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Assessment of IT Risk Management at the Faculty of Industrial Engineering, Telkom University, Utilizing the COBIT 2019 Framework's APO12 Domain with LAM INFOKOM Standards Mapping

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ABSTRACT

In the era of rapid technological development, Information Technology (IT) plays a critical role in the operational aspects of companies/organizations, including educational institutions like Telkom University. The proper implementation of IT can enhance system efficiency and integration within an institution. IT Governance aims to ensure that the measurement of effectiveness and efficiency within an agency aligns with its strategic goals. Telkom University, especially the Faculty of Industrial Engineering, is one of the educational institutions focusing on the development of Information Technology to ensure that the information systems and technologies used in academic activities are effective. COBIT 2019 is a framework developed by ISACA to organize and implement strategies in information management and governance with international standards. In this analysis, the focus is on the APO12 domain of COBIT 2019, which plays a role in IT risk management. The Faculty of Industrial Engineering also requires standardization with LAM-INFOKOM, an accreditation body that establishes standards for risk management in informatics and computer science. This research aims to map the standards of LAM-INFOKOM and COBIT 2019 to determine the capability level of Risk Management. Additionally, it aims to provide recommendations for potential improvements in three aspects: people, process, and technology. The expected outcome of this research is to enhance risk management at the Faculty of Industrial Engineering, Telkom University, to align with LAM-INFOKOM standards and the institution's vision and mission. The results of the IT Risk Management analysis using the COBIT 2019 framework can also serve as a structured approach for other universities in improving IT Governance.

1. INTRODUCTION

In the current era of rapid technological advancement, Information Technology (IT) plays a crucial role in the operational aspects of various companies and organizations, including educational institutions. Proper utilization of IT can significantly enhance efficiency and system integration within an institution, thereby improving overall operations. IT Governance is aimed at ensuring that the measurement of effectiveness and efficiency within an institution aligns with its strategic objectives [1]. Implemented across various entities, including universities, IT Governance encompasses a broader scope, focusing on performance and the transformation of technology to meet current and future needs [2].Thus, IT Governance within an institution can optimize IT usage to mitigate risks and security vulnerabilities.

Higher education institutions are among the sectors that emphasize mastery of Information Technology. Telkom University, a private university located in Bandung, Indonesia, has been focusing on the development of IT since its establishment in 1984 as Sekolah Tinggi Teknik Telekomunikasi (STTT) Telkom, before becoming an independent university in 2013. Telkom University is accredited as Excellent and offers 8 Vocational Programs, 25 Undergraduate Programs, and 11 Postgraduate Programs, all accredited by BAN-PT and international bodies. The university provides superior facilities for online learning, including the Faculty of Industrial Engineering (FRI). The Faculty of Industrial Engineering (FRI) at Telkom University, offering Bachelor's and Master's Programs in Industrial Engineering, Information Systems, and Logistic Engineering, records 3544 students with 135 lecturers and over 30 laboratories. Effective IT Governance is essential for academic activities to ensure information systems and technology are effectively utilized. However, the application of IT Governance can introduce various risks, such as information security risks. Hence, IT Risk Management is crucial for FRI to identify, analyze, and assess risks associated with IT usage, minimizing potential impacts on the faculty.IT Risk Management is a solution for managing risks in Information Technology (Mohammad, 2020). Risk Management involves evaluating and predicting risks, including identifying procedures to minimize impacts (Mohammad, 2020).

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Applying IT Governance for risk management helps FRI align with LAM-INFOKOM standards, using the international standard IT framework COBIT 2019.

COBIT (Control Objectives for Information and Related Technology) is a framework released by the IT Governance Institute (ITGI) and used internationally [3]. Developed by ISACA, COBIT serves as a framework for developing, organizing, and implementing information management and governance strategies [4]. This research analyzes IT Risk Management using the COBIT 2019 framework, specifically the APO12 domain, which plays a crucial role in IT risk management [5]. FRI needs to standardize with LAM-INFOKOM, an accreditation body initiated by the Association of Higher Education in Informatics and Computer Science (APTIKOM), Association for Information Systems Indonesia (AISINDO), and Indonesian Computer Electronics and Instrumentation Support Society (INDOCEISS). LAM-INFOKOM is responsible for managing and evaluating the accreditation process in informatics and computer science fields. Standardizing with LAM-INFOKOM ensures that FRI's risk management aligns with its standards [6]. FRI implements various information systems to facilitate academic activities, necessitating IT Risk Management standardization according to LAM-INFOKOM criteria using the COBIT 2019 framework. This research aims to enhance risk management at FRI, Telkom University, ensuring alignment with its vision and mission. Thus, an analysis of IT Risk Management in Telkom University's academic processes is required, in accordance with LAM-INFOKOM criteria.

2. LITERATURE REVIEW

2.1 LAM-INFOKOM

LAM INFOKOM, the Independent Accreditation Agency for Informatics and Computer Science, plays a pivotal role in accrediting informatics and computer science study programs, ensuring they meet national and international higher education standards [6]. With the mission to foster a quality culture in higher education, LAM INFOKOM sets a vision to be recognized as a credible and accountable body for continuous quality assurance in these fields. Its objectives include developing accreditation policies and procedures, conducting timely accreditations, assessing compliance with national education standards, and transparently publishing accreditation outcomes. Guided by national regulations and standards, including the National Standards of Higher Education (SNPT) and various BAN-PT regulations, LAM INFOKOM aims to align study programs with the Indonesian National Qualifications Framework (KKNI) [7], ensuring relevance and quality in the ever-evolving educational landscape.

2.2 IT Governance

IT Governance is a critical process within companies aimed at managing IT investment decisions to meet current and future needs and achieve organizational goals [8]. It requires the support of stakeholders to ensure the development and implementation of IT systems are on budget, timely, and of high quality. Effective IT Governance facilitates monitoring and evaluating the performance of implemented IT, thereby optimizing risk management related to Information Technology [9]. The process serves to ensure organizational objectives are met by evaluating stakeholders, providing direction, and offering solutions based on evaluations. Proper implementation of IT Governance enables organizations to realize benefits, optimize risk management, and efficiently use resources [10].

2.3 Comparison of IT Governance Frameworks

The IT Governance Framework plays a crucial role in the management of IT Governance within companies/organizations, facilitating the implementation of IT to achieve organizational goals. It elevates the value of information technology and aids in risk management during IT deployment. A precise framework is essential for IT Governance management in organizations, serving as a benchmark for generating improved recommendations [11]. Common IT frameworks include COBIT, ITIL, and ISO/IEC 20000, each with its unique focus but sharing the common goal of simplifying IT operational efficiency. COBIT (Control Objectives for Information and Related Technologies) focuses on the governance and management of information and technology, differentiating between governance and management and defining components crucial for supporting governance including processes, organizational structures, policies, and procedures [12]. ITIL is centered on IT service management, offering a collection of concepts and practices for customer service without addressing the alignment of corporate and IT strategies[13]. ISO/IEC 38500 provides guidance for organizations on applying governance in IT management processes to encourage the effective use of IT [14].These frameworks collectively contribute to the strategic alignment, risk management, and enhancement of IT value within organizations.

2.4 COBIT 2019

COBIT, an acronym for Control Objectives for Information and Related Technology, is an IT governance standard or best practice audit framework published by ISACA [15]. It encompasses a wide range of aspects, particularly internal control issues related to information technology. COBIT aims to research, develop, introduce, and promote an up-to-date, universally accepted control objective authority with international scope for daily use by business managers and auditors. According to ISACA, COBIT serves as a framework for IT governance, facilitating value from technical gaps, risks, and controls through dissemination by ISACA and ITGI. To realize IT Governance implementation within organizations, the COBIT 2019 framework is utilized in this study as it is the latest version released by ISACA in late 2018. COBIT 2s019 acts as a framework aiding organizations in controlling

and maximizing the role of information and technology [10].This research aims to assist companies/organizations in optimizing risk management, enhancing awareness, and maximizing resource utilization.

2.5 Domain COBIT 2019

The COBIT 2019 framework, detailed in the COBIT Core Model from the COBIT 2019 Framework Governance and Management Objectives, is organized into five distinct domains: Evaluate, Direct, Monitor (EDM)[16], which emphasizes the evaluation of strategic options, direction for senior management on chosen strategies, and the monitoring of strategic achievements; Align, Plan, Organize (APO), focusing on aligning the entire organization's strategy and support activities for IT and technology; Build, Acquire, Implement (BAI), dedicated to defining, acquiring, and implementing IT and technology solutions and their integration into business processes; Deliver, Service, Support (DSS), concerned with the operational delivery and support of IT and technology services, including security measures; and Monitor, Evaluate, Assess (MEA), which revolves around the performance monitoring and compliance assessment of IT and technology against internal performance targets, control objectives, and external requirements, as outlined [17].This research zeroes in on the APO12 domain, aimed at integrating corporate IT risk management with overarching corporate risk management strategies to balance the costs and benefits associated with IT and technology risk management, as highlighted [15].APO12 is further broken down into six subdomains, namely Collect Data, Analyze Risk, Maintain A Risk Profile, Articulate Risk, Define a Risk Management Action Portfolio, and Respond to Risk, which collectively provide a comprehensive approach to managing IT and technology risks within organizations.

2.6 Risk Management

Risk management is a critical component of IT Governance aimed at averting potential threats and minimizing the vulnerabilities and losses associated with risks that could adversely affect an organization's continuity [18]. It is a process designed to prevent losses by continuously identifying, evaluating, and mitigating risks, ensuring organizations can make continuous improvements in decision-making and performance enhancement. Effective IT Governance plays a vital role in risk management within organizations, as failure to manage risks properly can result in significant losses, including detrimental impacts on individuals within the organization [19]. In the context of higher education institutions, risk management adopts a methodology to manage the uncertainties of risks, encompassing risk assessment and the development of strategies through a series of human activities.

2.7 IT Risk Management

Understanding risk is crucial for organizations and companies as it can impact anyone, either positively or negatively, affecting the continuity of the organization. Higher education institutions are not exempt from risks that could potentially impact their set goals, outcomes, and impacts [20]. Risks may arise due to management failures in oversight and governance, thus ineffective IT Governance and a lack of awareness and understanding of risks among internal resources can lead to potential risks in an organization. Therefore, preventing risks by implementing IT Risk Management is essential for organizations or companies.IT Risk Management is an application that manages risks associated with information technology within an organization's management [21]. Organizations and companies face various risks that can affect operational outcomes/activities.

By applying IT Risk Management, organizations can analyze and control risks from potential threats [22]. Amidst the rapidly changing government regulations and increasing standards required for universities to achieve high accreditation ratings or even excellence, risk management becomes a fundamental element of good university governance, creating a competitive advantage when effectively implemented [20]. This study aims to analyze and understand the IT risk management process of the Faculty of Industrial Engineering at Telkom University using the COBIT 2019 framework in alignment with LAM INFOKOM standards.

3. RESEARCH METHODS

3.1 Conceptual Model

In the initial phase, problem identification and literature review are conducted to deepen the understanding of the research issue. This involves gathering information from a variety of sources, such as articles, books, documents, and relevant journals, to define the scope of the study, which is focused on IT Risk Management at the Faculty of Industrial Engineering, Telkom University, specifically addressing three key aspects: human, process, and technology. The project's goal is established as mapping the COBIT 2019 standards with LAM-INFOKOM standards to evaluate the capability level in managing risks and planning potential improvements in the human, process, and technology dimensions at the Faculty of Industrial Engineering, Telkom University. The study employs qualitative data collection methods, including interviews, document examination, and observation. The contextual setting for the research utilizes the COBIT 2019 Standard Practice along with the Strategic Plan from the organization's Strategic Planning. In the research content phase, detailed improvements and solution statuses are developed based on previously determined gap analysis results. Lastly, the significance of the study is discussed, highlighting the benefits of standardization mapping between LAM-INFOKOM and the COBIT 2019 Framework, and providing recommendations for potential improvements in human, process, and technology aspects at the Faculty of Industrial Engineering, Telkom University.

3.2 Research Flow

This explanation further elaborates on Figure 1, outlining the research methodology based on COBIT 2019 and LAM-INFOKOM standards for IT risk management at the Faculty of Industrial Engineering, Telkom University. The process begins with identifying the problem and stakeholder needs through interviews and literature review, leading to the formulation of research objectives and considerations of research limitations. The "Where are we now?" stage involves assessing the current state of IT risk management to understand the existing capabilities. In the "Where do we want to be?" phase, the goal is to determine improvement targets by analyzing gaps between the current state and desired outcomes, identifying potential improvements across people, process, and technology aspects. Finally, "What needs to be done" focuses on specifying the details of the improvements and solutions based on the gap analysis.

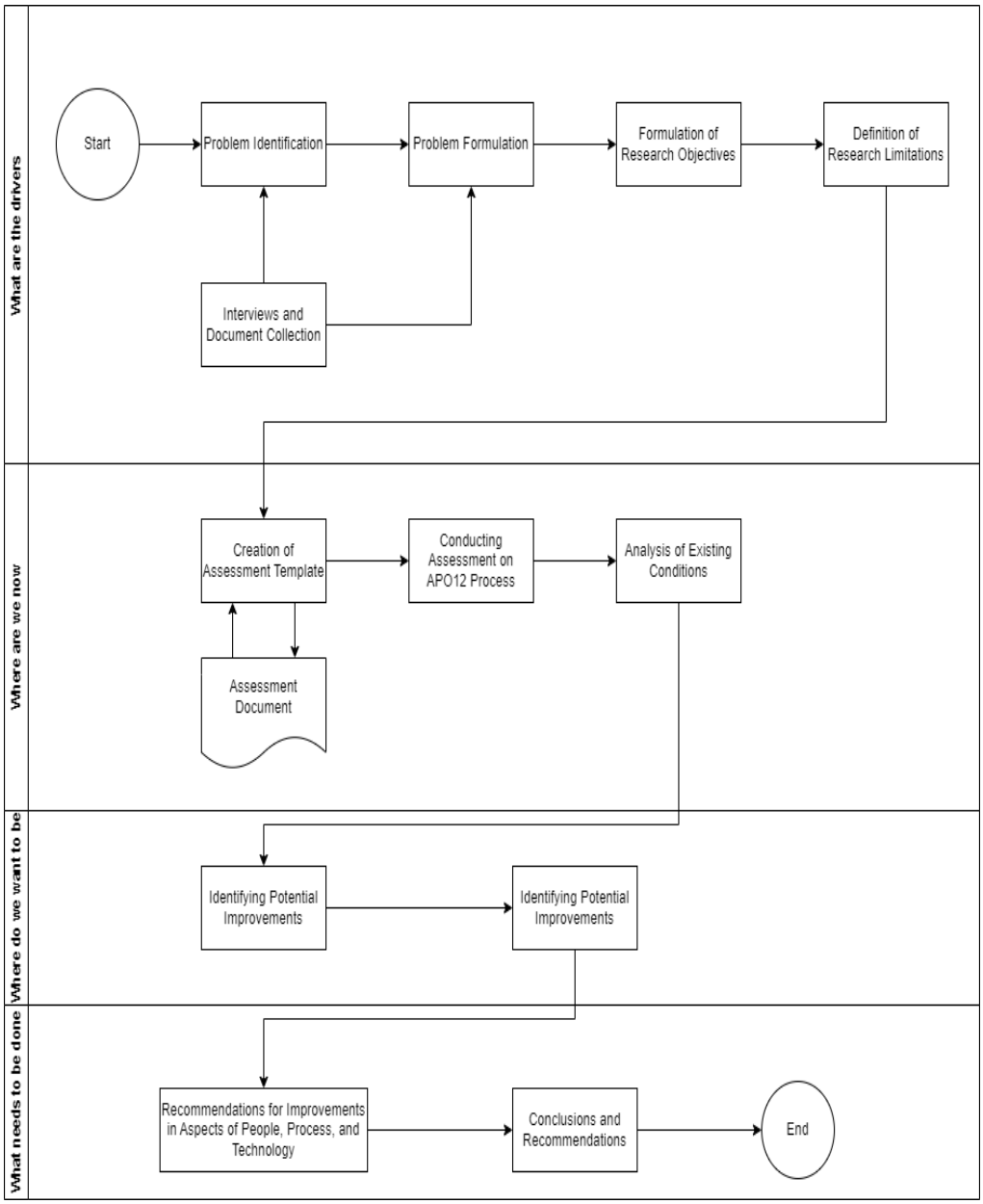

Figure 1. Research Flow

4. RESULTS AND DISCUSSIONS

Data collection for this research was conducted at the Faculty of Industrial Engineering, Telkom University, utilizing both primary and secondary data methods. Primary data was obtained directly from sources without intermediaries, while secondary data was sourced from previous research, facilitating a quicker data collection process. The data gathering techniques employed included direct observation at the Telkom University campus to acquire relevant information, interviews with related stakeholders

to extract information through direct discussions, and document analysis related to the Quality Assurance Unit and the organizational structure at Telkom University. These methods were selected to ensure the accuracy and relevance of the information obtained, supporting the research needs related to IT risk management according to the APO12 domain of COBIT 2019.

Table 1. Current State Assesment

No.	Activity	Fulfilment	Level
1	APO12.01 Collecting risk-related data	100% Fully	2
		100% Fully	3
		100% Fully	4
2	APO12.02 Analyzing or developing risk	100% Fully	3
		100% Fully	4
		50% Partially	5
3	APO12.03 Maintaining or managing the risk profile	100% Fully	2
		100% Fully	3
		100% Fully	4
4	APO12.04 Communicating risk	75% Largely	3
		100% Fully	4
5	APO12.05 Defining a risk management action portfolio	0% None	2
		100% Fully	3
6	APO12.06 Responding to risk	100% Fully	3
		100% Fully	4
		100% Fully	5

Table 2. Detailing Improvement APO12.04-04

Aspect	Potential Improvement	Solution Required	Document Required
People	Conduct workshops for all parties involved in risk management about the benefits of identifying opportunities from risk.	Develop workshop activities on the importance of identifying opportunities in areas of relative and balanced risk to all parties involved in risk management.	Draft circular for workshop activities, Draft MoM, Draft request for tools, and draft procedure for work instruction.
Process	Add work instructions after risk mitigation to identify IT-related opportunities.	Formulate clear Standard Operating Procedures (SOPs) for identifying opportunities, ensuring each step in the process is correctly followed.	
Technology	Add a special dashboard that illustrates relative risk and risk capacity parity in various areas or business units.	Create tools in the form of a dashboard containing steps for risk management, including opportunity identification information for each work unit, presented in a user-friendly manner.	

Table 3. Detailing Improvement APO12.05-01

Aspect	Potential Improvement	Solution Required	Document Required
People	Conduct socialization activities regarding discussions or meetings on inventory control with several parties.	Hold discussion activities in the form of socialization that addresses inventory control.	Draft Circular Letter, Draft MoM for meeting results, Draft Request for tool creation.
	Add parties responsible for implementing new inventory control.	Determine the party or team responsible for implementing inventory control.	
	Provide training to relevant parties regarding new control.	Ensure all parties involved in inventory management receive appropriate training on new control.	Having an up-to-date report on inventory activity status.
Technology	Add work instructions regarding the planning of documentation from inventory control.	Add procedures regarding work instructions in the planning of documentation from inventory control.	
	Add tools for inventory management that allows for real-time control to avoid risk.	Introduce tools used for inventory management that enables real-time control to prevent risk.	
	Add notification features for recording and updating inventory directly from their devices.	Incorporate notification features into the inventory management system, alerting the authorized team immediately in emergency situations like missing items or stock shortages for quick action.	

Table 4. Solution Status

Strategic Goal	LAM-INFOKOM Indicator	Status
Availability of distance learning programs and e-learning content	Number of Distance Learning Programs (PJJ)	Fulfilled
	Availability of Graduate Profiles, CPL aligned with Graduate Profiles and levels of KKNI/SKKNI	Not Fulfilled (0%)
	Number of e-learning contents	Fulfilled
	Execution of Learning Processes in alignment with Graduate Profiles, CPL according to Graduate Profiles and levels of KKNI/SKKNI	Fulfilled (100%)
Increased satisfaction with academic services	Level of student satisfaction	Largely Fulfilled (50%)
	Execution of evaluations concerning policies and achievement of standards (IKU and IKT), identifying best, poor, and new practices related to education/learning, including evaluation of student satisfaction with the learning process	Largely Fulfilled (50%)
Academic service application	Availability of follow-up documents and implementation regarding the evaluation results of standard achievement (IKU and IKT) related to education	Fulfilled (100%)
Improved ranking of Telkom University at both national and international levels	Higher Education Ranking by the Ministry of Research, Technology, and Higher Education (Kemristekdikti)	Fulfilled (100%)
Application of Portfolio Outcome Based Education	Execution of Learning Processes in alignment with Graduate Profiles, CPL according to Graduate Profiles and levels of KKNI/SKKNI	Fulfilled (100%)

5 CONCLUSSION

Based on the research conducted on IT Risk Management at the Faculty of Industrial Engineering, Telkom University, the following conclusions are drawn:

1. COBIT 2019 is applicable in mapping with LAM INFOKOM standards across the APO12 domains, including Collect Data, Analyze Risk, maintain a Risk Profile, define a Risk Management Action Portfolio, and Respond to Risk.
2. The APO12.01 Collect Data domain involves identifying and collecting relevant data to enable effective I&T risk identification, analysis, and reporting. It is mapped to the LAM INFOKOM practice of Document Availability for Follow-up Actions and Implementation of Evaluation Results related to Education Standards, achieving a capability level of 4 with 100% fully met.
3. The APO12.02 Analyze Risk domain focuses on developing evidence-supported views of actual I&T risks for decision-making support. It is mapped to LAM INFOKOM's Execution of Policy and Standard Achievement Evaluations to identify new, good, and bad practices related to Education/Learning, including Student Satisfaction Evaluation, achieving a capability level of 5 with 50% partially met.
4. The APO12.03 Maintain a Risk Profile domain aims to maintain a risk inventory and known risk attributes, including expected frequency, potential impact, and possible responses, achieving a capability level of 4 with 100% fully met when mapped to LAM INFOKOM practices.
5. The APO12.04 Articulate Risk domain entails timely communication of current I&T exposure and opportunities to all necessary stakeholders, achieving a capability level of 3 with 75% largely met when mapped to LAM INFOKOM practices.
6. The APO12.05 Define a Risk Management Action Portfolio domain manages opportunities to reduce risk to an acceptable level as a portfolio. It was found to be 0% none met at capability level 3 when mapped to LAM INFOKOM practices.
7. The APO12.06 Respond to Risk domain involves responding timely to risk events with effective actions to limit losses, achieving a capability level of 5 with 100% Fully met when mapped to LAM INFOKOM practices.
8. Recommendations for the people aspect include adding skills and awareness training and socialization for internal human resources, and communication activities to discuss processes to be undertaken.
9. Recommendations for the process aspect include adding work instructions for reporting procedure additions in risk management.
10. Recommendations for the technology aspect involve adding features to the AmeS application, including a dashboard for additional information and tools and features for inventory control processes.

REFERENCES

[1] P. L. Bowen, M. Y. D. Cheung, and F. H. Rohde, "Enhancing IT governance practices: A model and case study of an organization's efforts," *Int. J. Account. Inf. Syst.*, vol. 8, no. 3, pp. 191–221, 2007, doi: 10.1016/j.accinf.2007.07.002.

[2] B. Sarifah, "Analisis Dan Perancangan Proses Manajemen Sistem Kontrol Internal Ti Menggunakan Kerangka Kerja Cobit 2019 Di Pt Inti (Persero)," *e-Proceeding Eng.*, vol. 7, no. 3, pp. 9635–9642, 2020.

[3] P. N. Anastasia and L. H. Atrinawati, "Perancangan Tata Kelola Teknologi Informasi Menggunakan Framework Cobit 2019 Pada Hotel Xyz," *JSI J. Sist. Inf.*, vol. 12, no. 2, pp. 1–9, 2020, doi: 10.36706/jsi.v12i2.12329.

[4] A. Safitri, I. Syafii, and K. Adi, "Measuring the Performance of Information System Governance using Framework COBIT 2019," *Int. J. Comput. Appl.*, vol. 174, no. 31, pp. 23–30, 2021, doi: 10.5120/ijca2021921253.

[5] S. C. I. Simatupang and M. I. Fianty, "Assessment of Capability Levels and Improvement Recommendations Using COBIT 2019 for the IT Consulting Industry," *G-Tech J. Teknol. Terap.*, vol. 7, no. 4, pp. 1391–13400, 2023, doi: 10.33379/gtech.v7i4.3141.

[6] M. S. Fauzi, M. Lubis, L. Abdurrahman, F. S. Lubis, and H. Fakhrurroja, "Optimizing IT Human Capital: Evaluating and Crafting an Innovative Management System with COBIT 2019," *ACM Int. Conf. Proceeding Ser.*, pp. 545–550, 2023, doi: 10.1145/3629378.3629445.

[7] B. E. Sibarani, "The Influence of Curriculum Based on the Indonesian National Qualifications Framework (KKNI) on the Quality of Student Learning (Studies on Students at the State University of Medan)," *APTISI Trans. Technopreneursh.*, vol. 3, no. 2, pp. 171–180, 2021, doi: 10.34306/att.v3i2.179.

[8] M. Spremić, "IT governance mechanisms in managing IT business value," *WSEAS Trans. Inf. Sci. Appl.*, vol. 6, no. 6, pp. 906–915, 2009.

[9] A. Safitri, I. Syafii, and K. Adi, "Identifikasi Level Pengelolaan Tata Kelola SIPERUMKIM Kota Salatiga berdasarkan COBIT 2019," *J. RESTI (Rekayasa Sist. dan Teknol. Informasi)*, vol. 5, no. 3, pp. 429–438, 2021, doi: 10.29207/resti.v5i3.3060.

[10] S. C. Putra and A. F. Wijaya, "Analysis of Information Technology Governance Using COBIT 2019 Framework (Case study: PT. Bangkit Anugerah Bersama)," *J. Inf. Syst. Informatics*, vol. 4, no. 4, pp. 1135–1151, 2022, doi: 10.51519/journalisi.v4i4.401.

[11] F. Shafa Salsabila Khansa1*, Della Novia Ramadhan2, Ahmad Fadil Alfarisy3, "Perkembangan Evaluasi Tata Kelola Teknologi Informasi: Literature Review," *J. Comput. Sci. Eng.*, vol. 3, no. 2, pp. 60–70, 2022, doi: e-ISSN 2721-0251.

[12] S. Palutturi, L. M. Saleh, M. Rachmat, J. A. Malek, and E. W. Nam, "Principles and strategies for aisles communities empowerment in creating Makassar Healthy City, Indonesia," *Gac. Sanit.*, vol. 35, pp. S46–S48, 2021, doi: 10.1016/j.gaceta.2020.12.013.

[13] D. I. N. Afra, M. C. Rahmadan, D. I. Sensuse, S. Lusa, N. Safitri, and D. Elisabeth, "The Influence of Organizational Culture on Knowledge Management in Government Institution: A Systematic Literature Review," in *2021 International Conference on Computer Science and Engineering (IC2SE)*, 2021, vol. 1, pp. 1–8, doi: 10.1109/IC2SE52832.2021.9792120.

[14] A. Rubhasy and I. Maliki, "Rancangan Model Tata Kelola Teknologi Informasi pada Institusi Pendidikan Tinggi Menggunakan Pendekatan COBIT 5, ISO/IEC 38500, dan ITG4U," pp. 1–12, 2018.

[15] J. S. A. Rajjani, B. T. Hanggara, and Y. T. Musityo, "Evaluasi Manajemen Risiko Teknologi Informasi pada Department of ICT PT Semen Indonesia (Perseo) Tbk menggunakan Framework COBIT 2019 dengan …," *... Teknol. Inf. dan Ilmu ...*, vol. 5, no. 5, pp. 1734–1744, 2019, [Online]. Available: https://j-ptiik.ub.ac.id/index.php/j-ptiik/article/download/8982/4092.

[16] E. Nachrowi, Yani Nurhadryani, and Heru Sukoco, "Evaluation of Governance and Management of Information Technology Services Using Cobit 2019 and ITIL 4," *J. RESTI (Rekayasa Sist. dan Teknol. Informasi)*, vol. 4, no. 4, pp. 764–774, 2020, doi: 10.29207/resti.v4i4.2265.

[17] R. Anugrah, E. Utami, and A. H. Muhammad, "Analisis Manajemen Risiko TI Pada Perguruan Tinggi XYZ Berbasis COBIT 2019 Dengan Pertimbangan Domain APO12," *J. Ilm. Univ. Batanghari Jambi*, vol. 22, no. 2, p. 991, 2022, doi: 10.33087/jiubj.v22i2.2175.

[18] Z. Munawwaroh, "Analisis Manajemen Risiko Pada Pelaksanaan Program Pendidikan Dalam Upaya Meningkatkan Mutu Pendidikan," *J. Adm. Pendidik.*, vol. 14, no. 2, pp. 71–79, 2017, doi: 10.17509/jap.v24i2.8295.

[19] S. Sugiyanto and A. A. Rahayu, "the Implementation of Risk Management and Its Effect on Good Cooperative Governance and Success," *J. Indones. Econ. Bus.*, vol. 33, no. 3, p. 243, 2019, doi: 10.22146/jieb.28570.

[20] C. Septiawan and E. Sujana, "Model Sistem Manajemen Risiko Pada Perguruan Tinggi Kesehatan Swasta Di Indonesia (Studi Kasus Di Stikes Indonesia Maju)," *Proceeding Semin. Nas. ...*, vol. 5, no. 1, pp. 63–81, 2020, [Online]. Available: http://ejournal.stma-trisakti.ac.id/index.php/prosiding/article/view/49.

[21] J. B. Soriano *et al.*, "Prevalence and attributable health burden of chronic respiratory diseases, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017," *Lancet Respir. Med.*, vol. 8, no. 6, pp. 585–596, 2020, doi: 10.1016/S2213-2600(20)30105-3.

[22] R. Yasirandi, A. Rakhmatsyah, and F. Kurniawan, "IT Risk Management dalam Operasional untuk Peningkatan Layanan Informasi Pesanan," *Krea-TIF*, vol. 9, no. 2, p. 21, 2021, doi: 10.32832/kreatif.v9i2.5982.

[23] A. R. Lubis, M. Lubis and C. D. Azhar, "The Effect of Social Media to the Sustainability of Short Message Service (SMS) and Phone Call," *Procedia Computer Science 161, 687-695 2020.* DOI: 10.1016/j.procs.2019.11.172.

[24] M. Lubis, R. C. Annisyah and L. Winiyanti, "ITSM Analysis using ITIL V3 in Service Operation in PT. Inovasi Tjaraka Buana," *IOP Conference Series: Materials Science and Engineering 847 2020.* DOI: 10.1088/1757-899X/847/1/012077.

[25] I. W. Wulandari, M. Lubis, W. Witjaksono and A. H. Azizah, "Implementation of Enterprise Resource Planning (ERP) using Integrated Model of Extended Technology Acceptance Model (TAM) 2: Case Study of PT. Toyota Astra Motor," *Int. Conf. on Cyber and IT Service Management (CITSM) 2019*. DOI: 10.1109/CITSM47753.2019.8965342.

[26] S. J. Prasetyo, M. Lubis, R. W. Witjaksono and A. H. Azizah, "Critical Failure Factors in Enterprise Resource Planning (ERP) Implementation: Case Study of PT. Toyota Astra," *Int. Conf. on Informatics and Computing (ICIC) 2019*. DOI: 10.1109/ICIC47613.2019.8985720.

[27] A. D. Putri, M. Lubis and A. H. Azizah, "Analysis of Critical Success Factors (CSF) in Enterprise Resource Planning (ERP) Implementation using Extended Technology Acceptance Model (TAM) at Trading and Distribution Company," *Int. Conf. on Electrical, Telec. and Com. Engineering (ELTICOM) 2020.* DOI: 10.1109/ELTICOM50775.2020.9230527.