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Measuring IT Governance in ERP Systems: a COBIT 2019 Evaluation of SAP Material Management Module

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ABSTRACK

Information technology systems such as Enterprise Resource Planning (ERP) are crucial for companies to meet their business needs. However, as companies grow, challenges arise, particularly in the Material Management (MM) module within SAP. This study aims to identify issues such as data inaccuracies and material duplication during the interfacing process with SAP MM and assess IT governance capabilities using the COBIT 2019 framework. The methods used include interviews and literature review, focusing on the domains of APO12 (Managed Risk), BAI03 (Managed Solutions Identification & Build), and DSS03 (Managed Problems). The results show that APO12 reached capability level 4, while BAI03 and DSS03 are at level 3, with a target of level 4. Recommendations include enhancing proactive system design evaluation, developing systematic procedures to address data issues, and implementing permanent solutions to prevent data duplication and inaccuracies during interfacing.

ABSTRAK

Sistem teknologi informasi seperti Enterprise Resource Planning (ERP) sangat penting bagi perusahaan dalam memenuhi kebutuhan bisnis. Namun, seiring pertumbuhan perusahaan, tantangan muncul, terutama pada modul Material Management (MM) dalam SAP. Penelitian ini bertujuan untuk mengidentifikasi masalah, seperti ketidakakuratan data dan duplikasi material selama proses interfacing dengan SAP MM, dan mengukur kapabilitas tata kelola TI menggunakan kerangka kerja COBIT 2019. Metode yang digunakan meliputi wawancara dan studi literatur, dengan fokus pada domain APO12 (Managed Risk), BAI03 (Managed Solutions Identification & Build), dan DSS03 (Managed Problems). Hasil penelitian menunjukkan APO12 mencapai kapabilitas level 4, sedangkan BAI03 dan DSS03 berada di level 3 dengan target level 4. Rekomendasi mencakup peningkatan evaluasi proaktif desain sistem, pengembangan prosedur sistematis untuk mengatasi masalah data, dan implementasi solusi permanen untuk mencegah duplikasi data dan ketidakakuratan selama interfacing.

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INTRODUCTION

The continuously evolving field of information technology presents promising opportunities for businesses aiming to integrate advanced technology to enhance operational efficiency (Tahir et al., 2023). Information Technology (IT) leverages computers to collect, process, store, and manage data with the goal of generating valuable information (Destriana & Juanda, 2023). One common strategy adopted by organizations to achieve this goal is the implementation of Enterprise Resource Planning (ERP) systems, which encompass a suite of software modules evolving from traditional manufacturing resource planning systems (Alvianto et al., 2022). ERP systems aim to integrate various business processes such as ordering, production, accounts payable, and human resources (Febrianto et al., 2022).

Among the diverse ERP system options available for large enterprises, SAP ERP stands out as a widely used application, designed to streamline company operations efficiently and effectively (Li, 2023). This study focuses on evaluating the SAP ERP system, specifically the Material Management (MM) module, within the context of a company operating in the property and real estate sector. The company has been using SAP since 2013 to meet its business needs and standardize processes across its subsidiaries.

The MM module of SAP ERP plays a crucial role in managing inventory, procurement, and related processes that are vital to the company's business operations. Despite the advanced capabilities of the SAP ERP system, the implementation of its Material Management (MM) module has encountered complex and deeply rooted challenges that disrupt the company's core operations. Data inaccuracies during the interfacing process between SAP MM and surrounding systems, coupled with frequent material data duplication, have led to significant inefficiencies across procurement, inventory management, and overall material handling. These issues are not isolated incidents but are symptoms of deeper systemic problems, including unmet conditions during User Acceptance Testing (UAT), the use of non-standard APIs that introduce critical errors, and simultaneous user actions that create conflicts in data synchronization. The consequences are severe: operational delays, increased costs, unreliable data for decision-making, and diminished trust in the system's reliability. These persistent challenges undermine the company's efforts to standardize processes, complicate day-to-day operations, and pose a substantial risk to business continuity, making it imperative to address the root causes through a comprehensive evaluation of IT governance practices.

To address these issues, this study aims to evaluate the Material Management module of the SAP ERP system in the company using the COBIT 2019 framework. Developed by the Information Systems Audit and Control Association (ISACA), COBIT is a widely recognized framework for aligning IT with business goals, enhancing quality and value, and simplifying the implementation of organizational processes from an IT perspective (Vatresia et al., 2022). By leveraging the COBIT 2019 framework, this study seeks to assess capability levels and provide improvement recommendations for the SAP ERP Material Management module in the company.

Therefore, this research will utilize COBIT 2019 to evaluate the SAP Material Management system due to its focus on aligning the company's business goals with the use of information technology (Baisholan et al., 2021). Additionally, the study aims to measure capability levels to assess the progress and achievements of the SAP Material Management system implementation and to evaluate the extent to which IT governance processes in the SAP Material Management system are defined and managed (Sukamto et al., 2021). Similar to previous studies measuring capability levels using COBIT 2019 (Atrinawati et al., 2021) (Ikhsan & Dinar Mutiara Kusumo Nugraheni, 2022) (Safitri et al., 2021) (Angelina & Fianty, 2023), other research has used COBIT 5 for capability measurement (Sudarnoto et al., 2022) (Pratama Arthananda, 2021), while some studies have measured capability and maturity levels using the COBIT 2019 (Sipayung et al., 2022) atau COBIT 4.1 (Erma Zulhijjah & Lutfiyana, 2022). Furthermore, some research has used process mining tools to evaluate the implementation of SAP Material Management that encountered issues related to long lead times for certain materials (Alfi et al., 2022).

Therefore, this study aims to evaluate the SAP ERP system with a specific focus on the Material Management (MM) module, addressing critical issues such as data inaccuracies during interfacing between surrounding systems and SAP MM, and material data duplication within the company. Using the COBIT 2019 framework, this research will systematically assess the IT governance capabilities associated with the MM module. The scope of the study includes evaluating key COBIT 2019 domains—APO12 (Managed Risk), BAI03 (Managed Solutions Identification & Build), and DSS03 (Managed Problems)—to identify current capability levels, governance gaps, and areas requiring improvement. The primary objective is to provide targeted recommendations that enhance IT governance, align the SAP MM module's performance with business objectives, and develop robust solutions to eliminate the identified inefficiencies, ultimately strengthening the company's overall operational effectiveness.

RESEARCH METHODS

The research methodology used in this study serves as a guide for conducting the research. The sequence of steps followed in this study is outlined below. Figure 1 shows the research workflow that will serve as a guideline in this study.

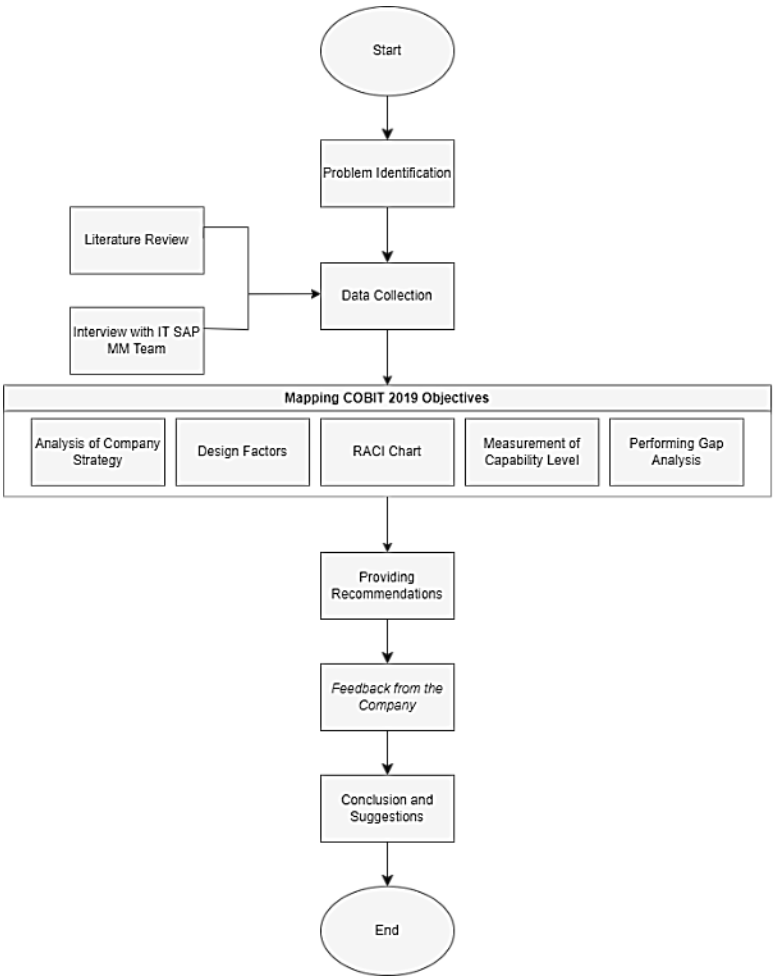

Figure 1. Research Flowchart

Identification Problems

This stage aims to identify the issues faced by the company that will be the focus of this research. Problem identification is conducted through interviews with the company. The identified problems include data inaccuracies between the surrounding system MM and SAP MM during the interfacing process and material data duplication

Data Collection

Data collection is conducted through literature review and interviews. The literature review involves studying relevant books and journals to better understand the concept of COBIT 2019 in measuring capability levels. Additionally, face-to-face interviews are conducted with the Material Management team to understand the issues in the SAP MM system at the company and provide appropriate solutions. These interviews allow for direct insight into the challenges faced by the team, ensuring that the recommendations are tailored to the company's specific needs. The combination of theoretical and practical approaches ensures a comprehensive understanding of the problems and potential solutions.

COBIT 2019 Objective Mapping

In this stage, the problems faced by the company will be mapped using the COBIT 2019 framework, based on selected COBIT objectives from the five available domains (Mubarak & Fianty, 2023). The mapping process will begin with design factors using the COBIT 2019 Design Toolkit.

a. Analyze and understand the company's strategy.
b. This step is carried out to determine the initial scope of the IT governance system by measuring design factors 1-4 and expanding the scope of IT governance in the SAP MM ERP system by measuring design factors 5-11, concluding with the IT governance design results.
c. Use the RACI Chart to identify respondents who will assess the audit documents based on COBIT 2019 objectives tailored to the company's needs (Dwi et al., 2021), using the COBIT 2019 Design Toolkit to determine the evaluation of each objective.
d. Measure the capability levels of the established objectives to determine the current capability level of the company.
e. Conduct a gap analysis between the current capability level and the target capability level to determine the extent of the gap.

Providing Recommendations

Based on the evaluation using the COBIT 2019 framework, the purpose of this research is to formulate recommendations to help the company overcome challenges and enhance its capabilities (Sherly & Fianty, 2024).

Company Feedback

Based on the provided recommendations, the company will review the recommendations to assess whether they are appropriate and can help the company address and resolve its issues.

Conclusion and Suggestion

Based on the research problem formulation, conclusions and suggestions will be provided for the company and for future research.

RESULTS AND DISCUSSION

Identification Problems

The company, operating in the real estate sector, has implemented information technology to support its residential, property, real estate, and commercial projects by utilizing the SAP ERP system. However, the dynamic nature of the company's business innovation and growth has posed several challenges in the implementation of the SAP MM system. Over the past year, issues such as data inaccuracies between the surrounding system MM and SAP MM, as well as data duplication, have emerged. These challenges negatively impact various operational aspects, including the new unit order process, product sales process, procurement procedures, material management, and inventory control. The main causes of these issues include unmet conditions during User Acceptance Testing (UAT), the use of non-standard APIs causing errors, and simultaneous user actions disrupting the unit status changes between SAP and the surrounding

system, resulting in interface monitoring failures. Additionally, material data duplication arises due to factors such as non-compliance with Standard Operating Procedures (SOPs), unclear writing due to SAP limitations, and the use of bilingual language during material description creation. Despite efforts to address these issues and data duplication, including debugging, program updates, and emphasis on SOP compliance, these problems persist, necessitating further investigation and resolution strategies in the company's operations.

COBIT 2019 Objective Mapping

After identifying the issues within the SAP ERP Material Management system, the next step is to measure the IT governance capabilities for the SAP MM system in the company using the COBIT 2019 framework.

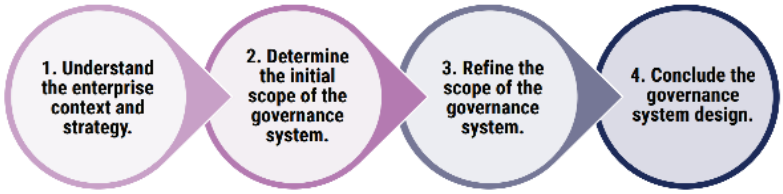

Figure 2. COBIT 2019 governance design workflow
Source: (COBIT, 2018a)

Figure 2 shows the COBIT 2019 governance design workflow. Before proceeding with the IT governance capability measurement, COBIT objectives will be mapped using the COBIT 2019 Design Toolkit. This process involves measuring the impact of each design factor, allowing the company to quantitatively prioritize governance and management objectives.

Conclusions from the Governance System Design

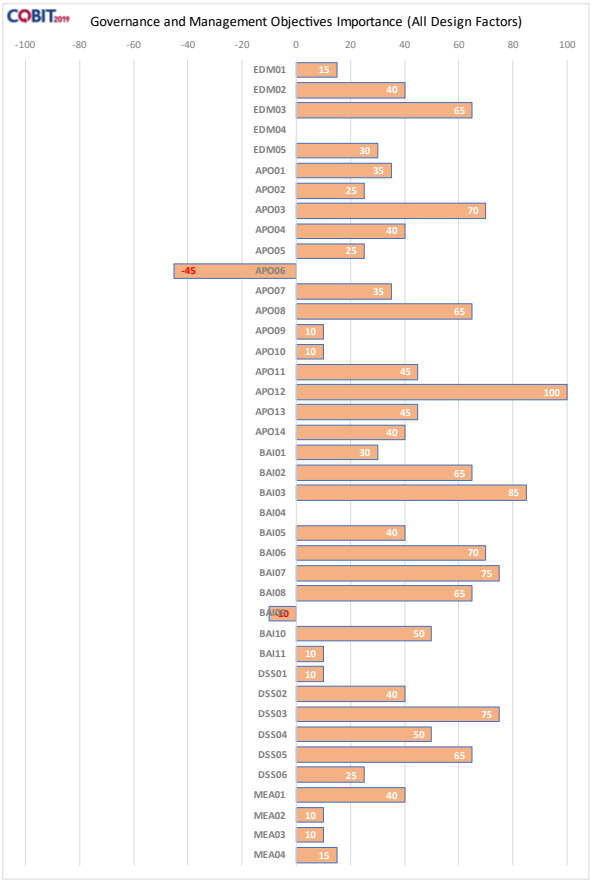

Figure 3. The Conclusion of All Design Factors
Source: : (COBIT, 2018b)

Figure 3 summarizes the overall design factor assessment, resulting in process domains prioritized according to the company's needs. Each process domain is evaluated on a scale from -100 to 100, where 100 is of utmost importance. Process domains with a score below 25 are at capability level 1, scores of 25 or above require capability level 2, scores of 50 or above require capability level 3, and scores above 75 require capability level 4. Based on the design factor results in Figure 4.12, four process domains scored 75 or above. However, after discussions with the company, it was agreed to prioritize three process domains: APO12 (Managed Risk), BAI03 (Managed Solutions Identification & Build), and DSS03 (Managed Problems), as these three domains relate to the current focus areas.

Capability Level Measurement

The capability level is derived from the average assessment of each process domain objective. If the capability level measurement results reach 85%-100%, the process can advance to the next level. Conversely, if the measurement results are less than 85%, the process cannot move to the next level. Activities with scores below 50% are considered findings and will be analyzed for root cause and improvement recommendations. Below are the average calculations for each objective along with their capability levels:

a. APO12 (Managed Risk)

Table 1. Calculation Result of Capability Level for APO12 Level 2

Domain Process	Rating	
APO12.01	93,5%	
APO12.03	92,6%	
APO12.05	90%	
Capability Level Results	**Total**	276,1%
	Average	92,03%

Table 1 shows the calculation results for 3 out of 6 objectives in the APO12 process domain at capability level 2, with an average of 92.03%. This indicates that the capability level can advance to level 3 because the results exceed 85%. This demonstrates that the company has successfully gathered, analyzed, and documented IT risk data, understands the dependencies between business processes and IT infrastructure, and has implemented appropriate controls to mitigate risks and ensure compliance with company policies and risk tolerance.

Table 2. Calculation Result of Capability Level for APO12 Level 3

Domain Process	Rating	
APO12.01	86%	
APO12.02	91%	
APO12.03	91,5%	
APO12.04	92,25%	
APO12.05	89%	
APO12.06	87%	
Capability Level Results	**Total**	536,75%
	Average	89,46%

Table 2 shows the results of the overall objectives calculation for the APO12 process domain at capability level 3. The average result obtained is 89.46%, indicating that the capability level can advance to level 4, as it exceeds the 85% threshold.

Table 3. Calculation Result of Capability Level for APO12 Level 4

Domain Process	Rating	
APO12.01	71%	
APO12.02	91%	
APO12.03	91,5%	
APO12.04	92,25%	
APO12.06	88%	
Capability Level Results	**Total**	442,25%
	Average	88,45%

Table 3 shows the calculation results for 5 out of 6 objectives in the APO12 process domain at capability level 4. The average result obtained is 88.45%, indicating that the capability level has reached the suggested target, which is capability level 4 (Fully Achieved).

b. BAI03 (Managed Solutions Identification &Build)

Table 4. Calculation Result of Capability Level for BAI03 Level 2

Domain Process	Rating	
BAI03.01	91,5%	
BAI03.02	90,5%	
BAI03.03	89,5%	
BAI03.05	88,3%	
BAI03.07	86%	
BAI03.08	78,8%	
BAI03.10	88%	
Capability Level Results	**Total**	612,6%
	Average	87,5%

Table 4 shows the calculation results for 7 out of 12 objectives in the BAI03 process domain at capability level 2. The average result obtained is 87.5%, indicating that the capability level can be advanced to capability level 3 as it achieved a result above 85%.

Table 5. Calculation Result of Capability Level for BAI03 Level 3

Domain Process	Rating	
BAI03.02	74,25%	
BAI03.03	89,5%	
BAI03.04	84%	
BAI03.05	87,8	
BAI03.06	87%	
BAI03.07	83,5%	
BAI03.09	82,6%	
BAI03.10	81,5%	
BAI03.11	84,75%	
BAI03.12	86%	
Capability Level Results	**Total**	840,9%
	Average	84,09%

Table 5 shows the calculation results for 10 out of 12 objectives in the BAI03 process domain at capability level 3. The average result obtained is 84.09%, indicating that the capability level cannot be advanced to capability level 4 as it achieved a result below 85%.

c. DSS03 (Managed Problems)

Table 6. Calculation Result of Capability Level for DSS03 Level 2

Domain Process	Rating	
DSS03.01	88,3%	
DSS03.03	94%	
DSS03.04	90,5%	
Capability Level Results	**Total**	272,8%
	Average	90,93%

Table 6 presents the calculation results for 7 out of 12 objectives in the DSS03 process domain at capability level 2. The average result obtained is 90.93%, indicating that the capability level can be advanced to capability level 3 as it achieved a result above 85%.

Table 7. Calculation Result of Capability Level for DSS03 Level 3

Domain Process	Rating	
DSS03.02	84,6%	
DSS03.03	50%	
DSS03.04	84%	
DSS03.05	71,6%	
Capability Level Results	**Total**	290,2%
	Average	72,55%

Table 7 shows the calculation results for 10 out of 12 objectives in the DSS03 process domain at capability level 3. The average result obtained is 72.55%, indicating that the capability level cannot be advanced to capability level 4 as it achieved a result below 85%.

Gap Analysis

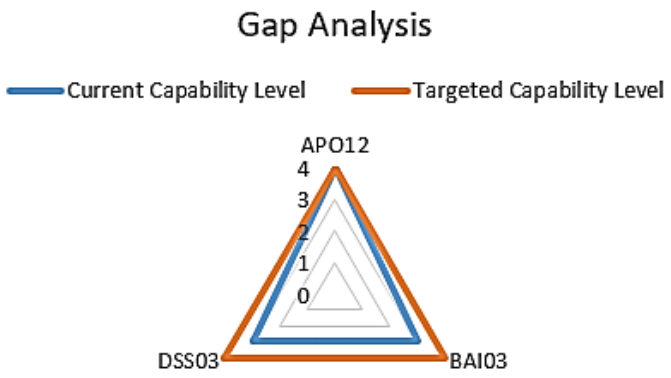

Figure 4. Gap Analysis

Figure 4 depicts the gap analysis between the current capability level and the target in the form of a radar chart. According to the calculation results, the company's capability level in the APO12 process domain has already reached target level 4, whereas BAI03 and DSS03 remain at level 3. This creates a gap of 1 in both the BAI03 and DSS03 domains, as the company's capability target is level 4.

Finding and Impacts

Based on the assessment across the three process domains, there are findings of activities with values ≤ 50 and a rating of Partially Achieved (P), which impact the company. These findings serve as references for providing improvement recommendations. Findings and impacts on activities in the BAI03 domain.08 level 2 indicate values ≤ 50 due to insufficient identification of

cases outside scenarios, leading to the risk of errors and data inaccuracies. Subsequently, findings on activities in the BAI03 domain.02 level 3 show values ≤ 50 due to the lack of evaluation of cases outside scenarios, resulting in bugs and inaccuracies in master data and management reports. Findings on two activities in the DSS03 domain.03 and DSS03.05 level 3 indicate values ≤ 50 due to the absence of actions to address cases outside scenarios and the lack of permanent solutions, allowing similar cases to recur. These activities tend to generate temporary solutions, increasing the risk of recurring incidents because the root problems are not fully addressed.

Recommendations

K-Fold ased on the measurement results of capability levels and their impact findings, the next step is to provide recommendations for improvement and increasing capability levels in accordance with the COBIT 2019 guidelines. The goal of these recommendations is to enhance activities with values ≤ 50 and elevate capability levels within the company.

Table 8. Improvement Recommendations BAI03.08 Level 2

Domain Process	Recomendations
BAI03.08	Improving the testing process by identifying, documenting, and categorizing errors based on their significance, conducting retesting until significant errors are rectified, and ensuring documented audit trails to reduce the risk of data inaccuracies, such as unchanged material data statuses for unit sales and discrepancies in company outcomes.

Table 8 above presents improvement recommendations for activities within the objective of the BAI03.08 process domain level 2. The recommendation provided is for the company to enhance the testing process by identifying potential occurrences outside the testing scenarios and documenting these events to ensure proper documentation.

Table 9. Improvement Recommendations BAI03.02 Level 3

Domain Process	Recomendations
BAI03.02	Enhancing proactive design evaluation by identifying and rectifying emerging weaknesses outside the scenario in the production environment, to prevent inaccuracies or data duplication that could lead to inaccuracies in presenting master data and management reports. For instance, occurrences of unchanged material statuses and errors in material usage due to material duplication.

Table 9 above presents improvement recommendations for activities within the objective of the BAI03.02 process domain level 3. This is done to evaluate system design weaknesses and identify flaws. The recommendation provided is for the company to enhance proactive design evaluation by identifying and rectifying weaknesses outside the scenario in the production environment.

Table 10. Improvement Recommendations DSS03 Level 3

Domain Process	Recomendations
DSS03.03	Evaluating, prioritizing, and addressing cases outside scenarios through IT change management to prevent the recurrence of similar cases, such as inaccuracies in unit sales material data statuses, by ensuring efficient collaboration with relevant stakeholders.
DSS03.05 (Level 3)	Developing more systematic and structured procedures to identify the root causes of problems and implement permanent solutions to reduce the risk of recurring similar incidents..

Table 10 displays improvement recommendations for activities within the objective of the DSS03.03 and DSS03.05 process domain level 3. The recommendation provided is to enhance the identification process, develop systematic procedures for cases outside scenarios, and identify the root causes of issues while providing permanent solutions to prevent the recurrence of similar cases.

Table 11. Recommendations to Enhance BAI03 Level 4

Domain Process	Recomendations
BAI03.06	• Performing routine monitoring of solution quality according to project needs and company policies is highly recommended. • Implementing development methods focused on testing, automated integration, and periodic evaluation in applications can reduce the risk of material data duplication. • Recording all information regarding reviews, outcomes, exceptions, and improvements made, and routinely evaluating their quality, can help enhance performance and reduce risks.
BAI03.10	Conducting routine monitoring of maintenance activity patterns and volumes to identify potential uncommon quality or performance issues and evaluating the potential cost benefits of any major repairs or replacements that may be required.

In Table 11, recommendations for enhancing the capability level in the BAI03 process include routine monitoring of solution quality, analysis of maintenance activity patterns and volumes to detect potential issues, and comprehensive documentation related to reviews, outcomes, and improvements. Additionally, it is advisable to implement development methods focused on testing, automated integration, and periodic evaluation in applications.

Table 12. Recommendations to Enhance DSS03 Level 4

Domain Process	Recomendations
DSS03.04	Continuously monitoring the long-term impact of known issues and errors on services and conducting regular reviews to ensure the success of major issue resolutions.
DSS03.05	• Tracking the total cost of issues, then documenting modification efforts resulting from issue management activities, such as addressing known issues and errors, and reporting them. • Monitoring the total costs associated with issues, then documenting any modification efforts arising from issue management activities, including corrective actions and identified error corrections, and creating reports on them. • Enhancing resource utilization efficiency and reducing reliance on

In Table 12 above, the recommendations for enhancing the capability level in the DSS03 process include monitoring the long-term impact of known issues and errors, total cost oversight of issues, and reporting to monitor resolutions according to business needs. It is also advisable to improve fund utilization efficiency and reduce reliance on temporary solutions.

Company Feedback

Based on the findings and their impacts, improvement recommendations and capability level enhancements have been provided, reviewed, and approved by the company. The company will prioritize the development of permanent solutions and the identification of out-of-scenario incidents. Once permanent solutions are implemented and preventive measures for out-of-scenario

incidents are in place, the company will proceed with the implementation of other recommendations gradually.

CONCLUSION

The results of this study indicate that the capability level of the APO12 process domain has reached target level 4, while the BAI03 and DSS03 process domains are at level 3 with a target of level 4. This indicates a one-level gap between the current capability level and the desired target. This research is in line with previous studies that also utilized the COBIT 2019 framework to evaluate IT governance and provide improvement recommendations. The recommendations provided focus on developing permanent solutions and identifying and addressing issues at their root causes.

From the findings of this study, it can be concluded that the capability level of the APO12 process domain has reached target level 4, while the BAI03 and DSS03 process domains are at level 3 with a target of level 4, indicating a one-level gap between the current capability level and the desired target. The recommendations focus on developing permanent solutions and addressing issues at their root causes.

A suggestion for future research utilizing the COBIT 2019 framework is to conduct a study on measuring the maturity level of IT governance in ERP systems in the property industry using the COBIT 2019 framework, as well as conducting research on measuring the capability level of IT governance in ERP systems in the EDM or MEA process domains, but in different industries, using the COBIT 2019 framework.

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