is also hoped that Bukalapak can manage and utilize the community to the maximum and can group information that is often shared with the Bukalapak community. Thus, the purposes of this study are to analyse what information is shared by sellers in the e-commerce community and what is the information sharing mechanism that implemented in this online communities.

## 2. Literature Study

### 2.1 Netnographic

Netnographic method is a qualitative research method modified from ethnographic, online ethnographic and virtual ethnographic that is designed to study the online community [9, 6]. Netnographic utilise and analyse the data and information provided by online community to identified and understand the community [9]. If

ethnography investigates all form of human communication such as gesture and intonation, netnography focus on online communication form like textual communication or multimedia communication such as video, audio and image.
The advantage of netnographic method is researcher does not need to interview the participant since the information can be observed in the online community media. Besides, researcher can also find the detail and sensitive information from the research object without asking for it. This method enable the researcher to track the activities form previous years so it possible to unsertand the history and development of this community [9]. Ethnography and netnographic both depend on researcher ability to observe on specific culture or environment [10].However, netnography study is faster, simpler and cheaper compared to traditional ethnographic [10]. There are six steps in this method which are entrée, data collecting, data analysis data and evalution and represenatation [9, 6].

**a. Entrée**

In this step, an online community will be identified. Generally, the online community at least has (a) topic, segment, or specific group (b) relevant with research topic (c) active member that contributes to the content (d) diverse member from different culture (e) interaction between members (f) communication flow among members and (g) provides descriptive and detail data (data-rich) [10, 9, 6]. After identifying of the online community, the reasearcher need to study the behavior, interest, language through the forum, group and the participant profile. The research question then defined by (a) forming main the question(s) followed by maximum of seven sub questions, (b) creating a specific main question (c) focusing on a phenomenon, (d) using explorative verbs like find, understand, explain, or report, (e) using open ended question (f) deteming the participant and research location.

**b. Data Collecting**

The data collected from member's communication process. The form of this communication can be in the form of involvement, interaction, contact or collaboration. Eventhough this approach uses the available data and information, researcher still need to understand the community member. In order to do so, researcher need to participate in the community yet it is not necessary to involve in every activities held in the community. Researcher can be involved by systematicly reading the real time message in the community, monitoring rating, writing short comment, joining and contributing or becoming the organizer and expert that will be listened by the member. Data collection can be conducted by:

- Archival data. Collected from the community online media. This method can be choosen if the researcher does not involve directly in the community activities. The archival data is a lot and easily found in the online community. Thus, filtering the data is important to get the revelant data.
- Elicited data. This data is gathered from the personal interaction between researcher and members such as from email, chat, or brief interview. This data is collectin when the data from online sources can not be complete or elaborate the research requirement.
- Fieldnotes. The notes used by researchers to record the observations on the community, regerading the members, interaction, and the meaning of the interaction.

Researchers have two choices in collecting data. If the researcher will analyze manually, using pen-and-pen techniques or using software such as Microsoft Excel or Microsoft Word, then data collection should be limited to a relatively small amount of data, about 1,000 data. This limitation also makes researchers more focused on analyzing a particular message or post on the community. However, if researchers will use computer programs to analyze the data, then the data collection can be more, more than 5,000 data.

**c. Data Analysis**

Analysis on netnographic involves an inductive approach. The netnographic analysis is done by examining the meaning of a sentence by breaking the sentence into sections and comparing it. In general, data analysis is done by collecting all the results of data collection into a single document, both paper and software, then look for meaning on the data. There are several common qualitative data analysis processes [9]. The process is named and adapted to the needs of the netnographer. The process is as follows:

- Coding. Researchers categorize data obtained during data collection by classifying, naming, or labeling any data obtained.
- Noting or Memoing. Create a marker on the data and give meaning to the sentence.
- Abstracting and Comparing. Researchers sort the data obtained to find similar phrases, the relationship between phrases and the differences. In this process also researchers categorize the label becomes more common.

- Checking and Refinement. The researcher examines and improves the meaning and pattern of a sentence.
- Generalizing. The researcher makes a label that is a generalization of some of the data, which will generalize the consistency of the data.
- Theorizing. Researchers create a new theory based on research. Theories are based on relevant prior knowledge.

**d. Representation and Evaluation.**

The last stage is to perform representations, ie present or publish the results of data analysis and evaluate. In presenting the results of data analysis, the researcher must pay attention to several things, among others: the researcher must be free from internal contradictions, the researcher must ensure the confidentiality and anonymity of informants, supported by data, have sufficient and relevant evidence to support representation, and able to map between online and the real world [9]. In addition, netnographic representation acknowledges the role of the researcher and is open to alternative interpretations.

### 2.2 Knowledge Sharing Mechanism

Knowledge sharing is an important activities in knowledge management practice where the tacit and explicit knowledge ia being transferred to the location where it is needed [11]. In knowledge sharing, it is vital that organization members are willing to contribute in the process and culture may influence and motivate them to do so [11]. Thus, organization has make some effort to encourage the sharing process. One of them is to provide a mechanism that could be used to effectively share the knowledge.

Mechanism is defined as organizational or structural means used to promote knowledge management [12], in this study we specifically refer to knowledge sharing. There are short term and long term mechanism for knowledge management. For the short, the mechanism can be in form of leaning by doing, learning by observation and face-to-face meeting [12]. For the long term, the mechanism for knowledge sharing such as policies, standard, hierarcical relationships, cooperative procject across department, job rotation and others [12]. However, the case in this study is not in a context of formal organisation, but online communities. Thus, we would like to analyse the mechanism that relevant for the case such as face-to-face meeting, policies or rules, standards and hierarcial relattionship if any.

## 3. Methodology

### 3.1 Methods

Observation is done by using netnographic method that is method of online observation in community. The first stage is the selection of time to be sampled in this study. The selected time is the month in which Bukalapak online community is not crowded with the contest held by Bukalapak. At this stage, it is obtained April 2016, May 2016, June 2016, July 2016, January 2017, and March 2017 that will be sampled in the study. After that, the next step is data collection. Data collection is done by web scraping technique and stored in Microsoft Excel software.

### 3.2 Case Study

Bukalapak Community is a forum for community members especially sellers, to discuss and share experiences on online buying and selling activities in Bukalapak. The purpose of this community was to improve the seller's quality and increase education activities among sellers. Bukalapak community has a vision to build a safe and comfortable online trading culture. To achieve this vision, the Bukalapak community has a mission to: invite the whole community of Bukalapak sellers to share the spirit of sharing; creating a healthy culture of transacting on the internet; calling on the whole community to feel the ease of shopping on the internet; provide more benefits to internet users in conducting online transactions [4]. The Bukalapak community consists of online and offline communities.

### 3.3 Data and sampling

The observation is conducted by observing at the information on the topic category that has been provided in Bukalapak Community. The relevant categories are selected that correspond to the buying and selling activities in Bukalapak. Categories such as Relax, Announcements and Contests are not included, as these are not particularly relevant to buying and selling activities. The sample of data in this study is 1,002 post that is in April 2016 with 25 posts, May 2016 with 166 posts, June 2016 with 229 posts, July 2016 with 150 posts, January 2017 with 226 posts, and March 2017 with 206 posts. The distribution is shon in Figure 1.

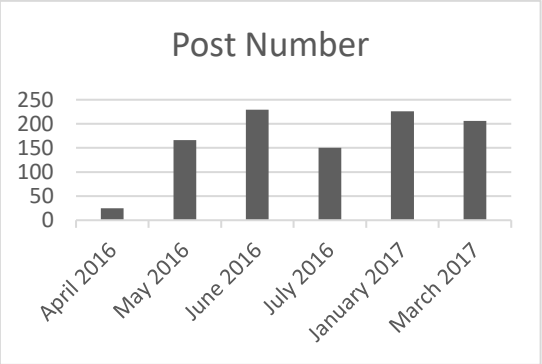


FIGURE 1 NUMBER OF POSTS IN APRIL 2016 UNTIL MARCH 2017

## 4. Result and Analysis

The online community of Bukalapak can be accessed at https://komunitas.bukalapak.com/. Activities in this community include discussing, sharing knowledge and experiences, and sharing interesting articles. All these online activities are conducted on open forum. To make this community forum more organized and make it easier for community members to search for the topic sought, Bukalapak created several categories used to position new posts created by community members. Categories and descriptions of these categories can be seen in Table 1.

TABLE 1 INFORMATION CATEGORY IN THE COMMUNITY

| No. | Category | Description |
|---|---|---|
| 1. | Video | Post with video content |
| 2. | Announcement | Post about official announcement form administrator |
| 3. | Sales Tips & Tricks | Post about tips and trick in online sales |
| 4. | Entrepreneurial Inspiration | Post about experience, stories or motivating and inspiring article |
| 5. | Question and answer | Post about questions and answer excluding transactions activities questions |
| 6. | Bycyle | Post about bicycle excluding transactions activities questions |
| 7. | Gadget | Post about gadget excluding transactions activities questions |
| 8. | Camera | Post about camera excluding transactions activities questions |
| 9. | Computer | Post about computer excluding transactions activities questions |
| 10. | Event | Post about incoming, ongoing or past events aor activities |
| 11. | Idea & Feature Problem | Post about function error or bug and development suggestion for Bukalapak application |
| 12. | Relax | Post of entertaining information |

Not only discussing activities, sharing knowledge and experiences, there are also webinar activities, namely online seminars are held regularly every week, with different topics every week, but still around tips and tricks on buying and selling online in Bukalapak. This webinar is filled with speakers, either from Bukalapak, the seller in Bukalapak itself, or inviting an outside party. This webinar is implemented by using Webinarjam application. Info about Webinar can be viewed on Bukalapak online community forum on weekly basis [4]. The sellers of Bukalapak who are the members of the community in their respective regions can also create their own activities. Bukalapak admin also have a way to invite sellers in Bukalapak to conduct discussions and make new posts in community forums. Bukalapak also holding a contest every month in a certain period with a theme or title. Several winners will be selected and awarded. In this community forum there is also Karma Level. Karma is the level of activity of the user in doing activities in Bukalapak online community. The user will get level 1 if it gets 0-200 points, level 2 if it has earned up to 1,000 points, level 3 if it has earned up to 5,000 points, level 4 if it has earned up to 10,000 points, and level 5 if it gets up to 20,000 points. Karma can be collected from activities in the Bukalapak online community as follows:

- Giving 1 comment on forum will get 1 point
- Creating 1 post/new topic will earn 100 points
- Getting 1 vote will earn 1 point
- Getting 1 follower will earn 1 point
- Creating 1 multimedia post will get 3 points

The method used to perform the qualitative data analysis in this research is netnographic method. Data analysis is done by using software that is Microsoft Excel.

### a. Entrée

At this stage, researchers identify the online community to be studied. The community of Bukalapak is chosen by following the terms of [10, 9] namely:

- Has a specific topic, which is related to online buying activities especially in Bukalapak
- Have a specific group, ie sellers at Bukalapak

• Relevant to the topic to be studied, that is related to knowledge sharing activities on C2C online e-commerce community,
• Have active members in online communities and contribute to community content, with an average of 10 posts per day,
• Have members who come from different cultures, which consists of Bukalapak sellers who come from different regions in Indonesia,
• Have interactions among community members, with interactions in the form of commenting or vote on post, and
• Provide a lot of data that is detailed and descriptive (data-rich)

At this stage the we also formulate research question consisting of one main question, followed by two sub questions. The main statements made is "What information is commonly shared in Bukalapak", with sub questions "What are the categories of the information discussed in the community" And "Does the category provided by Bukalapak be able to represent all information? "

**b. Data Collecting**

Data collection is done by taking archival data, ie data contained in the online community. Data retrieval is done using web scraping techniques and stored in Microsoft Excel software. Because the analysis is done manually using pen-to-pen technique, the amount of data collected is limited to about 1,000 data. For this stage we tried to find post on the community in a month that is not too crowded filled by the Contest. This is because the month contains a large post about the contest. In addition, this selection is also undertaken to avoid bias in the data collected. Months obtained are April 2016, May 2016, June 2016, July 2016, January 2016 and March 2017. After that, data elimination is performed. The data elimination include post in the form of spam, post which contains announcements from Bukalapak admin, contest, and other post that is not related to buying and selling activities. From this elimination, 1.002 data is obtained, with distribution of; 25 posts on April 2016, 166 posts on May 2016, 229 posts on June 2016, 150 post on July 2016, 226 posts on January 2017, and 206 posts on March 2017.

**c. Data Analysis**

Data analysis is done by understanding the meaning of the data sample, then analyzing with the coding process that is categorizing the data by naming each data obtained. The naming is a keyword of each sample of the data. After that done the determination of class and sub class. The determination of class and sub classes is done by calculating the mode to declare the occurrence of keywords that have the most frequent frequency.

1) **Understanding the meaning**

The first step in this qualitative data analysis is to read each post on the sample data. After that is done a search for meaning written by members of the community. The author takes one of the samples that will be an example. The sample taken is one of the posts in April 2016. The meaning of the post was defined as: Community members who make the post invite all members of Bukalapak Palembang community to gather and discuss about the topic "Yuk jualan online di Bukalapak" (Let's have online business on Bukalapak).

2) **Define the keyword**

The next stage done on this qualitative data analysis is to search for keywords from each sample data obtained. These keywords will be the basis for defining classes and subclasses. Keyword determination is also based on tags created by the post author. In the example post in previous part, the creator of the post creates an "event" tag, which means the creator post is informed about an activity, but this tag is not retained because most tags of this event speak about the community itself, with the option of reporting activities or invite to an event. Therefore, for event tags like this are more selected community keywords that can describe the post as a whole. However, other tags such as sales tips & tricks, feature ideas & issues, frequently asked questions and maintained into words keys, such as online selling tips, feature suggestions, feature issues, and queries. Therefore, in the sample in previous part, we define the keywords are offline meeting (kopdar), community, and invite. In this section, the keywords obtained, and the number of occurrences is shown in Table 2.

TABLE 2 KEYWORDS

| Keyword | Num-ber | Keyword | Num-ber |
|---|---|---|---|
| Bukalapak agent | 10 | Customer | 8 |
| Account | 1 | Seller | 7 |
| Shipping Insurance | 1 | Transaction Cancellation | 8 |
| Damaged product | 4 | Payment | 36 |
| Payment receipt | 4 | Capital lending | 1 |
| Installment | 17 | Product packaging | 8 |

| | | | |
|---|---|---|---|
| Product description | 8 | Product return | 16 |
| Dropship | 14 | Refund | 21 |
| Product photo | 8 | Shipment | 45 |
| Price | 3 | Crowded visitor | 4 |
| Bukalapak Anniversary | 3 | Fraud | 12 |
| Shipment service | 44 | Product promotion | 20 |
| Karma | 1 | Fund remittance | 10 |
| Credit card | 3 | Reportase | 118 |
| Learning class | 3 | Reseller | 4 |
| Postal code | 1 | Otomatic receipt | 1 |
| Unique code | 6 | Feature suggestion | 40 |
| Voucher code | 3 | Cash | 2 |
| Complaint | 41 | Transaction status | 28 |
| Community | 243 | Question | 323 |
| Payment confirmation | 5 | Telegram | 3 |
| Order confirmation | 3 | Online shopping tips | 21 |
| Offline meeting | 174 | Online selling tips | 182 |
| Feature issue | 143 | Transaction | 47 |
| Gathering | 1 | Invitation | 71 |
| Receipt number | 21 | Webinar | 5 |
| Shipment fee | 21 | | |

**3) Define the class and subclass**

Analysis of classes and sub classes is done by calculating the mode. The mode is used to express the choice or value that has the most frequent frequency. The most mentioned keywords will serve as the basis for defining classes and subclasses. In defining classes and subclasses, the author uses a top-down approach, by defining a general class or concept followed by a more specific class or concept. The author uses the Bukalapak category as the basis for defining classes and subclasses. From the list of keywords in previous part, we defined five classes which tips and tricks are, ideas and problems with third parties, ideas and feature issues, community, and frequently asked questions. The class and subclasses are shown in Table 3.

TABLE 3 INITIAL CLASS/SUBCLASS AND KEYWORDS

| No. | Class/Sub Class | Description | Keywords |
|---|---|---|---|
| 1. | Tips and trick | | |
| 1.1. | Tips and trick for online selling | This category contains information about tips and tricks related to online selling activities, especially on Bukalapak | dropship, product photo, customer, product packing, crowded visitor, reseller, online selling tips |
| 1.2. | Tips and trick for online purchasing | This category contains information about tips and tricks related to online purchasing activities, especially on Bukalapak | Seller (pelapak), online selling tips |
| 2. | Idea or Problem with the third party | This category contains information about problems or suggestions for third parties, such as shipping or payment services | Delivery insurance, payment proof, installment, delivery service, credit card, receipt number, delivery fee, payment, capital loan, delivery, automatic receipt |
| 3. | Idea and feature problem | This category contains information on bugs / errors, problems or suggestions for developing features on the platform | Account, product description, postal code, unique code, voucher code, payment confirmation, booking confirmation, feature problem, transaction cancelation, product return, refund, remit fund, feature suggestion, cash deposit, |

| | | | |
|---|---|---|---|
| | | | Bukalapak agent |
| 4. | Community | This category contains information about activities in the e-commerce community, both online and offline communities, such as activities to be carried out, or reports on activities that have been carried out. The categories of the event and the Grand Offline meeting found in the initial categories of the Bukalapak community | Bukalapak anniversary, Karma, learning class, community, offline meeting, nobar, telegram, webinar |
| 4.1. | Invitation | This category contains information on activities to be carried out by the community | Invitation |
| 4.2. | Reportage | This category contains information on community activity reports that have been carried out and summaries of community activities | Reportage |
| 5. | Question and answer | This category contains questions raised by community members about the buying and selling activities in the relevant e-commerce | Price, complaint, fraud, transaction status, question, transaction |

**d. Data Representation**

Based on the results of data analysis, the class consists of five categories of information, namely tips and tricks, ideas and problems with third parties, ideas and problems of features, community, and question and answer. Apart from the results of data analysis, we also maintain the categories that have been made by the Bukalapak community before, namely entrepreneurial inspiration, announcements, contests, and relaxation. The explanation of the class and sub-class for our initial analysis is shown in Table 3 and addition class are shown in Table 4.

TABLE 4. ADDITIONAL CLASS

| No. | Class/Sub Class | Description |
|---|---|---|
| 1. | Entrepreneurial inspiration | This category contains stories, experiences, or motivating articles that can inspire sellers on the platform |
| 2. | Announcements | This category contains notifications and official announcements from the administrator |
| 3. | Contests | This category contains information about the contests carried out by the platform. This category also contains community members' participation in the contest. |
| 4. | Relaxation | This category contains stories and things outside of online transaction |

**e. Sharing Mechanism in Bulalapak Community**

**1) Standard**

In the qualitative analysis, we also found that, the Bukalapak community has a special designation for addressing its members, namely "Om" for men, and "Tante" for women. This can be seen in every post in the Bukalapak community. At the beginning of community development, some community members did not make the Om/Tante designation as they should. During this development period, community members and admin of Bukalapak took the initiative to educate their members, namely by editing the post (Figure 2) or by notifying it in the comment's column. This can be categories as the standard that are used for all the member when they want to address others in the forum.


FIGURE 2. EDITED POST BY ADMIN TO REPLACE THE SPECIAL DESIGNATION IN THE POST

**2) Policy**

The Bukalapak Community has rules and procedures so that every buyer who has a complaint regarding a sale-purchase transaction is expected to contact BukaBantuan to resolve the complaint and is not recommended to ask the community. However, in reality in the community there were still many complaints and complaints related to buying and selling transactions at Bukalapak. For posts that contain these complaints, the Bukalapak admin will

give a comment so that the post creator immediately contacts BukaBantuan. Comments from the Bukalapak admin can be seen in Figure 2. Form this case, it can be seen that the community already has some policies regarding the operation in the community forum. When the policy was violated, then the admin would remind the member and give suggestion.

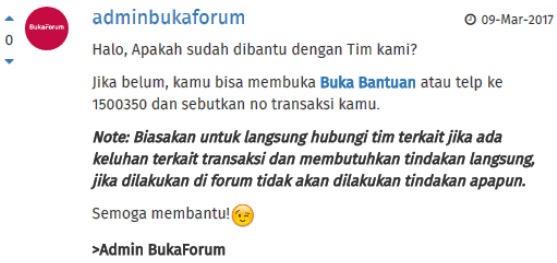


FIGURE 3 COMMENT FROM ADMIN TO SUGGEST USER FOR CONTACTING BUKA BANTUAN

Community members with high levels of karma and a number of posts that are much better known and have more post visitors than other members. This is evidenced by the considerable number of comments on each post they make. In addition, it was also discovered the fact that members of this community were chosen to be inspirational pioneers by another seller. This proves that he is quite well known by other members and has a pretty good reputation in the Bukalapak community. Some community members who share knowledge have evidence or experience, such as having a high level of karma, having positive feedback on the Bukalapak account, having tried features in Bukalapak, having experienced problems that were asked, or have been selling for a long time at Bukalapak. Community members who ask this online community are getting help by the presence of other members who share knowledge by commenting on their post. This is with the comments and statement "Thanks to the knowledge, it is very useful", "It is very helpful", "Very useful information", "very useful information", "Very helpful", " You are very helpful ","Although answer is short, it is very useful for me ". These comments can be found on posts that share tips and tricks or personal experiences, for example tips on using features on Bukalapak, tips on getting first feedback, and experience and how to resolve receipt number errors.

From this case, even though there were no hierarchical relationship, we can find that status is defined in this community. Members with higher level of Karma (rating in the community) are perceived to be more experienced and knowledgeable. Thus, when other members want to ask question or has issues, they could search for other member with higher Karma to share information and give them solution.

**3) Reward**

In August 2016 there were 955 posts in the online community (Table 4.2). One of the triggers of the hectic post for the month was the writing tips and tricks on selling tips organized by Bukalapak. In addition, Bukalapak gave prizes in the form of vouchers to winners every week. Compared to that month, other months that did not have a contest were quiet, for example in April 2016, with a total of 242 posts. Therefore, it can be concluded that one of the things that makes community members want to share information is reward. Reward has been proven to be a motivation when sharing information or knowledge [12] however, this has to be supported by sharing culture [11].

## 5. Discusion and Implication

In this study it was found that information that was widely shared in the Bukalapak community included online selling tips, communities, feature suggestions and problems, and suggestions and problems with third parties, such as shipping or payment services. In addition, it was also found that in this community there were many question and answer activities. Question and answer activities in this community are between buyers or between sellers and buyers. Information obtained is grouped in taxonomic form, and there are five classes, namely tips and tricks, ideas and problems with third parties, ideas and problems of features, community, and question and answer. The tips and tricks category class have two sub categories, namely online selling tips and tricks and online shopping tips and tricks. Community category classes have two sub categories, namely invitation and reportage. In this grouping there is also a class of categories that already exist in the Bukalapak community, such as entrepreneurial inspiration, announcements, contests, and relaxation.

It was also found that the categories found in the Bukalapak community were still unable to describe the overall information that was often shared with the community. It is proven that in the Bukalapak online community there is no category regarding third parties, such as shipping services. Whereas in this study it was found that quite a lot of information was exchanged about third parties, both problems, complaints, or suggestions from community members. In the category in the Bukalapak community there are also overlapping categories, such as the Community and Event categories, so that posts regarding community cooperative activities can be found in the Event and Community categories. In this study, the

category was only made in the Community category, because in general, the event that is often exchanged for the online community of Bukalapak is an event around the community.

Based on the result, the mechanism used in sharing information on the Bukalapak community platform are standard, policy, status and reward. Individuals who are examples or role models in sharing knowledge is one of the motivations of online community members to share knowledge. This individual usually has higher level of Karma.

This research also contributes to the information found in the C2C e-commerce online community, which is knowledge about online selling tips and tricks, ideas and problems with third parties, ideas and feature issues, and communities. It can be used as the reference in classifying knowledge on e-commerce, so that it will help e-commerce to build a knowledge base.

## 6. Conclusion

This study aims to analyze information shared in the Bukalapak community and analyze the mechanism used in the sharing process. Qualitative approach using netnographic method were conducted to answer the objectives of the study. It was found that information that is often shared in the Bukalapak community are online selling tips, communities, feature suggestions and problems, and suggestions and problems with third parties. In addition, it was also found that in this community there were many question and answer activities. This information is grouped in taxonomic form and there are 5 classes, namely categories of tips and tricks, ideas and problems with third parties, ideas and problems of features, community, and question and answer. The information category that has not been covered by Bukalapak original categories is and problems with third parties which mentioned in many posts by community member. The mechanisms used to share the information are including, standard, policy, status and reward.

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