10.24198/jaab.v5i2.39703

Information Technology Governance Assessment in Higher Education Institution Using COBIT 5 Framework

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Abstract: Information Technology (IT) is an essential part of overall organisational governance, and higher education is an educational institution that requires IT support. This study aims to evaluate how effective and efficient the implementation of information technology governance at higher education institutions (PTNBH X) as measured by the COBIT 5 Framework. This study will be an exploratory one that will rely on qualitative data. The domains Evaluate, Direct, and Monitoring (EDM) will be the focus of this study. Data collecting was the first stage of the study, followed by the analysis of maturity and gap levels, analysis and problem-solving in implementing IT governance and recommendations, and finally, conclusions and recommendations. According to the results of PTNBH X's capability level evaluation of the EDM domain, the company is at level 1 (performed process), with a value of 1.4. It means most EDM domains in PTNBH X implemented process achieve its purpose, but not yet at the level that the process is being planned, monitored and adjusted to their needs.

Keywords: *Information Technology Governance Higher Educational Institution; COBIT Framework*

Introduction

The role of information technology (IT) in overall organisational governance is critical. Good management of information technology will ensure efficiency and good service quality for organisational goals (Adikara, 2013). Higher Education is an institution that provides an education that requires information technology support. The development of information technology requires universities to manage resource potentials with information technology effectively and efficiently to face competition.

The advancement of information technology is becoming increasingly important in ensuring the organisation's performance and efficiency. Expenditure for investment in IT becomes significant in an institution, as well as in Higher Education institutions. IT supports the university's teaching, research, student learning, and administration. Organisations must include a comprehensive approach to risk management and IT performance measurement at the strategic level to support IT investment decision-making.

IT governance is defined as a collection of management, planning, performance reporting, and review processes with associated decision rights that establish controls and performance metrics over critical IT investments, delivery services, new or change authorisations, and compliance with regulations, laws, and organisational policies(Selig, 2018). It formalises and clarifies the organisation's monitoring, responsibility, and decision-making roles.

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The goal of IT governance is to direct and manage IT projects in order to ensure that performance satisfies the following goals (Selig, 2018):

- Aligns IT investments and priorities more closely with the business
- Manages, evaluates, prioritises, funds, measures and monitors requests for IT services and the resulting work and deliverables in a more consistent and repeatable manner that optimises returns to the business
- Responsible and efficient utilisation of resources and assets
- Ensures that IT delivers on its plans, budgets and commitments
- Establishes and clarifies accountability and decision rights (clearly defines roles and authority)
- Manages risks, change and contingencies proactively
- Improves IT organisational performance, compliance, maturity and staff development
- Improves customer service and overall responsiveness

Therefore, it needed to have an IT governance model as a tool to governance the data and information. Higher education is already doing data governance in various conditions, but they never make it to official programs and often as their daily activities. One example is how higher education institution stores their data; usually, their data storage is still unorganised. Besides that, the existing problem is more technical and relates to policy problems in higher education.

PTNBH X, one of the public higher education institutions in Indonesia located in West Java, is one of the best public universities, according to any source. PTNBH X itself now already transforming from financial management of public service agency (Perguruan Tinggi Negeri dengan pola pengelolaan keuangan badan layanan umum) or commonly known as PTN-BLU to financial management of independent legal entity (Perguruan Tinggi Negeri sebagai badan hukum) or commonly known as PTN-BH since the declaration on 2017.

As PTN-BH, PTNBH X now have the authority to fund itself like a corporation and not only depend on government funding. As regulation stated, now public universities that want to be or that are PTN-BH have good governance in every organisation under them and have to meet minimum standards of financial feasibility (Kementerian Pendidikan dan Kebudayaan Republik Indonesia, 2020).

Control Objectives for Information and Related Technology (COBIT) is a framework developed by the IT Governance Institute that is part of the Information System Audit and Control Association (ISACA). It is the foundation for companies to achieve their corporate governance and IT management goals(Ramlaoui & Semma, 2014). COBIT is a management guide that includes metrics, indicators, processes, and best practices to help organisations maximise their IT control and implementation.

ITIL (The IT Infrastructure Library), ISO / IEC 17799 (The International Organization for Electisechnical Commission), COSO (Committee of Sponsoring Treadway Commission Organizations), and COBIT (Control Objectives for Information and Related Technologies) are some of the frameworks that can be used to measure the effectiveness and efficiency of an entity's IT governance implementation (Hall, 2015). COBIT 5 will be used as a framework in this study to assess how effective and efficient IT governance has been.

COBIT 5 will be used as an IT governance framework in this study since it offers more benefits than other frameworks. COBIT is a framework model that covers a broader range of issues and gives more information than other framework models. Furthermore, COBIT provides a better balance of horizontal and vertical dimensions than other standards. COBIT is a comprehensive framework that assists organisations in achieving their goals. Everything is done by balancing the benefits, minimising risk, and maximising resource use.

COBIT 5 is a generic framework used by organisations of all sizes, for-profit, non-profit, or public (Erlangga, Sucahyo, & Hammi, 2016). Because of the various problems in the IT governance system, it is necessary to check on the PTNBH X IT governance system to create a transparent, accountable, and efficient university. Therefore, using COBIT 5 frameworks focusing on Evaluate, Direct and

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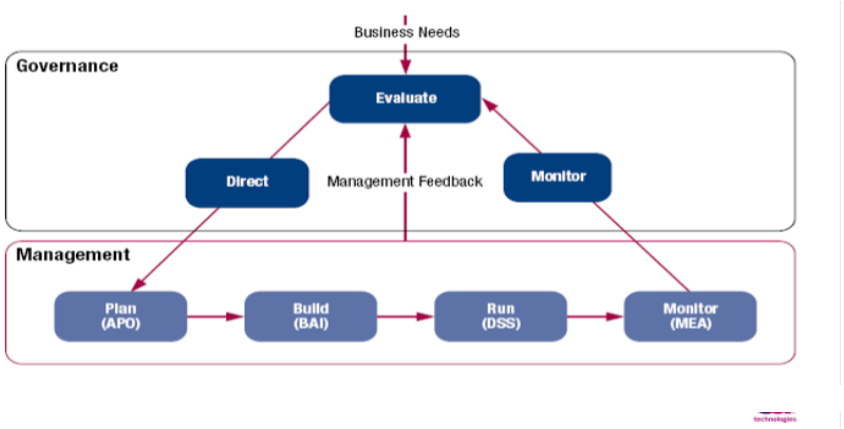
Monitor (EDM) domain, this research will assess the capability level of the IT governance system and see what PTNBH X can improve in their IT governance system at PTNBH X in West Java, Indonesia.

Literature Review

Corporate Governance

Corporate governance is how organisations are managed and controlled (Gao, Gao, & Zhang, 2008). 'Those oversight operations are done by the board of directors and audit committee to assure the integrity of reporting purposes,' according to corporate governance (Cohen & Sayag, 2010). According to the Organization for Economic Cooperation and Development (2004), corporate governance is a set of relationships between a company's management, board of directors, shareholders, and other stakeholders. Corporate governance also establishes the framework within which the company's goals are created and the methods for achieving those goals and measuring performance.

Figure 1. COBIT 5 Governance and Management Key Area



Recently, the concepts revolving around Corporate Governance have mainly been derived from the definition of Reding (2013), that defined Corporate Governance as: “the combination of processes and structures implemented by the board to inform, direct, manage, and monitor the activities of the organisation toward the achievement of its objectives.” To summarise, corporate governance is a network of interactions between a company's management, board of directors, shareholders, and stakeholders. It aims to ensure that information is shared responsibly and that the company's goals are met.

Higher Education IT Governance

Higher education in Indonesia has implemented IT Governance based on best practices from numerous prior higher educations without a model that can be utilised as a foundation for successfully implementing IT Governance. Higher education institutions must establish an IT Governance framework that meets their demands to implement good IT Governance. (Handeri, 2014) (Indrajit, 2011). Given the importance of technology in education, it must be backed up by proper and effective IT governance. The slightest error in IT Governance can significantly impact the institution. Furthermore, implementing IT in education involves a substantial financial investment and a high chance of failure. A suitable approach or standard is required to assist the implementation of the IT governance structure. (Haes, Steven, Grembergen, & Debreceny, 2013). Good IT governance is essential from strategy to implementation, and the IT management that will be used must correspond to widely recognised standards. (Yanosky & Caruso, 2008). Following an evaluation of several standards or methods that tertiary institutions can use, the most widely

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used is COBIT; whether COBIT is following the needs of higher education requires a review of the existing governance components in higher education. Here are the methods or tools that higher education institutions can use in managing IT according to (NasserEslami, Fatemeh, Fasanghari, & Abdollahi, 2008) (Yanosky & Caruso, 2008): ITIL, COBIT, ASL, CMM / CMMI, Six Sigma, SAS70, ISO 14550, Weil & Ross IT Governance Model, and ITGAP Model.

COBIT

COBIT (Control Objective for Information and Related Technology) is a set of documents and recommendations for establishing IT Governance, a framework that assists auditors, management, and users in bridging the gap between business risks, control needs, and technical issues. The IT Governance Institute (ITGI), part of the Information Systems Audit and Control Association (ISACA), created COBIT. COBIT has undergone a long development process to become a framework for implementing Enterprise IT Governance.

Evaluate, Direct, and Monitor (EDM) Domain Output

According to (ISACA, 2013), an assessment of the fulfilment of a domain can be measured through the output it produces. The breakdown of the outputs and activities that must be performed on the domain can be seen below:

Table 1. EDM Process

Process Name	Governance Practice
EDM 01 - Ensure Governance Framework Setting and Maintenance	**EDM01.01 Evaluate the governance system**. Continually identify and engage with the enterprise's stakeholders, document an understanding of the requirements, and judge the current and future design of governance of enterprise IT.
	EDM01.02 Direct the governance system. Inform leaders and obtain their support, buy-in and commitment. Guide the structures, processes and practices for IT governance in line with agreed-on governance design principles, decision-making models and authority levels. Define the information required for informed decision-making.
	EDM01.03 Monitor the governance system. Monitor the effectiveness and performance of the enterprise's governance of IT. Assess whether the governance system and implemented mechanisms (including structures, principles and processes) are operating effectively and provide appropriate oversight of IT.
EDM02 - Ensure Benefits Delivery	**EDM02.01 Evaluate value optimisation**. Continually evaluate the portfolio of IT-enabled investments, services and assets to determine the likelihood of achieving enterprise objectives and delivering value at a reasonable cost. Identify and judge any changes in direction that need to be given to management to optimise value creation.
	EDM02.02 Direct value optimisation. Direct value management principles and practices to enable optimal value realisation from IT-enabled investments throughout their full economic life cycle.
	EDM02.03 Monitor value optimisation. Monitor the key goals and metrics to determine how the business generates the expected value and benefits to the enterprise from IT-enabled investments and services. Identify significant issues and consider corrective actions.
EDM03 - Ensure Risk Optimisation	**EDM03.01 Evaluate risk management**. Continually examine and judge the effect of risk on the enterprise's current and future use of IT. Consider whether the enterprise's risk appetite is appropriate and that risk to enterprise value related to the use of IT is identified and managed**.**
	EDM03.02 Direct risk management. Direct the establishment of risk management practices to ensure that IT risk management practices are appropriate and that the actual IT risk does not exceed the board's risk appetite.

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	EDM03.03 Monitor risk management. Monitor the key goals and metrics of the risk management processes and establish how deviations or problems will be identified, tracked and reported for remediation.
EDM04 - Ensure Resource Optimization	**EDM04.01 Evaluate resource management**. Continually examine and judge the current and future need for IT-related resources, options for resourcing (including sourcing strategies), and allocation and management principles to meet the enterprise's needs optimally.
	EDM04.02 Direct resource management. Ensure the adoption of resource management principles to enable optimal use of IT resources throughout their full economic life cycle.
	EDM04.03 Monitor resource management. Monitor the key goals and metrics of the resource management processes and establish how deviations or problems will be identified, tracked and reported for remediation.
EDM05 - Ensure Stakeholder Transparency	**EDM05.01 Evaluate stakeholder reporting requirements**. Continually examine and judge the current and future requirements for stakeholder communication and reporting, including mandatory reporting requirements (e.g., regulatory) and communication to other stakeholders. Establish the principles for communication.
	EDM05.02 Direct stakeholder communication and reporting. Ensure the establishment of effective stakeholder communication and reporting, including mechanisms for ensuring the quality and completeness of information, oversight of mandatory reporting, and a communication strategy for stakeholders.

Capability Table

The capability Level is a model that outlines how an organisation's core process operates. This description is required to assess which processes meet expectations and require additional attention and improvement. It also gives an indication of the performance of processes in the governance and management areas are doing. Six process capability levels can be achieved, from Incomplete Process (level 0) to Optimising (level 5). The explanation of the level at this Capability Level is as follows (ISACA, 2013):

Table 2. Maturity Level Index Table

Maturity Indeks	Maturity Level	Explanation
0.0 – 0.50	Level 0 (Incomplete Process)	The organisation at this stage does not implement the IT process that should exist or has not succeeded in achieving the goals of the IT process.
0.51 – 1.50	Level 1 (Performed Process)	The organisation at this stage has successfully implemented the IT process, and the objectives of the IT process have been achieved.
1.51 – 2.50	Level 2 (Managed Process)	The organisation at this stage in implementing the IT process and achieving its goals is carried out well so that there is more assessment because implementation and achievement are carried out with good management. Management in the form of planning, evaluation and adjustment processes for the better.
2.51 – 3.50	Level 3 (Established Process)	The organisation at this stage has standardised IT processes within the scope of the organisation as a whole. This means that they already have a standard process that applies throughout the scope of the organisation
3.51 – 4.50	Level 4 (Predictable Process)	Organisations at this stage run IT processes within definite boundaries, such as time limits. These limits are generated from measurements that have been made during the implementation of the IT process before.
4.51 – 5.00	Level 5 (Optimizing Process)	At this stage, the organisation has made innovations and continuous improvements to improve its capabilities.

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Analysing the process outcomes as described in the detailed process descriptions for each process and providing a rating to the degree to which each objective is achieved using the ISO/IEC 15504 rating scale. The following are the ratings on this scale:

- N (Not achieved)— In the assessment process, there is little or no proof of achievement of the required attribute. (Achievement ranges from 0% to 15%)
- P (Partially achieved)— In the assessed process, there is some evidence of an approach to the defined attribute and some achievement. Some parts of the attribute's achievement may be completely unpredictable. (Achievement ranges from 15% to 50%)
- L (Largely achieved)— In the assessed process, there is evidence of a systematic approach to, and significant achievement of, the defined attribute. In the assessment process, several flaws may be associated with this attribute. (Achievement ranges from 50% to 85%)
- F (Fully achieved)— In the assessed process, there is evidence of a thorough and methodical approach to, and full achievement of, the required attribute. In the assessment process, there are no severe flaws related to this attribute. (Achievement ranges from 85% to 100%)

Method, Data, And Analysis

Capability Level Process

The capability Level is a model that describes how a core process in the organisation runs. This description is needed to determine which processes are running according to expectations and which processes are still lacking that require special attention and improvement. It also provides a measure of the performance of processes in the governance and management areas. Six process capability levels can be achieved, from Incomplete Process (level 0) to Optimising (level 5). The explanation of the level at this Capability Level is as follows (ISACA, 2013):

Table 3. Maturity Level Index

Maturity Index	Maturity Level	Explanation
0.0 – 0.50	Level 0 (Incomplete Process)	The organisation at this stage does not implement the IT process that should exist or has not succeeded in achieving the goals of the IT process.
0.51 – 1.50	Level 1 (Performed Process)	The organisation has successfully executed the IT process and met its objectives.
1.51 – 2.50	Level 2 (Managed Process)	The organisation is well-managed at this level in implementing the IT process and achieving its goals; therefore, there is more assessment because implementation and achievement are carried out with good management. For the better, management is in the form of planning, evaluation, and adjustment processes.
2.51 – 3.50	Level 3 (Established Process)	Within the scope of the organisation as a whole, the organisation has standardised IT processes at this point. This indicates that they already have a standard process that applies across the organisation.
3.51 – 4.50	Level 4 (Predictable Process)	At this point, organisations have conducted IT processes under specific boundaries, such as time constraints. These constraints are derived from previous measurements taken during the implementation of the IT process.
4.51 – 5.00	Level 5 (Optimizing Process)	The organisation has innovated and made ongoing changes to strengthen its capabilities at this level.

Level 0 process capability has no attributes. Level 0 reflects a process that was not implemented or failed to achieve at least part of its results. To determine whether a process has met the required capabilities at a level, it is necessary first to analyse the fulfilment of a

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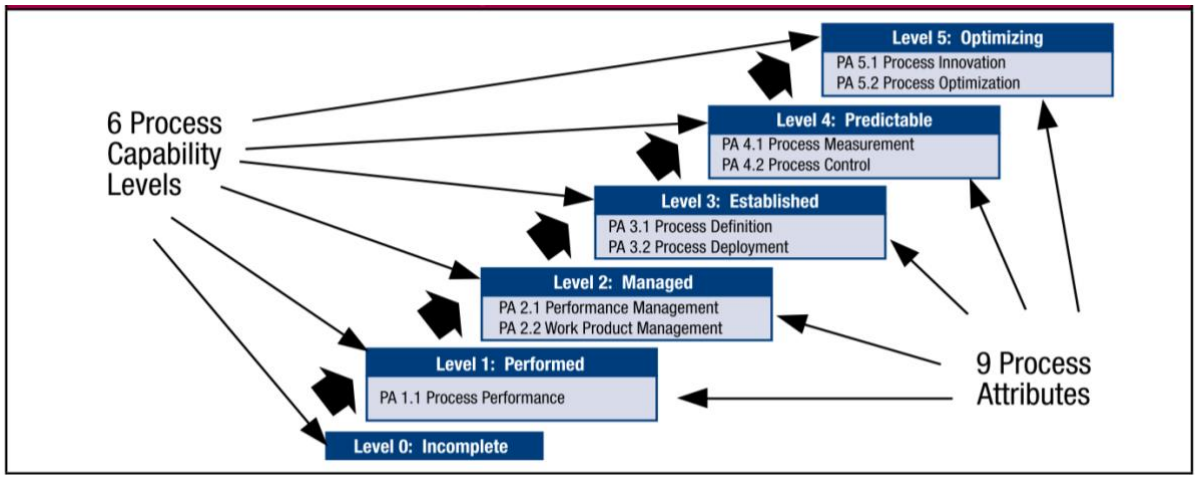
level's process attributes, which will be explained as follows.

Process Attributes

As displayed in Figure 2, the capability measurement in COBIT PAM is based on the nine process attributes described in ISO / IEC 15504-2. Each attribute applies to each process capability level. Process attributes are used to see if a process has reached the specified capabilities.

Figure 2. Process Attribute



It can be seen in the figure that there are all nine process attributes in all six capability levels. The assessment of the attributes of this process must be carried out in stages, and each attribute has several criteria that must be met. The criteria have been determined in COBIT 5 according to the activities suggested for each domain. To better understand the technical assessment of each attribute, the researcher will make the following parable:

- Level 0 indicates the absence of evidence of activity, so there are no process attributes for this level.
- If the company has evidence of the fulfilment of the first process attribute, namely PA 1.1 Process Performance, then the company has fulfilled the entire process attribute to be declared to have a level 1 capability. Then the assessment continues for the attribute process at level 2 capability, namely PA 2.1 Process Management and PA 2.2 Work Product Management.
- The assessment of the two attribute processes at capability level 2 must get full marks on two attributes to continue the assessment of the attribute process at capability level 3. This step is repeated until an attribute process cannot be fulfilled at a capability level.

As for categorising the minimum value needed to declare the fulfilment of an attribute process, it is done using the Rating Scale as follows.

Rating Scale

Analysing the process outcomes as described in the detailed process descriptions for each process and giving a rating to the degree to which each objective is met using the ISO/IEC 15504 rating scale. The ratings on this scale are as follows:

- N (Not achieved)— In the assessment process, there is little or no proof of achievement of the required attribute. (Achievement ranges from 0% to 15%)
- P (Partially achieved)— In the assessed process, there is evidence of an approach to the defined attribute and some achievement. Some parts of the attribute's achievement may be completely unpredictable. (Achievement ranges from 15% to 50%)
- L (Largely achieved)— In the assessed process, there is evidence of a systematic approach to, and significant achievement

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of, the defined attribute. In the assessment process, several flaws may be associated with this attribute. (Achievement ranges from 50% to 85%)

- F (Fully achieved)— In the assessed process, there is evidence of a thorough and methodical approach to, and full achievement of, the required attribute. In the assessment process, there are no severe flaws related to this attribute. (Achievement ranges from 85% to 100%)

Each process attribute has one or more general practice indicators to aid the production process and performance. Each threat attribute process uses a scale of 4 values in the form of N-P-L-F:

1. Not achieved (0 – 15%)
2. Partially achieved (>15% - 50%)
3. Largely achieved (>50% - 85%)
4. Fully achieved (>85% - 100%)

All samples are made based on practical evidence collected at the time of the sample. Any evidence must reflect the fulfilment or implementation of the process attributes concerned. There are levels 1 to 5 where each level has its requirements that must be met. To state that a capability level has been met, the process must reach the Fully Achieved (F) category to continue to the next capability level.

Results and Discussion

At this phase, the researcher will provide an assessment of the object of research and calculate the level achievement results of the Evaluate, Direct, and Monitor (EDM) domain. The data was collected from January 2021 until March 2021 in PTNBHX via interviews and documentation. The interviews will be done with top-level management that makes decisions from Direktorat Keuangan dan Tresuri, Direktorat Perencaan dan Sistem Infromasi, Direktorat Tata Kelola, Legal, dan Komunikasi and Satuan Pengawas Internal, which is a division that is responsible for implementing IT governance systems at UNPAD to know the current state or practices that have been carried out regarding IT governance and the documentation collected can be in the form of the results of questions and answers conducted during interviews, screenshots of a system, and supporting documents obtained during the research. The results of the evaluation of each subdomain are as follows:

	The processes in this domain were already assessed.
	The processes in this domain cannot be assessed.

Process EDM01 - Ensure Governance Framework Setting and Maintenance

This process aims to analyse and articulate the requirements for the governance of enterprise IT and put in place and maintain effective enabling structures, principles, processes and practices.

Table 4. Capability Level EDM01 Analysis

Manage Operations	Level 0	Level 1	Level 2		Level 3		Level 4		Level 5	
		PA 1.1	PA 2.1	PA 2.2	PA 3.1	PA 3.2	PA 4.1	PA 4.2	PA 5.1	PA 5.2
Rating (%)	100	95.83	66.67	75						
Colour										

With a score of 70.84% in the domain EDM01 level 2, the process gets the value of capability level Largely Achieved (L) so that the capability level for the EDM01 domain is 2 (Managed Process).

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Process EDM02 – Ensure Benefits Delivery

This process optimises the value contribution to the business from the business processes, IT services and IT assets resulting from investments made by IT at acceptable costs.

Table 5. Capability Level EDM02 Analysis

Manage Operations	Level 0	Level 1	Level 2		Level 3		Level 4		Level 5	
		PA 1.1	PA 2.1	PA 2.2	PA 3.1	PA 3.2	PA 4.1	PA 4.2	PA 5.1	PA 5.2
Rating (%)	100	81.67								
Colour										

With a score of 81.67% in the domain EDM02 level 3, the process gets the value of capability level Largely Achieved (L) so that the capability level for the EDM02 domain is 1 (Performed Process).

Process EDM03 - Ensure Risk Optimisation

In this part of the process, the purpose is to ensure that the enterprise's risk appetite and tolerance are understood, articulated and communicated and that risk to enterprise value is related to the

Table 6. Capability Level EDM03 Analysis

Manage Operations	Level 0	Level 1	Level 2		Level 3		Level 4		Level 5	
		PA 1.1	PA 2.1	PA 2.2	PA 3.1	PA 3.2	PA 4.1	PA 4.2	PA 5.1	PA 5.2
Rating (%)	100%	80%								
Colour										

With a score of 80% in the domain EDM03 level 1, the process gets the value of capability level Largely Achieved (L) so that the capability level for the EDM03 domain is 1 (Performed Process).

Process EDM04 - Ensure Resource Optimization

In this process, we have to ensure that adequate and sufficient IT-related capabilities (people, process and technology) are available to support enterprise objectives effectively at optimal cost.

Table 7. Capability Level EDM04 Analysis

Manage Operations	Level 0	Level 1	Level 2		Level 3		Level 4		Level 5	
		PA 1.1	PA 2.1	PA 2.2	PA 3.1	PA 3.2	PA 4.1	PA 4.2	PA 5.1	PA 5.2
Rating (%)	100	95	66.67	75						
Colour										

With a score of 70.84% in the domain EDM04 level 2, the process gets the value of capability level Largely Achieved (L) so that the capability level for the EDM04 domain is 2 (Managed Process).

Process EDM05 - Ensure Stakeholder Transparency

This process aims to ensure that enterprise IT performance and conformance measurement and reporting are transparent, with stakeholders approving the goals and metrics and the necessary remedial actions.

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Table 8. Capability Level EDM05 Analysis

Manage Operations	Level 0	Level 1	Level 2		Level 3		Level 4		Level 5	
		PA 1.1	PA 2.1	PA 2.2	PA 3.1	PA 3.2	PA 4.1	PA 4.2	PA 5.1	PA 5.2
Rating (%)	100%	80%								
Colour										

With a score of 80% in the domain EDM05 level 1, the process gets the value of capability level Largely Achieved (L) so that the capability level for the EDM05 domain is 1 (Performed Process).

Overall Rating of EDM Domain

The capability level assessment for the EDM domain as a whole is calculated as follows:

$$EDM = \frac{EDM01 + EDM02 + EDM03 + EDM04 + EDM05}{5}$$

$$EDM = \frac{2 + 1 + 1 + 2 + 1}{5}$$

$$EDM = \frac{7}{5}$$

$$EDM = 1.4$$

The number above comes from the level of the table below that indicates the current level from the assessment that the researcher did to measure the capability level of the EDM domain in PTNBH X. 1. It means most of the EDM domains in PTNBH X implemented process achieves its process purpose, but not yet at the level that the process is being planned, monitored and adjusted to their needs. The result indicates that domain EDM in PTNBH X is currently on level 1.4, based on the researcher's assessment.

Table 9. EDM Domain Capability Level Final Result

Domain Process	Level 0	Level 1	Level 2	Level 3	Level 4	Level 5
EDM01						
EDM02						
EDM03						
EDM04						
EDM05						

Recommendations

From the previous capability level results, PTNBH X may implement the following recommendations. The researcher divided the recommendations into parts based on the level reached by each domain for domains EDM02, EDM03, and EDM05 are on level 1 (performed process) and the other two domains, EDM01 and EDM04, are on level 2 (managed process).

Recommendations for Domain EDM02, EDM03, and EDM05

What can PTNBH X do to increase Domain EDM02, EDM03, and EDM05 level to level 2

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(managed process)? The previously established process can operate within defined limits to achieve its process outcomes.

Performance Management

A measure of the extent to which the performance of the process is managed. As a result of full achievement of this attribute:

1. Objectives for the performance of the process are identified: The performance objectives, scoped together with assumptions and constraints, are defined and communicated.
2. Process performance is planned and monitored: Basic measures of process performance linked to business objectives are established and monitored. They include vital milestones, required activities, estimates and schedules.
3. Performance of the process is adjusted to meet plans: Action is taken when planned performance is not achieved. Actions include identifying process performance issues and adjusting plans and schedules as appropriate.
4. Responsibilities and authorities for performing the process are defined, assigned and communicated: The key responsibilities and authorities for performing the critical activities of the process are defined, assigned and communicated. The need for process performance experience, knowledge and skills is defined.
5. Resources and information necessary for performing the process are identified, made available, allocated and used: Resources and information necessary for performing the critical activities are identified, allocated and used.
6. Interfaces between the involved parties are managed to ensure effective communication and clear assignment of responsibility: The individuals and groups involved with the process are identified, responsibilities are defined, and effective communication mechanisms are in place.

Work Product Management

A measure of the extent to which the work products produced by the process are appropriately managed. The work products referred to in this clause result from achieving the process outcomes. As a result of full achievement of this attribute:

1. Requirements for the work products of the process are defined: Should provide details of quality criteria and work product content and structure, including the content structure and quality criteria.
2. Requirements for documentation and control of the work products should include identification of dependencies, approvals and traceability of requirements. The documentation process should provide details of controls (control matrix).
3. Work products are appropriately identified, documented and controlled: Work products are subject to change control, versioning and configuration management as appropriate. It should be accompanied by details of the work product, quality criteria, documentation requirements and change control.
4. Work products are reviewed following planned arrangements and adjusted as necessary to meet requirements: Work products are subject to review against requirements following planned arrangements. Any issues arising are resolved by providing an audit trail of reviews undertaken.

To make it reach level 2 (managed process), PTNBH X should accomplish the process attribute given by COBIT5 above for at least until it becomes primarily achieved by making all the processes implemented in a managed fashion (planned, monitored and adjusted) and its work products are appropriately established, controlled and maintained.

Recommendations for Domain EDM01 and EDM04

Based on the result of the assessment for Domain EDM01 and EDM04, these are recommendations to reach level 3 (established process):

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Established Process

Measures the extent to which process standards are maintained to support the implementation of process standards which include:

1. Define the standard: Ensure the availability of applicable policies or SOPs that define a defined process.
2. Determine the sequence and interaction between processes: Ensure that the SOP includes the flow and interaction of a process with other processes.
3. Identify the roles and competencies: The applicable policies or SOPs have required the competencies and roles to carry out a process.
4. Identify the required infrastructure and work environment: The policy or SOP has identified the required infrastructure and work environment to perform a process.
5. Determine suitable methods: Appropriate methods for monitoring the effectiveness and suitability of the process have been specified in the applicable Policy or SOP.

Process Deployment

Contains a measure of the extent to which standard processes are effectively used in the specified process to achieve the process results, consisting of:

1. Deploy a defined process: The process is implemented based on the selected and adjusted policy or SOP.
2. Assign and communicate roles, responsibilities and authorities: Policies or SOPs have defined the roles, responsibilities, and authorities needed to carry out the specified processes defined and communicated.
3. Ensure necessary competencies: Policies or SOPs require personnel performing the specified process to be competent based on appropriate education, training and experience.
4. Provide resources and information to support the performance: Policies and SOPs define the resources and information needed to perform the specified processes available, allocated, and used.
5. Provide adequate process infrastructure: The infrastructure and work environment required to perform the specified process is available, managed, and maintained according to applicable policies or SOPs.
6. Collect and analyse data: Ensure that appropriate data is collected and analysed as a basis for understanding behaviour, demonstrating the suitability and effectiveness of the process, and evaluating where continuous improvement of the process can be made.

Conclusion

Based on the findings of the previous chapter's analysis and discussions, below are some conclusions about the results of the IT governance evaluation at PTNBH X, particularly in the domain Evaluate, Direct, and Monitoring (EDM):

The capability level evaluation of the EDM domain in PTNBH X shows that the company is at level 1 (performed process), with a value of 1.4. It means most EDM domains in PTNBH X implemented process achieve its purpose, but not yet at the level that the process is being planned, monitored and adjusted to their needs.

On domain EDM02, EDM03, and EDM05, PTNBH X can only reach level 1 (performed process). The rating for each omain is already good. Each of them has already primarily achieved on the rating scale and already passed 80% just need some improvement to be able to reach fully achieved to make it able rating the next level in a managed process. On the note, some aspects that may be a note for improvement is ensuring that every process that still follows COBIT 5 as the guidelines can be integrated.

On domain EDM01 and EDM04, both of it currently be able to reach level 2 (managed process). Both domains got a 70.84% score on their rating scale, and they still have much adjustment if PTNBH X want to make both of them reach the next level in level 3 (established process). Those domains also need an interface that is being managed to help the performance of each process that can collect data required to monitor the effectiveness and suitability of the process across the organisation.

The risk that the researcher found after conducting the research may be more focusing on two EDM domains that still got lower points than others. First, EDM03 - Ensure Risk

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Optimisation; in this domain, the researcher found that the risk guidance for PTNBH X is still being developed in the draft from the interview conducted with the interviewees. Even though every head of the work unit had their guidance for their work unit, PTNBH X should release those drafts as soon as possible as the base guidance for every work unit under PTNBH X, so heads of work units will not make guidance of their own even there is not much different from the PTNBH X goals. Moreover, for the EDM05 - Ensure Stakeholder Transparency, because PTNBH X is one of the higher education institutions in Indonesia under the Ministry of Education and Culture, the researcher did not find any risk that may threaten PTNBH X as an institution or business unit because PTNBH X have to annually report to the ministry about the problems and achievement that happened in PTNBH X. PTNBH X itself annually posted about what they did on their website also publish their audited annual report. However, the lack of documentation can be reviewed on this part make researcher cannot find threatening risks in this domain.

For what PTNBH X can do to improve their IT governance systems, moreover in EDM domain are things that can improve their level if there any researcher that may assess their PTNBH X IT governance systems like researcher did in this research. Implement performance of the process that is being managed in fashion (planned, monitored and adjusted) and make sure that the work products are also being appropriately established, controlled and maintained for domains EDM02, EDM03, and EDM05. Finally, for domains EDM01 and EDM04, analyse process and product measurement results, ensure that SOP includes the flow and interaction of a process with other processes, along with suitable methods for monitoring the process' effectiveness and suitability, and provide adequate process infrastructure to support process performance.

Limitations

This research was the first research that the researcher conducted. All errors and mistakes in the research are to be understood and forgiven, and the researcher hopes constructive feedback could be given to help the researcher grow and learn. The researcher could not make direct contact with the executive position of Majelis Wali Amanat (MWA) or rector and its vice in PTNBH X, the highest level in the organisation.

The research was conducted when the COVID-19 pandemic occurred, and the researcher could not make direct observations at PTNBH X due to conditions where the researcher had to implement social distancing practices, and permits were not possible. The researcher depended on what interviewees gave the researcher during the interviews and what could be accessed on the internet to conduct documents content analysis. As a result, the score given by the researcher during this research may not give an accurate picture of the condition of IT governance at PTNBH X.
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