Performance Analysis of Information Technology Services in Higher Education using COBIT 2019

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Abstract

Higher education institutions increasingly leverage information technology (IT) to improve their services. IT services are crucial in managing and supporting students, faculty, and staff. As IT governance evolves, measuring performance to identify potential service delivery issues becomes essential. This research adopts the COBIT 2019 framework, particularly the Deliver, Service, Support (DSS) domain, as a structured approach to assessing IT services' capability and maturity levels at a public university in Indonesia. The research methodology involves identifying measurement areas, collecting data, evaluating capability and maturity levels, validity testing, and providing recommendations. The study results show that the IT service maturity level of the university related to management practices in managed operations (DSS01), managed service requests and incidents (DSS02), and managed problems (DSS03) has reached level 3. Five activities in the IT service management have not been performed optimally: monitoring incidents and problems to improve task reliability, integrating key internal IT processes with outsourced service providers, comparing measures and plans with insurance policy requirements, evaluating physical modifications to IT sites to re-evaluate environmental risks, and including review knowledge in the service review meeting with the business customer. The validity results indicate that most of the measurement results align with the actual conditions of IT services, with an average validity score of 4.14. This study suggests specific improvements related to those five activities feasible for the university to implement to enhance its IT services.

Keywords: Capability level; COBIT 2019; Governance; IT services; Maturity level

1. Introduction

An organization or institution is required to manage services as part of its business objectives. One way to achieve this is by implementing Information Technology (IT) governance within the organization. IT governance involves organizational capacity by engaging the board, executive management, and IT management to control the formulation and implementation of IT strategies, ensuring the alignment of business and IT (Grembergen & Haes, 2009). IT governance becomes a component that integrates organizational management, including leadership, structure, and processes, to ensure that IT can sustain and advance organizational goals (Surendro, 2009). Organizations use IT governance as a framework in IT decision-making to guide user behavior and ensure the smooth operation of IT activities (Willy & HM, 2011). Every organization employing IT governance needs to measure the level of capability and maturity to identify potential issues in service delivery. Capability refers to the organization's ability to effectively apply and execute IT governance principles and practices. Meanwhile, maturity is the organization's progress in IT governance principles and practices, measuring how well it has implemented good IT governance practices.

COBIT 2019 is a framework that provides principles, practices, tools, and models to enhance the trust and value of organizations. It is also an advanced framework compared to COBIT 5. One of the differences is that in COBIT 5, capability levels and maturity levels are combined, whereas in COBIT 2019, capability and maturity levels are distinct. COBIT 2019 includes five process capability models to measure the level of IT governance capability in the EDM (Evaluate, Direct, and Monitor), APO (Align, Plan, and Organize), BAI (Built, Acquire, and Implement), DSS (Deliver, Service, and Support), and MEA (Monitor, Evaluate, and Assess) domains.

Previous studies used COBIT 5 to gain insights into IT governance (Setiawan & Andry, 2019), create an evaluation framework for academic information systems in higher education (Witjaksono, 2019), evaluate service management in local government agencies (Andriansyah et al., 2019), and measure the capability levels of information system governance in higher education through an information system audit (Bahari et al., 2019). Meanwhile, E. Y. Putra et al. (2020) used a combination of the EDM, APO, and DSS domains to measure the maturity levels of public services in a local government command center.

Since the publication of COBIT 2019, several researchers have conducted studies using COBIT 2019, particularly related to IT services associated with the DSS domain. The DSS domain consists of six management objectives: DSS01 (Managed Operations), DSS02 (Managed Services Request and

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Incidents), DSS03 (Managed Problems), DSS04 (Managed Continuity), DSS05 (Managed Security Services), and DSS06 (Managed Business Process Controls). IT services performance is engaging to review and analyze because it significantly improves customer satisfaction internally and externally. Optimal IT services can also enhance the operational efficiency of the organization. Saleh et al. (2021) measured IT performance in a polytechnic, with findings indicating a maturity level of 3.21, suggesting suboptimal operational efficiency of the IT system. Wijaya & Lestari (2021) evaluated the performance of an e-commerce system, revealing that the system needed to meet requirements fully. Iman et al. (2023) measured the maturity level of the e-SA information system of a foundation, achieving maturity levels of 3 and 4. Additionally, research using the DSS domain by Putra et al. (2022) on network service governance in higher education measured maturity levels, reaching level 3.

Some studies combined the DSS domain with other domains in COBIT 2019. Sahrul & Hadisaputro (2021) evaluated the information system services of a village using the DSS and MEA domains. Putra et al. (2020) planned IT governance audits using the DSS, APO, and EDM domains. Windasari et al. (2022) measured the achievement of IT implementation using the DSS and MEA domains. Atrinawati et al. (2021) assessed the capability levels of universities using the APO, BAI, and DSS domains. Darmajaya & Wasilah (2022) used the APO and DSS domains to determine capability and maturity levels in a provincial religious affairs office. Windasari, Yonanta, et al. (2022) audited IT governance in higher education using the DSS and MEA domains.

Higher education is an organization that urgently needs to implement IT governance. Higher education requires IT governance to manage and serve students, faculty, and staff. Higher education in Indonesia faces essential issues due to disruptions of the academic information system website, affecting exam administration and leading students to retake exams. Therefore, research in higher education is crucial, especially in reviewing IT service capability and maturity levels. Our study aims to analyze IT service performance at a public university in Indonesia. IT service performance is measured using capability and maturity levels concerning COBIT 2019. Through this study, the university can identify areas that need improvement in its operations and subsequently make enhancements to improve the performance of its IT services.

2. Theoretical Framework

This section explains the concepts used to design and conduct the study. The concepts reviewed include IT governance, COBIT 2019, and performance measurement of IT service.

2.1. IT Governance

Governance is defined as the responsibility of executives and the board of directors, consisting of leadership, organizational structures, and processes that ensure corporate IT sustains and extends the organization's strategy and objectives. Governance is a process carried out by an organization or society to address existing problems. Governance includes institutions as well as structures of authority and collaboration aimed at allocating resources or coordinating and controlling various activities within society (Willy & HM, 2011).

IT governance is the capacity of an organization, carried out by the board, executive management, and IT management, to control the formulation and implementation of IT strategy and, in this way, ensure the alignment between business and IT (Grembergen & Haes, 2009).

2.2. COBIT 2019

COBIT 2019 is the latest version of COBIT, succeeding COBIT 5.0. ISACA developed COBIT and provides IT governance and management guidelines within a company's business processes. COBIT 2019 has five domains: EDM (Evaluate, Direct, and Monitor), APO (Align, Plan, and Organize), BAI (Build, Acquire, and Implement), DSS (Deliver, Service, and Support), and MEA (Monitor, Evaluate, and Assess). The DSS domain is a management domain that focuses on managing IT services within an organization (ISACA, 2018).

2.3. Performance Measurement of IT Service

The DSS domain coordinates and executes operational activities and procedures to deliver internal and external IT services. This includes implementing predefined standard operating procedures and conducting necessary monitoring activities (ISACA, 2018). This domain is divided into six components: DSS01 Managed Operations, DSS02 Managed Services Request and Incidents, DSS03 Managed Problems, DSS04 Managed Continuity, DSS05 Managed Security Services, and DSS06 Managed Business Process Controls.

Capability level is an indicator of how well the implementation and performance of a process are. The capability level ranges from 0 to 5 (ISACA, 2018). Table 1 illustrates the model and capability levels along with their characteristics.

Table 1. Capability Level

Capability Level	Description
0	The organization lacks basic capabilities, employs an incomplete approach to addressing governance and management objectives, and fails to meet the intent of existing process practices.
1	Existing processes more or less achieve their objectives by applying a set of incomplete activities characterized as initial or intuitive.

Capability Level	Description
2	The organization executes processes that achieve its objectives by applying a complete set of essential activities.
3	Processes use organizational assets to achieve their objectives much more efficiently. These processes are well-defined.
4	Processes achieve well-defined objectives, and the organization measures their performance.
5	Processes achieve well-defined objectives, are well-measured for performance, and the organization actively pursues continuous improvement.

The measurement of capability levels aims to determine the capability level that aligns with the university's existing IT service system. The measure of capability levels utilizes the reference capability levels for each activity within each IT service management process according to COBIT 2019. Calculating the percentage of capability level achievement is carried out using equation (1).

$$\% \ Achievement = \frac{Number \ of \ activites \ carried \ out}{Number \ of \ activities} \times 100\% \quad (1)$$

The cumulative process capability levels in a specific focus area are referred to as the maturity level (ISACA, 2018). Table 2 defines maturity levels as performance metrics for the existing focus areas.

Table 2. Maturity Level

Maturity Level	Description
0	Incomplete - Work may or may not be finalized to meet governance and management goals within the focus area.
1	Initial - Work is finished, but the overall objectives and goals of the focus area have not been fully attained.
2	Managed - Plans are in place, and performance metrics are tracked, though not yet standardized.
3	Defined - Organizational standards are established and followed.
4	Quantitative - Decisions and actions are driven by data, with measurable performance improvements.
5	Optimizing - The company prioritizes ongoing improvement and refinement.

3. Research Method

This research will go through several steps in the research methodology, as depicted in Figure 1.

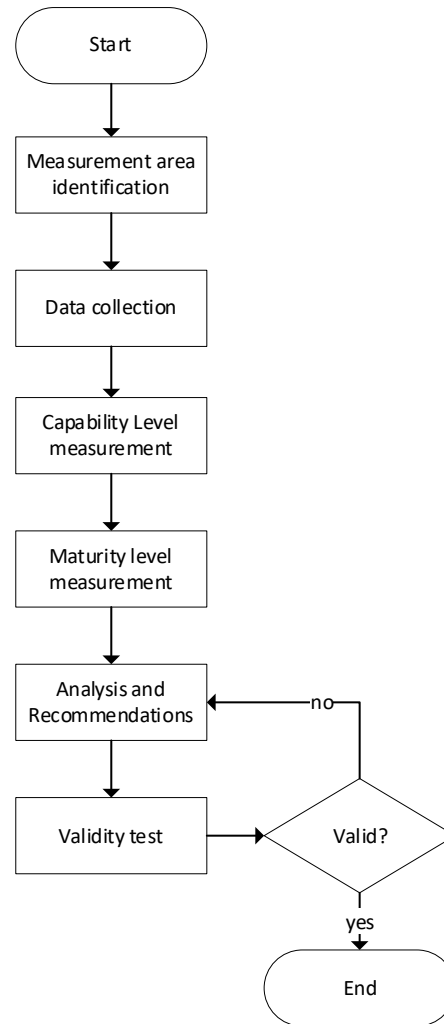Figure 1: Research Method

3.1. Measurement Area Identification

Identification of measurement areas using the awareness level measurement questionnaire provided by COBIT 2019. The questionnaire was filled out through interviews with the Director of the Information Systems Directorate and the Head of Technical Services and Web Systems, who understand the condition of the university's IT services.

Table 3 presents the results of management awareness diagnostics in the DSS domain within the university. Based on Table 3, it can be observed that DSS01, DSS02, and DSS03 have the highest total risk compared to other domains. The total risk is determined by the level of importance on a scale from 1 (not at all) to 5 (very) and the level of performance from 1 (very well) to 5 (do not know or badly). The university has also conducted internal audits for DSS01, DSS02, and DSS03, so formal documents are fully available. Therefore, DSS01, DSS02, and DSS03 are the most appropriate areas for measuring capability and maturity levels.

Table 3. Results of Measurement Area Identification in the DSS Domain

| No. | COBIT 2019 domains and objectives | Risk | | | Who does it? | | | | Audited | Formality |
		Importance (1-5)	Performance (1-5)	Risk Total	IT	Non-IT/Other	Outside	Do Not Know		
1	DSS01 - Managed Operations	3	3.6	10.8	V				V	V
2	DSS02 - Managed Services Request and Incidents	4	3.6	14.4	V				V	V
3	DSS03 - Managed Problems	4	3.6	14.4	V				V	V
4	DSS04 - Managed Continuity	4	2	8		V			X	X
5	DSS05 - Managed Security Services	4	2	8	V				X	V
6	DSS06 - Managed Business Process Controls	3	2	6		V			V	V

3.2. Data Collection

Data was collected through interviews to discover information unavailable from document analysis. Interview questions will refer to activities outlined in COBIT 2019 involving IT service stakeholders in the university, aligning with the RACI chart in the measurement area.

Question items were prepared in the instrument, which served as a reference during the interview. The questions were designed for each activity in each management practice based on COBIT 2019. An IT governance expert performed content validation to evaluate whether the instrument covered all aspects relevant to the capability level.

Respondents in this study are individuals responsible for the specific areas adjusted according to the RACI model in COBIT 2019. Seven respondents were involved in data collection for performance measurement, including the Director of Academic Affairs and the Director of Resources representing the business process owners, the Director of the Information Systems Directorate, the Head of Technical Services and Web Systems, the Head of Digitization and Systems Development, the Head of Data Security, and the Head of System and Network Operations.

3.3. Capability Level Measurement

The assessment employs the NPLF criteria, which stands for not achieved, partially achieved, largely achieved, and fully achieved. A university that receives a fully achieved score has fulfilled the core model at a certain level. If the calculations fall into the categories of not achieved, partially achieved, and largely achieved, specifically at levels below 85%, the capability level calculation will halt at that particular level. If the calculation results surpass 85%, the process can proceed to the next level.

3.4. Maturity Level Measurement

The next step involves calculating and determining the focus areas at the maturity level within the university based on the capability level values from the previous process. This process aims to define maturity levels as performance metrics at the level of existing focus areas.

3.5. Recommendations

The recommendations are based on the results of the existing capability level achievements. Recommendations will align with activities at the current capability level, thereby enabling progression to the next capability level. Furthermore, these recommendations will serve as a guide for the university in further developing IT services.

3.6. Validity Test

The validity test was conducted by key stakeholders involved in the university's IT service management. These stakeholders are respondents who were also involved in the capability level measurement. The measurement analysis results and recommendations will be presented to them for review to determine if the results represent the actual conditions in IT services. The review uses a questionnaire with a scale from 1 to 5, indicating a range from results that do not reflect the actual conditions to results that fully reflect the actual conditions. Stakeholders also provide feedback on whether the recommendations are feasible to implement or not.

4. Results and Discussion

This section explains the results and discussion of the data collection, the discussion of the capability level measurements for each process in the DSS domain from DSS01 to DSS03, the results of maturity level measurements, and recommendations based on unfulfilled activities in the DSS01 to DSS03 domains.

4.1 Data Collection Result

The instrument used as a reference in the interview has been declared content-valid by an IT governance expert. The instrument's content covers all aspects for measuring the capability level in the selected domain.

The data collection results include responses to interview questions from the respondents and evidence from the interview outcomes. The interview was conducted through a focus group discussion (FGD). The interview involved seven key roles in the university's IT service management, as outlined in Section 2. Each question item was asked of personnel

who have the responsible (R) or accountable (A) role for the related activities according to the RACI diagram. The interview was conducted openly, allowing respondents to discuss and agree on answers.

4.2 Analysis of Capability Level Measurement Results

The overall measurement results for the DSS01, DSS02, and DSS03 domains yielded capability level achievement, as shown in Table 4.

Table 1. Overall Results of Capability Level Measurement

Management Practice	Capability Level	Achievement Percentage
DSS01 - Managed Operations	Level 2	100%
	Level 3	85.71%
	Level 4	83.33%
DSS02 - Managed Services Request and Incidents	Level 2	100%
	Level 3	100%
	Level 4	100%
	Level 5	100%
DSS03 - Managed Problems	Level 2	100%
	Level 3	100%
	Level 4	100%
	Level 5	0%

4.2.1. Measurement Results for the DSS01 Domain

Based on COBIT 2019, the DSS01 domain has five subprocesses: DSS01.01, DSS01.02, DSS01.03, DSS01.04, and DSS01.05. The DSS01 domain has 12 activities at level 2, 14 at level 3, 6 at level 4, and 1 at level 5.

According to the interview results, the university has not optimally performed two activities at level 3. In DSS01.2, the activity: "Integrate critical internal IT management processes with those of outsourced service providers" has not been performed optimally. The university states that they have integrated critical internal IT management processes with the processes of outsourcing service providers. However, they lack documented evidence of the integration results. In DSS01.04, the activity: "Compare measures and contingency plans against insurance policy requirements and report results" has also not been performed optimally. The university has not even conducted discussions regarding this activity, explicitly comparing measures and contingency plans against insurance policy requirements and reporting the outcomes to address compliance points promptly.

The university has also not conducted activities at level 4 in DSS01.05: "Analyze physical alterations to IT sites or premises to reassess the environmental risk." The university has not even conducted discussions regarding this activity, specifically related to analyzing physical changes to the IT site or building to reassess environmental risks.

Based on equation (1), DSS01 achieves the highest capability at level 4 with 83.33% (largely achieved). Therefore, DSS01 has reached level 3 with 85.71% (fully achieved). This level indicates that processes use university assets to achieve their objectives more efficiently. These processes are well-defined.

4.2.2. Measurement Results for the DSS02 Domain

According to COBIT 2019, the DSS02 domain has seven subprocesses: DSS02.01, DSS02.02, DSS02.03, DSS02.04, DSS02.05, DSS02.06, and DSS02.07. The DSS01 domain has 15 activities at level 2, 7 at level 3, 2 at level 4, and 1 at level 5.

According to the interview results, the university has performed all activities in the DSS02 domain. Therefore, DSS02 has reached level 5 with 100% (fully achieved).

4.2.3. Measurement Results for the DSS03 Domain

As outlined in COBIT 2019, the DSS03 domain consists of five subprocesses: DSS03.01, DSS03.02, DSS03.03, DSS03.04, and DSS03.05. The DSS01 domain includes nine activities at level 2, 8 at level 3, 5 at level 4, and 1 at level 5.

According to the interview findings, the university has not fully optimized one activity at level 5 in DSS03.04: "Make sure the knowledge learned from the review is incorporated into a service review meeting with the business customer." This activity aims to integrate insights from reviews into discussions with business customers during service review meetings. The university indicated that they only document review outcomes and use them as a reference, but they do not conduct service review meetings with business customers.

DSS03 has achieved capability level 4 with 100% (fully achieved). Based on Table 2, the capability level at level 4 indicates that university processes have achieved well-defined objectives and the university has measured their performance.

4.3 Results of Maturity Level Measurement

The results of the maturity level measurement refer to the capability level measurement results in Table 4. Table 4 indicates that two domains have not reached the highest level of capability achievement. These domains are DSS01 (level 3) and DSS03 (level 4). Therefore, the existing maturity level only reaches level 3. Based on Table 3, the maturity level at level 3 indicates that the university processes are well-defined. University standards are established and followed.

4.4 Recommendations

Based on the existing measurement results, the university needs to improve the activities in the DSS01.01, DSS01.02, DSS01.04, DSS01.05, and DSS03.04 domains. This study provides recommendations to the university to enhance the capability level in each domain.

To improve the achievement level of the management objective DSS1.01, the university should record the results and monitor incidents related to existing operational procedures. The goal is to detect any changes in incidents and compare changes that occur intentionally or unintentionally.

Furthermore, to achieve the management objective of the DSS01.02, the university should record the results of integrating critical internal IT management processes with outsourcing service providers. The purpose is to serve as evidence of errors in internal IT management processes with outsourcing service providers.

Meanwhile, the recommendation for the management objective DSS01.04 is for the university to create steps or contingency plans related to insurance policy requirements and the reported outcomes. These contingency steps can include goals, implementation, planning principles, assumptions about what will happen about insurance policy requirements, and reference needs or requirements for existing activities.

The recommendation for capability level improvement of DSS01.05 is that the university needs to analyze physical changes to the IT site or building to review potential environmental risks and formulate the most appropriate handling methods when such events occur.

Additionally, the study also provides a recommendation for the improvement of the capability level DSS03.04. The recommendation is for the university to conduct meetings that discuss findings or new features with business customers, both internal and external to the university, with clear and easily understandable delivery.

4.5 Validity Test Results

The relevant stakeholders have validated the capability and maturity level measurement results. The results indicate that most measurement results align with the actual conditions of IT services at the university, with an average validity score of 4.14.

Stakeholders also provided feedback on the initial recommendations that we formulated. The final recommendations obtained from this study have been deemed feasible for implementation.

4.6 Discussion

Based on the assessment results and interview findings, the university's capability and maturity levels values reach level 3. This achievement is higher than other universities' capability and maturity levels in several previous studies. A study on a polytechnic using the DSS01 domain in COBIT 2019 reached capability and maturity levels at level 2 (Saleh et al., 2021). The university in this study has a similar level of value to the polytechnic. However, a study on a university using the DSS01, DSS02, and DSS03 domains for the service delivery process in COBIT 5 reached capability and maturity levels at level 4 (Witjaksono, 2019). Therefore, the university in this study can implement the recommendations from this research to enhance capability and maturity levels to compete with other universities.

5. Conclusion

The conclusion from the research on the capability level and maturity level of IT services using COBIT 2019 in a university are as follows. Based on the performance analysis results, the university's capability level has reached level 3 for DSS01, level 5 for DSS02, and level 4 for DSS03. According to the analysis of all capability levels, the university's maturity level of IT services reached level 3, indicating that the university processes are well-defined. University standards have guided the organization. The validity testing indicates that most measurement results represent the actual conditions of IT services, with an average validity score of 4.14.

The university has not performed five activities optimally related to the management objectives: DSS01.01, DSS01.02, DSS01.04, DSS01.05, and DSS03.04. The five activities are (1) monitoring incidents and problems in operations and taking action to improve task reliability, (2) integrating key internal IT processes with outsourced service providers, (3) comparing measures and plans with insurance policy requirements and reporting findings, (4) analyzing physical changes to IT sites to reassess environmental risks, and (5) ensuring the knowledge from the review is included in the service review meeting with the business customer. This study provides recommendations to improve those five activities, including recording results and monitoring incidents related to existing operational procedures; recording results of integrating critical internal IT management processes with processes from outsourcing service providers; creating steps or contingency plans related to insurance policy requirements and reported outcomes; conducting an analysis of physical changes to the IT site or building to review potential environmental risks and formulate the most appropriate handling methods when such events occur; and conducting meetings to discuss findings or new features with business customers, both internal and external to the university, with clear and easily understandable delivery. A suggestion for further research is to conduct an overall calculation of capability and maturity levels for the entire DSS domain.

Acknowledgment

Bibliography

Andriansyah, A., Perdanakusuma, A. R., & Aknuranda, I., 2019. Evaluasi Tingkat Kapabilitas Manajemen Permintaan dan Insiden Layanan (DSS02) Pada Badan Kepegawaian Daerah Kabupaten Lumajang Menggunakan Framework COBIT 5. Jurnal Pengembangan Teknologi

Informasi dan Ilmu Komputer, 3(12), 10916–10925. Retrieved from http://j-ptiik.ub.ac.id

Atrinawati, L. H., Ramadhani, E., Fiqar, T. P., Wiranti, Y. T., Abdullah, A. I. N. F., Saputra, H. M. J., & Tandirau, D. B., 2021. Assessment of Process Capability Level in University XYZ Based on COBIT 2019. Journal of Physics: Conference Series, 1803(1). https://doi.org/10.1088/1742-6596/1803/1/012033

ISACA, 2018. COBIT 2019 Framework Governance and Management Objectives. Information Systems Audit and Control Association.

Bahari, B.A., Adnan, F., & Prasetyo, B., 2019. Audit Capability Level Using COBIT 5.0: A University Customer Care Center at University of Jember. International Conference on Computer Science, Information Technology and Electrical Engineering (ICOMITEE). https://doi.org/10.1109/ICOMITEE.2019.8921118

Darmajaya, & Wasilah, 2022. Assessment Capability Level dan Maturity Level Tata Kelola TI pada Kantor Kementerian Agama Kabupaten Pesawaran Provinsi Lampung Menggunakan Framework COBIT 2019. KONSTELASI, 2(2). https://doi.org/10.24002/konstelasi.v2i2.5553

Grembergen, W. Van, & Haes, S. De, 2009. Enterprise Governance of Information Technology. https://doi.org/10.1007/978-0-387-84882-2

Iman, T. S., Destriani, M., & Ridwaudin, A. R., 2023. Audit Tata Kelola Sistem Informasi E-SA Menggunakan Framework COBIT 2019 Domain DSS pada Yayasan As Syifa Al Khoeriyah Subang. Global, 10(1). Retrieved from http://ejournal.unsub.ac.id/index.php/Fasilkom

Putra, A. W. N., Sunyoto, A., & Nasiri, A., 2020. An Information Technology Governance Audit Planning Calibration Laboratory using Cobit 2019 (Case study: BSML Regional II Calibration Laboratory, Ministry of Trade). JURNAL FASILKOM, 10(3). https://doi.org/10.37859/jf.v10i3.2272

Putra, E. Y., Lombone, H. N., Purba, H. D., Gosal, M. C., & Sitepu, S. I. B., 2020. Measuring the Maturity Level of Public Service Cerdas Command Center (C3) using COBIT 5.0 at the Pemkot Manado. Cogito Smart Journal, 6(2). https://doi.org/10.31154/cogito.v6i2.275.298-309

Putra, S., Herman, & Yudhana, A. (2022). Evaluasi Tata Kelola Layanan Jaringan menggunakan COBIT 2019 pada Sekolah Tinggi Ilmu Kesehatan. RESISTOR, 5(2). https://doi.org/10.24853/resistor.5.2.119-126

Sahrul, & Hadisaputro, E. L., 2021. Evaluation of Yankel Services using DSS and MEA Domains Based on The 2019 COBIT Framework (Case Study of Kelurahan Manggar). SEMINASTIKA, 3(1), 138–145. https://doi.org/10.47002/seminastika.v3i1.264

Saleh, M., Yusuf, I., Suijaini, H., Harry, Hidayat, M. N., Prasetya, I. A., Pratiwi, G., Rezza, M., Hariyanto, Rohendi, R., & Waliyuddin, M.H., 2021. Penerapan Framework COBIT 2019 pada Audit Teknologi Informasi di Politeknik Sambas. Jurnal Edukasi dan Penelitian Informatika, 7(2). https://doi.org/10.26418/jp.v7i2.48228

Setiawan, A. K., & Andry, J. F., 2019. IT Governance Evaluation Using COBIT 5 Framework on the National Library. Jurnal Sistem Informasi, 15(1). https://doi.org/10.21609/jsi.v15i1.790

Surendro, K., 2009. Implementasi Tata Kelola Teknologi Informasi Edisi 1 (1st ed.). Informatika.

Wijaya, A. F., & Lestari, M., 2021. Evaluasi Kinerja E-Commerce Berdasarkan Perspektif Pengguna Menggunakan Framework COBIT. Inspiration Jurnal Teknologi Informasi dan Komunikasi, 11(2). https://doi.org/10.35585/inspir.v11i2.2662

Willy, A., & HM, J., 2011. Sistem Tata Kelola Teknologi Informasi (1st ed.). Andi.

Windasari, I. P., Rochim, A. F., Alfiani, S. N., & Kamalia, A., 2022. Audit Tata Kelola Teknologi Informasi Domain Monitor, Evaluate, and Asses dan Deliver, Service, Support Berdasarkan Framework COBIT 2019. J. Sistem Info. Bisnis, 11(2), 131–138. https://doi.org/10.21456/vol11iss2pp131-138

Windasari, I. P., Yonanta, M. Y., Himawati, R. Y., & Rochim, A. F., 2022. Audit Tata Kelola Teknologi Informasi pada Perusahaan menggunakan Domain DSS dan MEA Kerangka Kerja COBIT 2019 (Studi Kasus: Fakultas Teknik UNDIP). TEKNIK, 43(1), 67–77. https://doi.org/10.14710/teknik.v43i1.34121

Witjaksono, R. W., 2019. Audit Sistem Informasi Akademik Universitas Telkom menggunakan Framework COBIT 5 Domain DSS untuk Optimasi Proses Service Delivery. Jurnal Rekayasa Sistem & Industri (JRSI), 6(1). https://doi.org/10.25124/jrsi.v6i1.341