



MEASUREMENT OF INFORMATION TECHNOLOGY GOVERNANCE CAPABILITY LEVEL USING COBIT 2019 FRAMEWORK

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Article history:

Received July 21, 2023

Revised August 24, 2023

Accepted August 28, 2023

Keywords:

Capability Level;

COBIT 2019;

IT Governance.

Abstract

This mining company is one of the full-service mining contractors that has implemented IT for its mining operations. However, there are issues with resource needs and the development of company procedures in classifying IT risks, resulting in difficulties in problem-solving. This study aims to evaluate the level of IT governance capability in companies using the COBIT 2019 framework. The selected process objectives based on design factors are EDM03 (Ensured Risk Optimization), APO12 (Collect Data), MEA03 (Managed Compliance with External Requirements), and MEA04 (Managed Assurance). The results of the process objective capability measurement indicate that EDM03 reaches level 3, APO12 reaches level 2, MEA03 reaches level 3, and MEA04 reaches level 2, whereas the expected capability level is at level 4. This demonstrates a gap of 2 levels. The given recommendation is to create a document that clearly outlines comprehensive and necessary detailed procedures and ensures all employees understand their roles and responsibilities in technology development and managing information security.

1.0 INTRODUCTION

Information Technology (IT) is a term used to refer to technologies that help humans in performing tasks related to information, particularly in the digital sector [1]. IT has been implemented in a majority of organizations across various industries, making the effectiveness of its usage crucial for organizations to consider [2]. This is to ensure that the use and implementation of IT align with the expectations of the company [3]. This enterprise strives to implement information technology or information systems. With the presence of IT in the company's operations, proper maintenance and supervision of IT are necessary to ensure that it aligns with the company's business objectives [4]. As one of the largest mining contractors in Indonesia, especially in Berau, the company needs to compete with other mining contractor competitors by providing the best and most innovative services to clients. The company itself has been implementing IT for a long time, but periodic evaluations are necessary as there are still issues related to IT governance and IT resource procurement within this company.

There are several issues related to IT governance that companies experience. Server Downtime. When the server goes down, server repairs can take several hours, causing delays

in employees' work if the server issue is not resolved before the start of working hours. The server is also responsible for receiving data traffic from heavy equipment operating in the mines. Therefore, if the server is down, it becomes difficult to monitor vehicle traffic, posing a risk of accidents. CCTV frequently experiences malfunctions at critical points such as the cylinder warehouse, service pit, and fuel skid. These locations require extra surveillance to prevent unwanted incidents, and the repair process can take a long time, ranging from hours to days [5].

Based on the outlined issues, the company needs to measure the level of Information Technology governance capability. The framework that will be utilized in this research is COBIT 2019 [6]. Similar to previous studies, capability levels are gauged using the COBIT 2019 framework [7]. In a different study, capability levels were measured employing the COBIT 5 framework. COBIT 2019 places emphasis on the connection between business objectives and the utilization of IT to generate benefits within the company [8]. This IT governance assessment will address the challenges faced by mining companies by employing the COBIT 2019 framework, with a focus on the IT resources and compliance area [9].

2.0 THEORETICAL

2.1. IT Governance

IT governance is a process of aligning and managing decisions and investments related to IT within a company or institution to achieve agreed-upon objectives. IT governance is a crucial component in achieving success in implementing good corporate governance [10]. IT governance itself is created to ensure the efficiency and effectiveness of business processes using IT towards the company's goals [11].

Given the crucial role of information technology, it is necessary to have IT governance that can conduct a comprehensive evaluation of information technology within the company [12]. ISACA 2019 outlines that IT governance is based on six fundamental principles: providing stakeholder value, adopting a holistic approach, implementing a dynamic governance system, differentiating governance from management, tailoring to enterprise needs, and employing an end-to-end governance system [13].

2.2. COBIT 2019

COBIT 2019 is an internationally applicable best practice for IT, Information, and risk related to organizations or companies, and this framework was developed by the IT Governance Institute (ITGI) [14]. COBIT 2019 plays a role in evaluating controls and maximizing the value of both existing and future technology implementations, with the aim of risk optimization, recognizing benefits, and achieving resource goals [15]. The creation of COBIT 2019 was driven by the demand that IT management in companies should be faster, more agile, and supportive of innovation development [16].

2.3. Capability Level

The capability level measures how well a process is applied and executed based on an assessment of the company's processes and practices. The measurement of processes is divided into several assessment ranges. The capability levels used in the process evaluation consist of 6 levels, namely [12]:

- 1) Level 0: Incomplete approach, signifies processes that are not implemented or fail to achieve their strategic goals.
- 2) Level 1: Processes achieve their goals through the application of incomplete activities that can be categorized as intuitive and not very organized.
- 3) Level 2: Processes achieve their goals through the application of basic, complete, and a series of activities that can be characterized as performance oriented.
- 4) Level 3: Processes achieve their goals in a much more organized manner, utilizing organizational assets. Processes are usually well-defined.
- 5) Level 4: Processes achieve their goals and define their performance well (quantitatively measurable).
- 6) Level 5: Processes achieve their goals, define and greatly enhance their performance (quantitatively measurable), and engage in continuous improvement.

2.5. Gap Analysis

Gap analysis is a tool to assist a company in providing a comparison between the current state and the desired state as per agreement [17]. If the gap is lower, it can be interpreted that

the quality of the company's performance is better [18]. The gap is calculated by the difference between the current capability level and the expected capability level [19]

3.0 METHODOLOGY

The research was conducted by first developing scenarios using the COBIT 2019 framework [20]. In Figure 1, the research flow conducted in this study serves as a guide in conducting the research, with the following research flow:

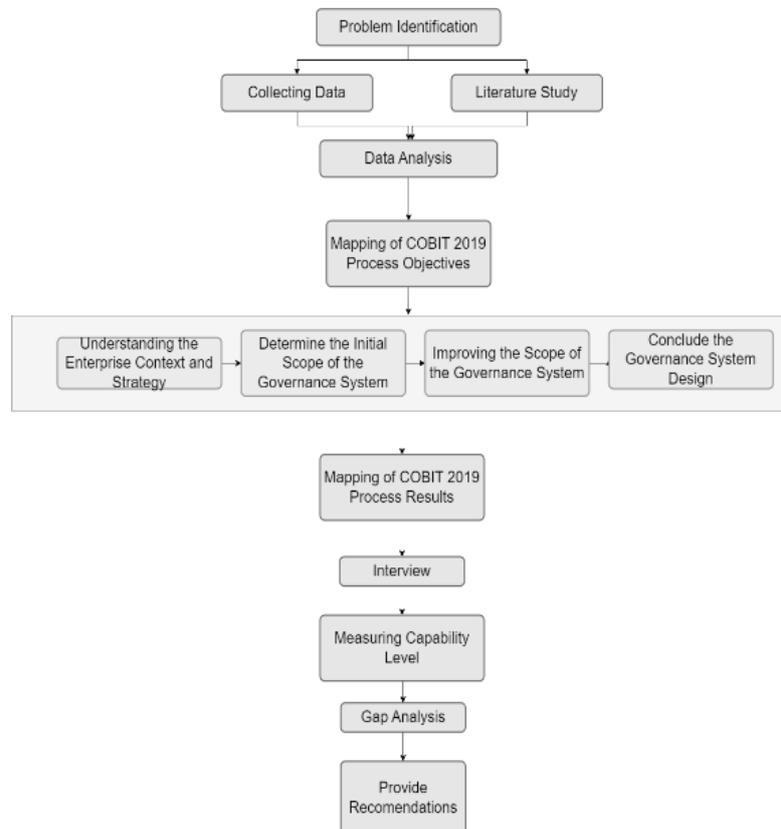


Figure 1. Research Flowchart

3.1 Identification of Problem

Problem identification is carried out regarding the IT governance issues within the company, which is the focal point of this research. The issues in question are connected to the IT governance utilized for mining operational activities, directly overseen by the IT department at the company site. The process of problem identification involves conducting interviews with the IT department Supervisor and Business Excellence staff of the company. The outcomes of these interviews are anticipated to unveil the challenges or limitations that the company encounters in terms of IT governance.

3.2 Data Collection

A literature review is carried out by searching for references from various sources. Once the issues faced by the company are identified, the literature review process becomes more focused, facilitating the discovery of topics pertinent to the current problems. The data collection process employs two methods: conducting direct interviews via Zoom Meeting and distributing a questionnaire to the IT department Supervisor, who is the focal point of this research.

3.3 COBIT 2019 Process Objective Mapping

In this stage, the identification and mapping process is conducted based on the challenges encountered in IT-related mining operational activities using COBIT 2019. This is carried out according to the selected COBIT process objectives. The mapping process commences by mapping the design factors through the utilization of the COBIT 2019 Design toolkit. This entails understanding the company's strategy, defining the initial scope of the governance system using design factors 1-4, refining the governance system scope based on design factors 5-11,

and concluding the design of the governance system. This procedure aids in pinpointing the COBIT 2019 process objectives. There are four steps involved in mapping the COBIT 2019 process objectives:

- 1) Understanding the company's context and strategy by identifying the company's strategy, goals to achieve, IT-related risks, and IT-related challenges faced by the company.
- 2) Determining the initial scope of the governance system by populating design factors 1-4 using the COBIT 2019 Design Toolkit.
- 3) Enhancing the initial scope of the IT governance system by completing design factors 5-11 using the COBIT 2019 Design Toolkit.
- 4) Finalizing the populated design factors using the COBIT 2019 Design Toolkit.

During this stage, the COBIT 2019 process objectives to be assessed within the company are identified based on the encountered challenges. The assessment outcomes will be utilized to gauge the capability level and to analyze the gap between the current capability level and the target capability level. The formula that will be employed to calculate the capability level is based on the data acquired from the interview results:

$$CC = \frac{\sum CLa}{\sum Po} \times 100\%$$

- $\sum CLa$: The value of achieving the level of capability
 $\sum CLa$: Total value of governance and management
 $\sum Po$: Total process of governance and management.

3.5 IT Governance Capability Measurement

In this stage, the capability level will be measured based on the interview results, followed by an analysis of the achieved capability level and the desired capability target of the company. After conducting the measurement and obtaining the results of the capability level assessment, the next step involves analyzing the gap. Upon completing the analysis, the gap between the current capability level and the targeted capability level will become evident.

3.6 Provide Recommendations

After conducting evaluations using the COBIT 2019 framework throughout the mentioned processes, this study will yield improvement recommendations to be presented to the company.

4.0 RESULTS

4.1 Identification of Problems

Before conducting the mapping of COBIT 2019 process objectives, problem identification will be carried out first. This problem identification is performed through interviews with key personnel from the company, namely the IT Supervisor and Business Excellence representatives. These interviews are conducted using the COBIT 2019 Design Toolkit, structured around design factors. After analysis, the results indicate the absence of Standard Operating Procedures (SOPs) and formal rules related to collecting IT risk data and classifying IT risks. The limited awareness of these issues has resulted in the failure to address imminent IT risks.

Moreover, there are no SOPs for inventorying IT risk control activities and managing IT risks. The lack of data concerning procedures for inventorying IT risk control activities can lead to catastrophic failures in mitigating frequently occurring IT risks. There's also a deficiency in managing vendor control processes used by the company in administering the corporate network. This becomes evident when the services are inaccessible during downtime maintenance, causing a halt in company operations. Furthermore, the inadequate management of infrastructure, such as the absence of a disaster recovery center, results in widespread disruptions to IT equipment and significantly diminishes the possibility of successful recovery.

4.2 Conducting 2019 COBIT Process Objective Mapping

In the implementation of IT governance measurement in the mining company, the COBIT 2019 framework is utilized to measure each IT governance process it possesses. To assess the

level of IT governance capability within the company, it is necessary to conduct a mapping of COBIT process objectives first. The COBIT 2019 Design Toolkit is employed for this mapping process. Within the COBIT 2019 Design Toolkit, measurements are carried out for each design factor. The mapping of COBIT process objectives is executed collaboratively within the company.

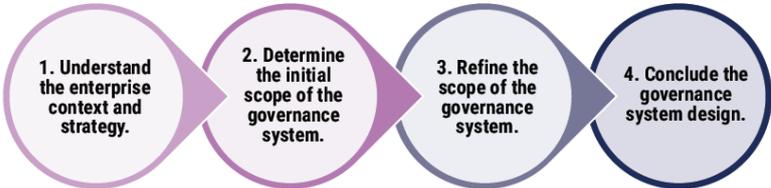


Figure 2. COBIT 2019 Governance Design Flow

Figure 2 represents the steps of the COBIT 2019 IT governance design process, consisting of four steps. These steps will yield the priority objectives of IT governance within the company.

4.3 Understanding Context and Company Strategy

In this stage, it serves as the foundation for understanding and determining the company's strategy, objectives, risk profile, and issues based on the design factors stipulated by COBIT 2019. The company employs a customer-focused strategy.

4.4 Defining the Initial Scope of the Governance System

In this stage, the initial scope of the governance system is determined using the toolkit provided by COBIT 2019 to establish domain objectives. The subsequent step involves considering factors from design factors 1 to 4 to ascertain the company's strategy, corporate objectives, IT risk profile, and IT-related issues. Table 1 presents the outcomes of design factors 1 to 4:

Table 1. Results of Design Factor 1 to 4

Design Factors	Result
1 Enterprise Strategy	Based on the importance value, the company prioritizes client service/stability. This is due to the company's nature as a mining contractor, aligning with the company's mission to provide stable services to its customers.
2 Enterprise Goals	There are 3 enterprise goals with an importance value of 5, namely, customer-oriented service culture, optimization of internal business process functionality, and managed digital transformation programs.
3 Risk Profile	The risk profile design factor is based on its risk ranking. Risk categories with very high rankings include IT expertise, skills & behavior, and Program & projects life cycle management. This is due to the company's heavy reliance on the use of IT for nearly all operational activities. As a result, if these risks were to occur, it would have adverse effects on the company's operational continuity.
4 IT Related Issues	Based on discussions with the company, the IT-related issues that pose a serious level of concern are Frustration between different IT entities across the organization because of a perception of low contribution to business value" and "Insufficient IT resources, staff with inadequate skills or staff burnout/dissatisfaction.

4.5 Improving the Scope of the Governance System

The company expands the initial scope of the governance system by measuring design factors 5-11 to understand vulnerabilities, compliance, IT roles, IT resources, IT implementation methods, used technologies, and company size. Table 2 presents the outcomes of design factors 5 to 10:

Table 2. Results of Design Factor 5 to 11

Design Factors		Result
5	Threat Landscape	The threat level within the company tends to be high, with a value of 60%
6	Compliance Requirements	The compliance requirements level tends to be high, with a value of 90%, attributed to the involvement of vendors in the company's IT projects.
7	Role of IT	The significant IT role within the company is support, as IT plays a vital role in supporting all operational activities at the mining site
8	IT Sourcing Model	A majority of companies in the site area utilize cloud services for their operational activities, with outsourcing having the second highest percentage. This is because many of the company's IT services are managed by third-party providers.
9	IT Implementation Methods	The company employs a traditional method for IT implementation, as this gradual and structured approach minimizes implementation errors.
10	Technology Adoption Strategy	The technology adoption strategy employed by the company leans more towards being a follower, with a value of 60%, reflecting the company's approach of assessing whether new technologies align with its needs before adopting them.
11	Enterprise Size	The number of employees in the company is around 1000, placing it within the category of a large enterprise.

4.5 Conclusion Design Factors

After conducting an analysis to determine the process objectives using design factors (DF1-DF11) based on the COBIT 2019 Design Toolkit, the process objectives to be further evaluated can be concluded as shown in Table 3 below:

Table 3. Design Factor Conclusions

Process	Score
EDM03 (Ensured Risk Optimization)	100%
APO12 (Managed Risk)	80%
MEA03 (Managed Compliance with External Requirements)	75%
MEA04 (Managed Assurance)	80%

Based on the conclusions determined as shown in table 3 process objectives with a value of 75 or higher should be prioritized. The assessment of these process objectives can range from -100 to 100, where 100 represents the highest importance. Objectives with importance values above 75 correspond to process objectives targeting capability level 4. Meanwhile, process objectives with values of 50 or higher aim for capability level 3. Process objectives with values of 25 or higher aim for capability level 2. In this study, the company's priority process objectives are those with a value of 75 or higher. Therefore, based on Figure 4.14, the process objectives with a value of 75 or higher are EDM03 (Ensured Risk Optimization), APO12 (Managed Risk), MEA03 (Managed Compliance with External Requirements), and MEA04 (Managed Assurance).

4.7 Measuring Capability Level

After conducting interviews with company representatives, specifically the IT department Supervisor of this mining company, using the COBIT 2019 framework, the following results were obtained:

4.7.1 EDM03 Ensured Risk Optimization

The results of the calculation process for the EDM03 process objective at level 3 the company are as follows:

Table 4. EDM03 Calculation Results Level 3

Objective process	Total Rating
EDM03.01	26.67
EDM03.02	50
EDM03.03	50
Capability Level Results	Total 126.67
	Average 42.23

Table 4 shows the calculation results for the EDM02 process objective at level 2, which is 91.25%, indicating that the EDM03 process can proceed to level 3. However, the calculation results for the EDM03 process objective at level 3 are 42.23%. Therefore, the company cannot progress to level 4 as the obtained value is below 85%. This is due to the company not having clear guidelines for IT risk management.

4.7.2 APO12 Managed Risk

The results of the calculation process for the APO12 process objective at level 2 of the company are as follows:

Table 5. APO12 Process Calculation Results Level 2

Objective process	Total Rating
APO12.01	67.5
APO12.03	96.67
APO12.05	50
Capability Level Results	Total 214.17
	Average 71.4

Table 5 shows the calculation result for the APO12 process objective at level 2 is 71.4%. Therefore, this company cannot proceed to level 3 as the obtained value is below 85%. This is due to the company lacking clear references regarding the IT risk data collection process.

4.7.3 MEA03 Managed Compliance with External Requirements

The results of the calculation process for the MEA03 process objective at level 3 of the company are as follows:

Table 6. MEA03 Level 3 Process Calculation Results

Objective process	Total Rating
MEA03.01	28.33
MEA03.02	37.5
MEA03.03	35
MEA03.04	15
Capability Level Results	Total 115.83
	Average 28.95

In Table 6, the calculation result for the MEA03 process objective at level 2 is 87.25%, indicating that the MEA03 process can proceed to level 3. However, the calculation result for the MEA03 process objective at level 3 is 28.95%. Therefore, the company cannot proceed to level 4 as the obtained value is below 85%. This is due to the lack of employee awareness in the company about the importance of risk evaluation and the absence of a formal process to integrate risk considerations.

4.7.4 MEA04 Managed Assurance

The results of the calculation process for the MEA04 process objective at level 3 of the company are as follows:

Table 7. MEA04 Level 2 Process Calculation Results

Objective process	Total Rating
MEA04.01	85
MEA04.02	91.67
MEA04.03	85
MEA04.04	95
MEA04.05	91.67
MEA04.06	50
MEA04.08	50
MEA04.09	92.5
Capability Level Results	Total 640.80
	Average 80.1

Table 7 shows the calculation result for the MEA04 process objective at level 2, which is 80.1%. Therefore, this company cannot proceed to level 4 as the obtained value is below 85%. This is due to employees in the company lacking documents and supporting resources related to up-to-date technology data, which hinders the decision-making process.

4.8 Gap Analysis

After calculating all the process objectives, the next step is to proceed to the next phase, which is comparing the expected targets using design factors with the measurement results. If the importance value is 75 or higher, then the required capability level is 4. Gap analysis is necessary to help identify the comparison between the target level and the calculation results, as well as to determine which areas need improvement.

Table 8. Gap Analysis

Objective	Expected Level	Capability Level	GAP
EDM03 - Ensured Risk Optimization	4	3	1
APO12 – Managed Risk	4	3	1
MEA03 - Managed Compliance with External Requirements	4	2	2
MEA04 - Managed Assurance	4	2	2

After getting the results of the gap analysis in Table 8, a radar chart is then prepared to display the radar chart of each of these processes.

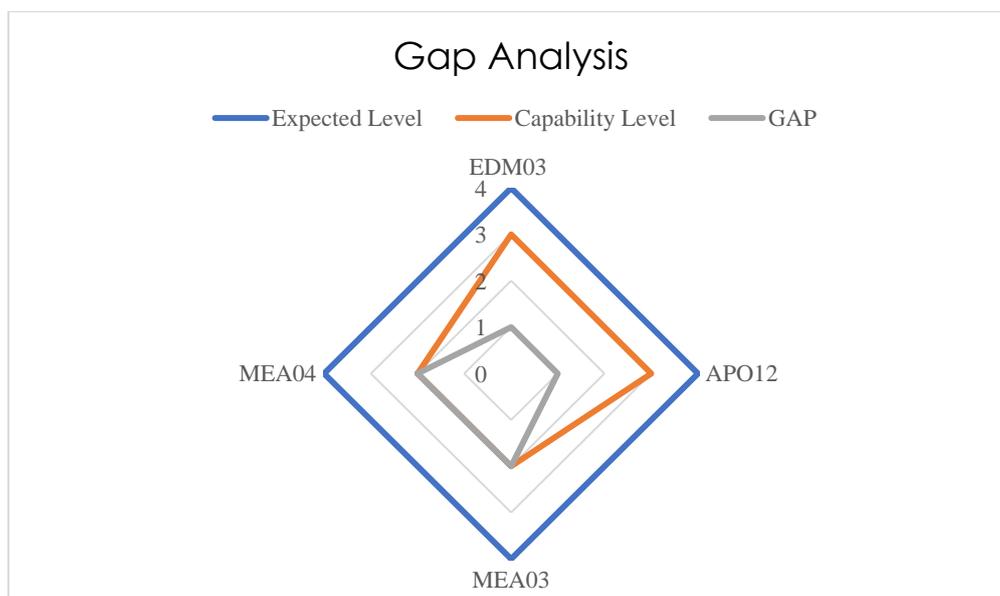


Figure 3. Radar Chart Gap Analysis

Table 8 and Figure 3 display the results of gap analysis that can assist the company in assessing whether the IT governance in the company aligns with the current needs comprehensively. The measurement results for the EDM03 process currently stand at level 3, while the target level is set at level 4. Therefore, to help the company enhance its capability level, the auditor will provide necessary recommendations to elevate the capability level. The measurement outcome for the APO12 process also rests at level 3, indicating a one-level gap from the target level of level 4. Hence, the auditor offers recommendations for capability enhancement. The MEA03 process outcome remains at level 2, thus exhibiting a two-level gap from the target level of level 4. Consequently, the auditor recommends improvements in that area. The MEA04 process outcome also resides at level 2, with a two-level discrepancy from the target level of level 4. Therefore, improvement recommendations are given in that area based on the COBIT theory.

4.9 Recommendations

This recommendation phase aims to address the findings in the short term. Improvement suggestions for the EDM03, APO12, MEA03, and MEA04 process objectives will be elaborated based on the findings and impacts. The suggested improvements are as follows:

Table 9. EDM03 Level 4 Process Improvement Recommendations

Process	Recommendations
EDM03.01	Be more proactive in involving relevant stakeholders, including senior management team, IT department, and other stakeholders.
EDM03.02	Involve relevant authorities, such as senior management, in the process of identifying objectives and metrics, as well as obtaining approval for the measurement approach.

Table 9 presents the recommendations provided to enhance the EDM03 process. The recommendations given are related to efforts to be more proactive in involving stakeholders in decision-making.

Table 10. APO12 Level 4 Process Improvement Recommendations

Process	Recommendations
APO12.01 (1)	Conduct thorough research and evaluation of independent advisors being contacted, including considering their reliability, reputation, and expertise in the fields of law, regulations, and applicable standards.
APO12.01 (2)	Create a document that clearly outlines comprehensive and detailed procedures that serve as a reference for employees.

Table 10 presents the recommendations provided to enhance the APO12 process. The recommendations given are related to the methods of data collection and documentation recording.

Table 11. MEA03 Level 4 Process Improvement Recommendations

Process	Recommendations
MEA03 (1)	Conduct thorough research and careful evaluation of the independent advisors being contacted, including considering their reliability, reputation, and expertise in the field of law, regulations, and applicable standards.
MEA03.01 (2)	Implement an adequate system or process to manage and update requirement logs in a structured and organized manner. Establish a regular update schedule to ensure that requirement records are always up-to-date and relevant.

Table 11 presents the recommendations provided to enhance the MEA03 process. The recommendations given are related to adjusting the applicable regulations within the company's environment and staying updated on regulatory compliance.

Table 12. MEA04 Level 4 Process Improvement Recommendations

Process	Recommendations
MEA04 (1)	Allocate sufficient resources, ensure the sustainability of training and development for the IT assurance team, stay connected with technological advancements and security trends, and foster effective communication and collaboration among all stakeholders.
MEA04 (2)	Ensure clear understanding, effective communication, strong management involvement, and thorough risk analysis.

Table 12 provides the recommendations given to improve the MEA04 process. These recommendations are related to ensuring effective communication between the IT department, stakeholders, and other departments regarding technology implementation.

5.0 CONCLUSION

This mining company has conducted IT governance measurement using the COBIT 2019 framework. The capability level of the EDM03 process is at level 3 with a rating of P (Partially Achieved), for the APO12 process it's at level 2 with a rating of P (Partially Achieved), for the MEA03 process it's at level 3 with a rating of P (Partially Achieved), and for the MEA04 process it's at level 2 with a rating of L (Largely Achieved). Within these four domains, there are several findings that need to be addressed by the company. Moreover, a gap analysis was conducted, revealing a one-level gap from the target level 4 for the EDM03 process, and a one-level gap from the target level 4 for the APO12 process. Additionally, there is a two-level gap from the expected target for the MEA03 process, as well as a two-level gap for the MEA04 process. Taking all these factors into consideration, improvement recommendations have been provided and reviewed by the Supervisor acting as the auditor. These recommendations will be implemented by the company.

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