Measuring the Maturity Level of Information Technology Governance in the Informatics Engineering Department Using COBIT 4.1

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Abstract. Information technology plays an important role in the business world because it may affect the operations of the organization within the organization that also uses information technology to provide information. One of the departments that use information technology is the Information Engineering Department of Musamus Merauke University, which is used to provide information related to the Department of Information Engineering. But in the use of information technology is still flawed. Therefore, it is necessary to have a standard in information technology management to measure overall standards and governance in information technology management, ie using COBIT. 4.1. Based on this study, we will design an information technology management model for the Department of Information Engineering. Control objectives for information and related technologies (COBIT) are 4 primary domains, including domains, planning and organization (PO), acquisition and implementation (AI), transmission and support (DS) and Monitor and Evaluate (ME) in all four domain research in COBIT 4.1 used to solve the problems and needs of the information engineering department in information technology management, support the process of technology services Prof. support and supervision and evaluation of information technology. The study found that the level of maturity of information technology supervision in the information engineering department is at level 2. Therefore, information technology in the information engineering department must be improved to the expected level.

1. Introduction
Ministry of Communications and Information of the Republic of Indonesia issued regulations No. 4 of the year 2016 regarding the information security management system (ISMS) for all government agencies. One of the public institutions that have to comply with ISO 27001: 2003 in improving information security systems, namely public universities because Information and Communication Technology (ICT) has become a part of public services at public universities. The government has prepared tools for implementing information security management by measuring the level of errors in order to improve service quality. [1].

The information security management system (ISMS) has been well implemented in providing solutions for service use because the scope of standards is not too wide in terms of fulfilling all data management needs. Therefore, there are still problems. To find that [2].

Information Engineering Department is an agency that uses information systems as a tool to support information. The information system is intended to provide information about activities that usually occur in the information department so that students can search for information through the information systems found in the Department of Information Engineering. But there are obstacles in
the information system that have not yet received actual data due to data. There are not many updates, so many students use information systems to receive information. In order to improve the management of information technology in the Department of Information, it is necessary to have a model that refers to the standard of practice in order to be consistent with the strategy and objectives of the agency in order to resolve problems that occur frequently. One form that is often used in agencies or companies is the control objectives for information technology and related (COBIT), which is a form of appropriate and comprehensive regulatory standards under the scope of planning, implementation and governance. Supervise all information technology processes. COBIT has 4 main domains: planning and organization domain (PO), acquisition and execution (AI), shipping and support (DS) and auditing and evaluation (ME). PO domain involves strategy, strategy and Pay attention to how to use information technology to provide the best support to achieve business goals. AI domains relate to the use and strategy of using information technology in business processes. Foreign DS domain associated with the submitted information technology and support services using the ME domain associated with the care of all the controls on the use of information technology [3].

Modeling, using PO and AI domains in information technology management, including strategies and tactics, including attention to identifying, enabling, and integrating the best engagement strategies [4]. Modeling uses DS and ME domains to solve problems and fulfill the needs of the delivery and support of information technology services, including controlling all controls to provide the best support. In order to be able to solve problems and meet the needs of document analysis results. [5].

The results of using information technology will be improved if using the information technology management model by measuring the efficiency and success of the agency's objectives.

2. Methodology
Research methodology is one of the process of finding problems through studying and analyzing the factors used in conducting research. They must follow the rules set so that the research can be used scientifically. [6].

The research will be conducted using questionnaires to collect data from respondents, including the design and development of causal relationships, because in the methods that researchers use as examples to enable researchers to obtain the information needed to support Research conducted [7].

2.1. Data collection
Collecting literature studies that support research that will be conducted on the maturity level measurement with the framework of COBIT 4.1 in order to be able to measure achievement and readiness in the assessment index to help organizations know the management of service security.

2.2. Interview
Interview with the head of the department, the secretary of the department and the lab leader to receive information about information technology used in the information engineering department.

2.3. Data analysis
After receiving the information collected during the interview and from the subsequent data collection, the data will be analyzed according to the degree of security security of information technology services in the information engineering department.

2.4. Concepts / Processes
The concept of research is to obtain information about information technology in the Department of Information in sampling. There are three objects that become research populations among others. Head of Department Secretary Secretary of the Department of Laboratory Head can be viewed in the table. from now on:

| No | Respondents         | Total |
|----|---------------------|-------|
| 1  | Head of Department  | 1     |
| 2  | Secretaries         | 1     |

Table 1. Respondents.
This study uses tools in the form of questionnaires. The queries of the queries were developed based on the number of statements at each level of maturity in the domain, plan and organization (PO), Acquire and Implement (AI), delivery and support (DS) and Monitoring and Evaluate (ME) the total number of each domain has the same amount, i.e., PO Domain is 291 statements, AI domain is 196, DS domain is 291, and the total number of messages in the ME domain is 149 messages, so the total number in the query is 927 messages to a number of statements in the domain can be seen in Table 2, Table 3, Table 4 and Table 3 below:

| Domain | Level Maturity | Total Statement |
|--------|----------------|-----------------|
| PO1 – Defining IT planning strategies | 2 3 2 4 5 5 | 21 |
| PO2 – Data architecture designation | 3 5 6 5 6 7 | 32 |
| PO3 – Technology direction | 2 4 6 7 7 8 | 34 |
| PO4 – Define IT processes, organizations and relationships | 2 3 2 7 8 6 | 28 |
| PO5 – IT investment management | 2 5 4 7 6 6 | 30 |
| PO6 – Communication Management Aims and Direction | 2 3 4 5 3 3 | 20 |
| PO7 – Manage IT human resources | 2 4 3 5 6 7 | 27 |
| PO8 – Quality management | 3 3 2 4 9 5 | 26 |
| PO9 – Assess and manage IT risks | 3 4 5 7 8 9 | 36 |
| PO10 – Project management | 1 8 6 8 9 5 | 37 |
| **Total** | **22 42 40 59 67 61** | **291** |

| Domain | Level Maturity | Total Statement |
|--------|----------------|-----------------|
| AI 1 – Automatic solution identification | 2 4 5 3 6 6 | 26 |
| AI 2 – Defining IT planning strategies | 2 4 4 5 6 6 | 27 |
| AI 3 – Procurement and maintenance of technology infrastructure | 2 5 5 5 5 5 | 27 |
| AI 4 – Enable work and use | 2 6 5 7 8 5 | 33 |
| AI 5 – Receiving IT resources | 2 5 6 7 8 7 | 35 |
| AI 6 – Practice change | 2 4 2 5 5 5 | 23 |
| AI 7 – Install and recognize corrections and changes | 2 3 3 4 7 6 | 25 |
| **Total** | **14 31 30 36 45 40** | **196** |
This study uses a quantitative and descriptive analysis model. Descriptive analysis is used to find that information technology supervision in the current information department and problem solving methods can improve information technology governance operations in the information engineering department. Quantitative analysis model use Microsoft Excel spreadsheet to process all the answers and explain the problem determination of the maturity level of information technology governance conducted in the information engineering department. The data obtained from the respondents are processed using the average calculation so that the average maturity level and radar chart can be obtained from the radar chart results. It can be seen that the maturity level of the institution is high or

| Domain                                    | Level Maturity | Total Statement |
|-------------------------------------------|----------------|-----------------|
| DS1 – Define and manage service levels    | 2 3 2 3 4 4    | 18              |
| DS2 – Manage trid party services          | 1 4 4 4 5 5    | 23              |
| DS3 – Manage performance and capacity     | 2 3 4 6 6 6    | 27              |
| DS4 – Ensure continuous service           | 2 2 2 6 7 5    | 24              |
| DS5 – Ensure system security              | 1 4 3 5 5 5    | 23              |
| DS6 – Identify and allocate cost          | 2 2 3 4 3 3    | 17              |
| DS7 – Educate and trainusers              | 2 3 3 4 5 6    | 23              |
| DS8 – Manages service desk and incidents  | 2 2 2 3 7 4    | 20              |
| DS9 – Manage the configuration            | 2 3 4 6 6 7    | 28              |
| DS10 – Manage problems                    | 1 7 4 6 7 4    | 29              |
| DS11 – Manage data                        | 1 3 3 4 4 4    | 19              |
| DS12 – Manage the physical environment    | 2 3 3 4 4 4    | 20              |
| DS13 – Manage operations                  | 2 3 2 3 4 4 5 6 4 7 | 291         |
| **Total**                                 | 22 42 40 59 67 61 | 291          |

| Domain                                    | Level Maturity | Total Statement |
|-------------------------------------------|----------------|-----------------|
| ME1 – Monitor and evaluate information technology | 4 8 7 6 6 6 | 37              |
| ME2 – Monitor and evaluate internal control | 4 8 8 6 7 6 | 39              |
| ME3 – Monitor and evaluate ensure regulatory compliance | 4 7 7 8 6 5 | 37              |
| ME4 – Monitor and evaluate provide information technology Governance | 2 8 8 7 6 5 | 36              |
| **Total**                                 | 14 31 30 27 25 22 | 149             |
low. And maturity level The information engineering department is still at a low level, which is at level 2, so it does not match the expected maturity level [8].

3. Results and Discussion
The COBIT maturity level questionnaire distributed to respondents is used to calculate the maturity level of information technology supervision in the information engineering department. This questionnaire uses the maturity criteria specified in the COBIT framework 4.1. The scale used in this query uses the Guttman scale. In the query, there are two answer options. Choose Y (yes) and T (no) to calculate the answer Y (yes) will be converted to a value of 1 and the answer T (no) is converted to 0. The software used to calculate maturity level is Microsoft Excel. After all the results of the query are included in the table, maturity level of each process in the Domain Plan domain and Organization Organization (10 processes), Acquire and Implement (7 processes), delivery and support (13 processes) and monitoring and evaluation (4 processes) distributed to respondents Each one The results of the maturity level of each process from 3 (three) respondents. Then, find the mean and average results will be the value of the maturity level of each information technology process. Results of the conclusion of the new COBIT 4.1 The level that can be viewed in Table 6, Table 7, Table 8 and Table 9.

Table 6. Abbreviations of domain integrity levels Plans and organizations (PO).

| Domain Proses                                      | Current Maturity | Expected Maturity | Maturity Level |
|---------------------------------------------------|-----------------|-------------------|---------------|
| PO1 – Defining IT planning strategies             | 1.65            | 3                 | 2             |
| PO2 – Data architecture designation               | 2.05            | 3                 | 2             |
| PO3 – Technology direction                        | 2.20            | 3                 | 2             |
| PO4 – Define IT processes, organizations and relationships | 2.15       | 3                 | 2             |
| PO5 – IT investment management                    | 1.82            | 3                 | 2             |
| PO6 – Communication Management Aims and Direction | 1.63            | 3                 | 2             |
| PO7 – Manage IT human resources                   | 1.68            | 3                 | 2             |
| PO8 – Quality management                          | 1.68            | 3                 | 2             |
| PO9 – Assess and manage IT risks                  | 1.55            | 3                 | 2             |
| PO10 – Project management                         | 1.87            | 3                 | 2             |

Table 7. Abbreviation of maturity level in Acquire and Implement domains (AI).

| Domain Proses                                      | Current Maturity | Expected Maturity | Maturity Level |
|---------------------------------------------------|-----------------|-------------------|---------------|
| AI 1 – Automatic solution identification           | 0.54            | 3                 | 1             |
| AI 2 – Defining IT planning strategies             | 1.00            | 3                 | 1             |
| AI 3 – Procurement and maintenance of technology infrastructure | 1.60        | 3                 | 1             |
| AI 4 – Enable work and use                        | 0.81            | 3                 | 1             |
| AI 5 – Receiving IT resources                      | 0.50            | 3                 | 1             |
| AI 6 – Practice change                            | 1.00            | 3                 | 1             |
| AI 7 – Install and recognize corrections and changes | 1.00       | 3                 | 1             |
The maturity level referred to in this study is level 3 (three). As a result of the calculations that have been done, it can be assumed that the maturity level of information technology in the Information Engineering Department uses COBIT 4.1. The average level 2 means that in the present, information technology supervision in the information engineering department needs to be developed.

Assessing the maturity level of each information technology process using COBIT 4.1. Reference to the criteria for the assessment index defined can be found in the following table 10:

Table 8. Repetition of domain level Monitoring and Evaluate (ME).

| Domain Proses                                      | Current Maturity | Expected Maturity | Maturity Level |
|----------------------------------------------------|------------------|-------------------|----------------|
| ME1 – Monitor and evaluate information technology  | 1,725            | 3                 | 2              |
| ME2 – Monitor and evaluate internal control        | 1,735            | 3                 | 2              |
| ME3 – Monitor and evaluate ensure regulatory compliance | 1,688            | 3                 | 2              |
| ME4 – Monitor and evaluate provide information technology Governance | 1,881            | 3                 | 2              |

Table 9. Abbreviations of the maturity level in sending and supporting domains (DS).

| Domain Proses                                      | Current Maturity | Expected Maturity | Maturity Level |
|----------------------------------------------------|------------------|-------------------|----------------|
| DS1 – Define and manage service levels             | 1,655            | 3                 | 2              |
| DS2 – Manage third party services                  | 2,053            | 3                 | 2              |
| DS3 – Manage performance and capacity              | 2,207            | 3                 | 2              |
| DS4 – Ensure continuous service                    | 2,158            | 3                 | 2              |
| DS5 – Ensure system security                      | 2,026            | 3                 | 2              |
| DS6 – Identify and allocate cost                   | 1,636            | 3                 | 2              |
| DS7 – Educate and train users                      | 1,688            | 3                 | 2              |
| DS8 – Manages service desk and incidents           | 2,685            | 3                 | 2              |
| DS9 – Manage the configuration                     | 1,556            | 3                 | 2              |
| DS10 – Manage problems                             | 2,076            | 3                 | 2              |
| DS11 – Manage data                                 | 1,688            | 3                 | 2              |
| DS12 – Manage the physical environment             | 1,688            | 3                 | 2              |
| DS13 – Manage operations                           | 1,688            | 3                 | 2              |
Table 10. COBIT criteria for the maturity level version 4.1.

| Score Range | Description                |
|-------------|----------------------------|
| 0 - 0.55    | Non-Existent               |
| 0.51 - 1.50 | Initial/Ad Hoc             |
| 1.51 - 2.50 | Repeatable But Invinitve   |
| 2.51 - 3.50 | Defined Process            |
| 3.51 - 4.50 | Managed and Measurable     |
| 4.51 - 5.00 | Optimized                  |

**Figure 1.** Current maturity level with expected maturity level in Domain Plans and organizations (PO)

(a)

**Figure 2.** Current maturity level with expected maturity level in Domain Acquire and Implement (AI)

(b)

**Figure 3.** Current maturity level with expected maturity level in Domain Delivery and Support (DS)

(c)

**Figure 4.** Current maturity level with expected maturity level in Domain Monitoring and Evaluate (ME)

(d)
3.1. Domain Plans and organizations (PO)
In the PO domain under study from 10 processes that are at level 2, below the maturity level specified for a better maturity level, must be at level 3, which can be seen from the maturity level that has received the highest level of education Maturity is PO3 - the direction of technology So that there is no potential technology planning to create business opportunities and information technology planning is not adapted to the existing infrastructure while the minimum maturity level is PO8 - quality management At this level, it is known that the risk management policy does not define the time and method of risk assessment, while risk management does not pay attention to the processes that have been defined and documented.

3.2. Domain Acquire and Implement (AI)
In the AI domain studied from 7 processes, on an average level 1, below the maturity level for better maturity levels must be at level 3, which can be seen from the level of kematanga that has been studied for the highest maturity level. Is AI3 - procurement and maintenance of technology infrastructure So that there are no management procedures that support the improvement of the changes that have been considered.

3.3. Domain Delivery and Support (DS)
Based on the research conducted in the DS domain, there are 13 processes that show the mean level 2 (two), referring to the desired maturity level, which is at level 3 (three). Then, information technology in the information engineering department is still low. Over the level Expected maturity can be seen at the highest level of value in the DS. 8 Manage service areas and events that occur while the smallest level of DS1 is to define and manage service levels. At this level, it is known that the service management is not periodic according to the rules specified.

3.4. Domain Monitoring and Evaluate (ME)
The results of the research are conducted in the ME domain. There are 4 processes that show the mean at level 2 (two), referring to the desired maturity level which is at level 3 (three). Then, information technology in the information engineering department is still below the level. Defined The expected value can be seen at the highest level in ME 4, providing information technology governance while ME’s smallest level is ME 3. Ensuring compliance with external needs. At this level, it is well known that external needs meetings do not have an exact schedule.

4. Conclusion
Based on research conducted in the Information Engineering Department with the COBIT 4.1 Framework in the PO Domain, which contains 10 Domain AI processes, there are 7 processes. Domain DS has 13 processes and Domain ME, which has 4 processes in research. Information can be viewed in the PO Domains at Level 2, where the process of developing the same process is carried out by different people. There is no formal communication or training about the standard procedures and responsibilities submitted with high trust in Individual ability Occurs. The AI domain is at level 1, with known events and viewed as problems that must be handled by the company. There are no standards. The method used is ad-hoc is likely to be resolved by the processing person. Data results are not classified in level 2, where is the process? Developed at this level, it is known to manage services that are not periodic as defined by the rules, while Domain ME is at level 2, which is known that meeting external needs is not scheduled.

Improve information technology supervision in the information department by increasing the level of maturity at level 3, depending on the mission, vision, goals and development direction of the information engineering department, with standards and documents and communication through training.

In creating the right suggestions, it requires deep understanding and knowledge. The questionnaire does not provide 100% of the information technology supervision in the organization because
everyone can understand the statement about the questionnaire. In making recommendations, there must be good coordination to ensure that the short, medium and long term goals are truly.

5. Acknowledgment
The author expressed his deepest gratitude to the President of the Department, Department Secretary and Chief of the Laboratory of the Department of Information Engineering, Musamus University, to provide information for this study, support families and other individuals. Give help in this research.

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