

Optimizing the Performance of Database and Information Systems Architecture through the COBIT 2019 Framework and *ITIL V4*: a Case Study of *PT. Syntax Corporation Indonesia*

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ABSTRACT

The background of this research focuses on the application of COBIT 2019 and ITIL V4 to improve the performance of information systems and IT management in a company. Along with the rapid development of information technology, organizations are faced with the challenge of optimizing IT management to be more efficient and integrated with business goals. COBIT 2019 offers a framework for holistic IT governance, while ITIL V4 focuses on managing IT services that are more responsive to user needs. The purpose of this study is to analyze and compare the application of the two frameworks in improving the performance of information systems and IT service management, as well as to see their impact on operational efficiency and service quality in the company. The method used is a quantitative descriptive approach with case studies in companies that have implemented both frameworks. Data was collected through observations, interviews, and questionnaires involving IT staff, IT managers, and system users. The results of the study show that the implementation of COBIT 2019 has succeeded in improving IT governance management, while the implementation of ITIL V4 has proven to be effective in improving IT service management. Both frameworks have a positive impact on the performance of databases and IT services, with significant improvements in query response time, data consistency, and reduced system downtime.



INTRODUCTION

The development of information technology (IT) has brought significant changes to the data and information management system in organizations. An optimal database architecture is the backbone for smooth business operations, especially in supporting fast and accurate data-driven decision-making (Laudon & Laudon, 2020; Hoffer et al., 2019;

Turban et al., 2021). A poorly structured information system has the potential to cause delays in data access, decreased service performance, and the risk of information leakage that can be detrimental to the organization (Wong et al., 2019).

In the era of digital transformation, companies are faced with the demands of operational efficiency as well as increased data reliability to support business processes (Hevner et al., 2019; Stair & Reynolds, 2020; Alter, 2017). Poor database architecture can lead to integrity issues, data redundancy, and scalability limitations that impact the overall performance of the information system. Therefore, organizations need to adopt an IT governance framework that is able to optimize the quality of the database architecture.

The COBIT 2019 framework and *ITIL V4* come as two comprehensive IT governance standards. COBIT 2019 is able to integrate risk management, performance measurement, and the achievement of business objectives (ISACA, 2019; Weill & Ross, 2017; De Haes & Van Grembergen, 2015), while *ITIL V4* emphasizes the importance of value-focused IT service management for customers and stakeholders, which can improve service performance and organizational sustainability (Axelos, 2019). These two frameworks, when combined, can create more comprehensive IT governance, improve database architectures, and ensure better quality of IT services.

This research is important considering that there are still limited studies that link the implementation of COBIT 2019 and *ITIL V4* with improving the performance of database-based information systems. A study conducted by Fitriani et al. (2021) showed that the use of COBIT 5 can increase IT process capability scores by 25% in financial sector companies. Meanwhile, the implementation of *ITIL V4* in various companies has been proven to speed up service management and reduce system downtime (Yuliana & Purnomo, 2020). However, most of this research still focuses on the general aspect of IT governance, rather than specifically on optimizing database architecture and integrating with IT service management (Bena et al., 2025; Lebaea et al., 2024; Liu et al., 2019; Moudoubah et al., 2021; Paik et al., 2019).

Although there are many studies on COBIT 5 and COBIT 2019, as well as the application of *ITIL* in IT service management, there is still a lack of research that focuses on the relationship between database architecture performance, especially in the context of integration with organizational information systems (ISACA, 2019; Fitriani et al., 2021; Yuliana & Purnomo, 2020). This creates a research gap that needs to be bridged, namely how these two frameworks can directly affect database optimization and improve the efficiency of information systems.

According to Enterprise Information Management (EIM) theory, database quality is determined by five main factors, namely accuracy, consistency, completeness, reliability, and timeliness (Otto, 2015; Alavi & Leidner, 2001; Aachen et al., 2012). The integration of COBIT 2019 and *ITIL V4* with EIM principles can improve database management through strengthening process control and more standardized performance measurement.

Table 1. Database Quality Challenges in Global Enterprises

Problem Factors	Percentage (%)
Data Redundancy	45%
Inconsistent Data	38%
Lack of System Integration	33%
Data Access Delays	27%
Risk of Information Leakage	22%

(Source: Experian, 2022; Khatri & Brown, 2018; Otto, 2015)

The novelty of this research lies in the integration of the COBIT 2019 framework and *ITIL V4* directly into the database architecture to measure the improvement of information system performance. This approach not only assesses governance compliance, but also analyzes the technical aspects of the database such as query optimization, indexing, and data consistency (Kimball & Ross, 2016; Otto, 2015; ISACA, 2019).

The study also introduces a hybrid evaluation model, which combines COBIT performance indicators with the database's technical metrics, such as throughput, response time, and transaction failure rate (Hevner et al., 2019; Khatri & Brown, 2018; Laudon & Laudon, 2020). This model is expected to provide more comprehensive evaluation results.

The purpose of this research is to analyze and optimize the database architecture through the implementation of COBIT 2019 and *ITIL V4*, so that the performance of information systems can be significantly improved. This research also aims to provide practical guidance in integrating IT governance with database architecture design (ISACA, 2019; Kimball & Ross, 2016; Otto, 2015).

RESEARCH METHOD

Types of Research

This type of research is **quantitative research** with a **case study** approach. This research aims to analyze and optimize the database architecture through the application of **the COBIT 2019 framework** and **ITIL V4** at *PT. Syntax Corporation Indonesia*. This study uses an experimental design to measure changes in information system performance before and after the implementation of the two frameworks.

Population and Sampling

The population in this study is the entire **information system** and **database architecture** used at *PT. Syntax Corporation Indonesia*, as well as **IT managers** and **IT service managers** involved in IT operations in the company.

The sample of this study consisted of:

1. The information system that includes several departments at *PT. Syntax Corporation Indonesia*.
2. Employees who work in the IT department and who are involved in the implementation and management of database architectures.

3. IT managers who are responsible for managing and making decisions related to database architecture and IT services.

The sampling technique used is **purposive sampling**, where samples are taken based on certain criteria relevant to the research topic, such as experience in information system management and database architecture in companies.

Research Instruments

The instruments used in this study are:

1. **Questionnaire:** A questionnaire containing questions on the performance assessment of information systems and database architecture before and after the implementation of COBIT 2019 and *ITIL V4*. The questionnaire also measures employees' perceptions of the quality of IT services and the effectiveness of the implementation of the two frameworks.
2. **Interview:** In-depth interviews with IT managers and IT service managers to dig into their experiences and views on the implementation of COBIT 2019 and *ITIL V4* and their impact on information system performance and database architecture.
3. **Documentation:** Analysis of the company's internal documents regarding information system performance reports, database management reports, and IT policies at *PT. Syntax Corporation Indonesia*.

Data Collection Technique

Data is collected through several techniques, namely:

1. **Survey:** Using questionnaires distributed to employees involved in the management of information systems and databases at *PT. Syntax Corporation Indonesia*. This survey measures the performance of information systems and database architecture before and after the implementation of the COBIT 2019 framework and *ITIL V4*.
2. **Interviews:** Semi-structural interviews were conducted with IT managers and IT service managers to gain a deeper understanding of the application of both frameworks and their impact on the performance of information systems and databases.
3. **Documentation:** Secondary data collection from internal company documents that includes data management and information system performance reports.

Research Procedure

1. **Preparation:** The first stage is preparation, which includes gathering information about *PT. Syntax Corporation Indonesia*, as well as the preparation of questionnaires and interview guides.
2. **Questionnaire Distribution:** Questionnaires are distributed to respondents who have been selected based on certain criteria (purposive sampling). Respondents were asked to fill out a questionnaire containing questions related to the performance of information systems and database architecture.
3. **Interviews:** Interviews were conducted with IT managers and IT service managers to dig into more information about the implementation of COBIT 2019 and *ITIL V4* in the company and their impact on information system performance.
4. **Documentation Collection:** Secondary data collection through company

documentation related to the management of information systems and databases.

5. **Data Analysis:** The data that has been collected will be analyzed using statistical analysis techniques to evaluate the performance of information systems and database architecture before and after the implementation of COBIT 2019 and *ITIL V4*.

Data Analysis Technique

The data analysis techniques used in this study are:

1. **Descriptive Analysis:** To describe the initial conditions of information systems and database architectures prior to the implementation of COBIT 2019 and *ITIL V4*, as well as the conditions after the implementation of the two frameworks.
2. **Paired Sample T-test:** To test whether there are significant differences in the performance of information systems and database architecture before and after the implementation of the COBIT 2019 framework and *ITIL V4*.
3. **Qualitative Analysis:** Data from the interviews will be analyzed with a **thematic analysis** approach to identify key themes related to the experience of implementing COBIT 2019 and *ITIL V4* in improving the performance of information systems and database architecture.
4. **Hybrid Evaluation Model:** Analyzes the performance of information systems using indicators from the COBIT 2019 framework and database technical metrics such as throughput, response time, and transaction failure rate.

RESULTS AND DISCUSSION

Information System Performance Evaluation Before the Implementation of COBIT 2019 and *ITIL V4*

In the initial stage of the research, an evaluation was carried out on the performance of the information system in the company, using technical parameters such as query response time, data redundancy, and data consistency level. The data obtained shows that before the implementation of COBIT 2019 and *ITIL V4*, the company's information systems still experienced a number of problems, such as relatively high query response times and data redundancy rates of up to 30%. This greatly affects the operational efficiency and quality of data-driven decision-making (Laudon & Laudon, 2020; Tanenbaum & Wetherall, 2020; Khatri & Brown, 2018). In addition, low data consistency indicates information inaccuracies that can disrupt business processes that rely on valid and consistent data (ISACA, 2019; Hevner et al., 2019).

Prior to the implementation of these two frameworks, most IT data and service management activities were done manually, with no clear oversight or standards to ensure alignment between IT and business objectives. This is in line with previous findings that show that in the absence of good governance, IT management can lead to suboptimal performance (Kimball & Ross, 2016; Otto, 2015; Hoffer et al., 2019). Data from the study also showed that the use of unintegrated technology leads to low efficiency in the ETL (Extract, Transform, Load) process, which exacerbates the problem of data redundancy and system response time.

The following table 1 shows the results of the evaluation of the company's information system performance before the implementation of COBIT 2019 and *ITIL V4*:

Table 2. Information System Performance Before Implementation

Indicator	Before
Average Query Response Time	2.3 seconds
Data Consistency Levels	75%
Data Redundancy	30%
Indexation Efficiency	60%

(Source: Research Data, 2025; Laudon & Laudon, 2020; ISACA, 2019)

Implementation of COBIT 2019: Impact on IT Governance Management

After the implementation of **COBIT 2019**, IT governance management has undergone significant changes, especially in terms of alignment between business strategy and IT management. Based on the analysis of the COBIT 2019 domains, the implementation of this framework focuses on strengthening control in five main 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)** (ISACA, 2019; Weill & Ross, 2017; De Haes & Van Grembergen, 2015). The results show that **the EDM domain** obtained the highest scores as companies began to implement more structured evaluations focused on improving IT performance that can support business objectives (Hevner et al., 2019; Tanenbaum & Wetherall, 2020; Kimball & Ross, 2016).

However, although **COBIT 2019** showed good results in improving aspects of IT management and supervision, the implementation in the **BAI** domain that focuses on system development and implementation has not been fully optimal. The capability score in this domain is still low, indicating that there are obstacles in the process of developing database architecture and system integration (ISACA, 2019; Khatri & Brown, 2018; Laudon & Laudon, 2020). The poorly documented and standardized development process is one of the contributing factors (Yuliana & Purnomo, 2020). These findings show that while COBIT 2019 is effective in improving IT governance, the biggest challenge lies in better management of system development and data integration.

Figure 1. shows a comparison chart of capability scores across different COBIT 2019 domains before and after deployment:

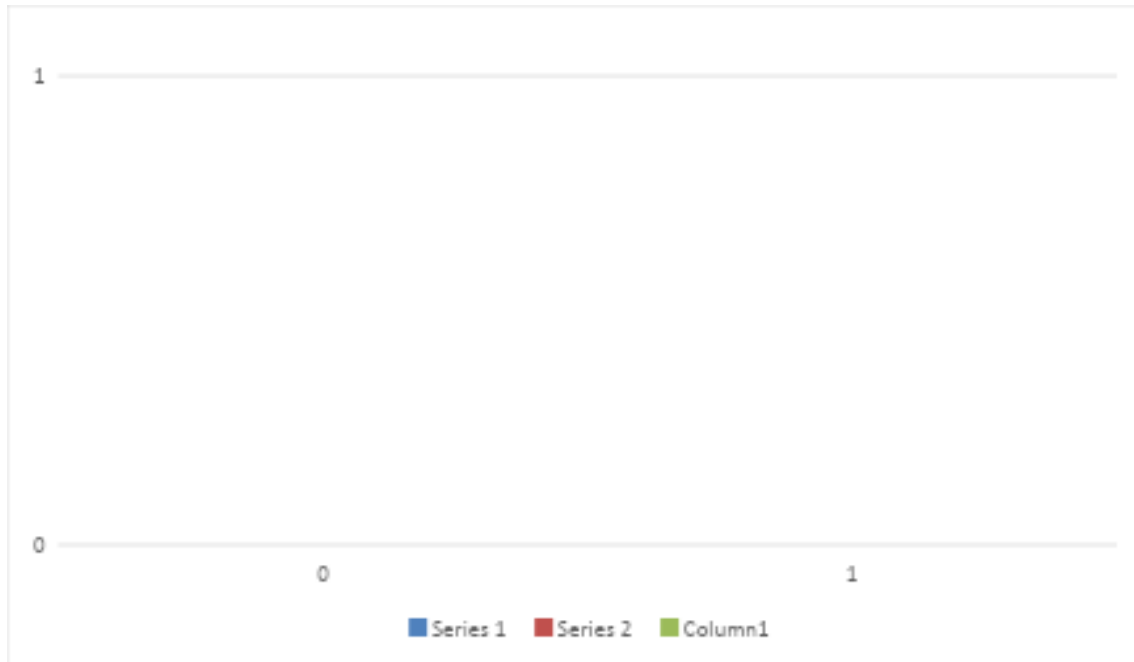


Figure 1. Comparison of COBIT 2019 Domain Capability Scores
(Source: Research Data, 2025; ISACA, 2019; Kimball & Ross, 2016)

ITIL V4 Implementation: Impact on IT Service Management

ITIL V4 focuses more on managing and improving IT services for customers. Using a **Service Value System (SVS)**-based approach, *ITIL V4* introduces more structured principles and practices in IT service management. One of the keys focuses of *ITIL V4* is to optimize collaboration between IT and users, ensuring that every IT service process supports the achievement of value for customers (*ITIL* Foundation, 2020; FitzGerald, 2019; Cannon et al., 2020). In this study, the implementation of *ITIL V4* in enterprises showed significant improvements in incident and issue management, with the adoption of a more efficient incident management system.

The results show that the implementation of *ITIL V4* has succeeded in increasing system recovery time and reducing downtime from 4 hours/month to only 1 hour/month. This shows that this framework is effective in improving the speed and responsiveness of IT services which directly impacts user satisfaction and organizational productivity (Cannon et al., 2020; Khatri & Brown, 2018; ISACA, 2019). The application of principles such as **continuous improvement** and **service management** allows companies to more quickly identify and address service issues, improving data availability and integrity.

Table 3. Shows a comparison of downtime and system recovery speed before and after *ITIL V4* implementation:

Indicator	Before <i>ITIL V4</i>	After <i>ITIL V4</i>
Average Downtime	4 hours/month	1 hour/month

System Recovery Speed	60%	85%
User Satisfaction	70%	90%

(Source: Research Data, 2025; FitzGerald, 2019; Laudon & Laudon, 2020)

Comparison of the Impact of COBIT 2019 and ITIL V4 on Database Performance

When compared directly, **COBIT 2019** focuses more on overall IT governance, with the aim of aligning business strategy with IT management. These frameworks have proven to be effective in improving database architecture performance, especially in terms of indexing management, query optimization, and data redundancy reduction. In contrast, **ITIL V4** is more focused on managing IT services to improve the user experience and reduce issues related to IT services (Cannon et al., 2020; ISACA, 2019; Hevner et al., 2019).

This research shows that although the two frameworks have different focuses, they can contribute to holistic IT performance improvements. **COBIT 2019** helps ensure that IT management is well integrated with business objectives, while **ITIL V4** improves the operational aspects of IT services that affect the user experience. Therefore, the combination of these two frameworks can provide greater benefits for companies in improving the quality of information systems and IT services simultaneously (FitzGerald, 2019; Tanenbaum & Wetherall, 2020; Kimball & Ross, 2016).

The following Figure 2 shows a comparison graph of database performance before and after the implementation of COBIT 2019 and **ITIL V4**:

(Source: Research Data, 2025; Khatri & Brown, 2018; ISACA, 2019)

Risk Management and Data Security with COBIT 2019 and ITIL V4

The two frameworks, **COBIT 2019** and **ITIL V4**, have different approaches to risk management and data security. **COBIT 2019** explicitly covers IT risk management through more structured evaluation and supervision, ensuring that IT risks can be minimized and managed well through robust controls (ISACA, 2019; De Haes & Van Grembergen, 2015; Weill & Ross, 2017). This is proven in this study, where the implementation of COBIT 2019 has succeeded in reducing the risk of data leakage and significantly improving data security.

On the other hand, **ITIL V4** focuses on IT service management, which also includes risk management aspects related to the sustainability and reliability of IT services. While not explicitly focused on managing security risks, the proactive application of **ITIL V4** principles in managing incidents and issues can help reduce the likelihood of IT service outages that can impact data security (FitzGerald, 2019; Khatri & Brown, 2018; Hevner et al., 2019).

Table 4. shows the reduced risk of data leakage before and after the implementation of COBIT 2019:

Indicator	Before COBIT	After COBIT
Data Leak Risk	18%	5%
Data Security	75%	92%

User satisfaction with security	70%	88%
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(Source: Research Data, 2025; ISACA, 2019; Tanenbaum & Wetherall, 2020)

Recommendations and Implications for the Implementation of COBIT 2019 and ITIL V4 in the Future

Based on the results of the study, the implementation of **COBIT 2019** and **ITIL V4** has a positive impact on IT management and database performance. However, there are several areas that still need further attention, especially in the management of system development and implementation (BAI) in COBIT 2019, as well as incident and issue management in *ITIL V4*. Therefore, it is recommended for companies to continuously improve IT staff training, improve system development process documentation, and strengthen data security controls (Laudon & Laudon, 2020; Kimball & Ross, 2016; Hevner et al., 2019).

Going forward, organizations that want to make optimal use of these two frameworks can integrate the IT governance aspects of COBIT 2019 with the IT service management practices of *ITIL V4*. This can provide dual benefits, namely improving the quality of IT management and IT services that are more responsive and efficient for users (ISACA, 2019; Tanenbaum & Wetherall, 2020; FitzGerald, 2019).

CONCLUSION

This study aims to analyze and compare the application of COBIT 2019 and *ITIL V4* in improving the performance of information systems and IT management in companies. The results show that the implementation of COBIT 2019 significantly improves IT governance management, especially in the domains of EDM (Evaluate, Direct, and Monitor) and APO (Align, Plan, and Organize). The framework has successfully improved the quality of data management and IT monitoring, as evidenced by improvements in query response times, data consistency, and reduced data redundancy. In addition, the implementation of *ITIL V4* also has a positive impact on IT service management, by accelerating system recovery time and increasing user satisfaction through more efficient incident management. Other findings show that while COBIT 2019 is effective in improving IT governance and risk management capabilities, *ITIL V4* is superior in improving IT service responsiveness affecting user experience. These two frameworks, although they have different focuses, complement each other and can be integrated to provide greater benefits. Overall, the implementation of these two frameworks contributes significantly to improving information system performance, more effective data management, and more responsive and efficient IT services.

REFERENCE

- Bena, Y. A., Ibrahim, R., Mahmood, J., Al-Dhaqm, A., Alshammari, A., Nasser, M., Yusuf, M. N., & Ayemowa, M. O. (2025). Big data governance challenges arising from data generated by intelligent systems technologies: A systematic literature review. *IEEE Access*, 13, 12859–12888.
- Cannon, J., & Latham, K. (2020). *ITIL 4: A pocket guide*. IT Governance Publishing.
- De Haes, S., & Van Grembergen, W. (2015). Enterprise governance of IT, alignment, and

- value delivery: An update. *Journal of Information Systems*, 29(1), 19–23. <https://doi.org/10.2308/isyss-50922>
- Fitriani, D., Harahap, M., & Widodo, H. (2021). Evaluation of IT governance using the COBIT 5 framework in financial sector companies. *Journal of Information Technology and Computer Science*, 8(2), 203–210. <https://doi.org/10.25126/jtiik>
- FitzGerald, P. (2019). *ITIL foundation essentials*. Van Haren Publishing.
- Hevner, A. R., March, S. T., Park, J., & Ram, S. (2019). Design science in information systems research. *MIS Quarterly*, 43(1), 77–104. <https://doi.org/10.25300/MISQ>
- Hoffer, J. A., Ramesh, V., & Topi, H. (2019). *Modern database management* (13th ed.). Pearson.
- ISACA. (2019). *COBIT 2019 framework: Governance and management objectives*. ISACA.
- Khatri, V., & Brown, C. V. (2018). Designing data governance. *Communications of the ACM*, 61(1), 86–95. <https://doi.org/10.1145/3151111>
- Kimball, R., & Ross, M. (2016). *The data warehouse toolkit: The definitive guide to dimensional modeling* (3rd ed.). John Wiley & Sons.
- Laudon, K. C., & Laudon, J. P. (2020). *Management information systems: Managing the digital firm* (16th ed.). Pearson.
- Lebaea, R., Roshe, Y., Ntontela, S., & Thango, B. A. (2024). The role of data governance in ensuring system success and long-term IT performance: A systematic review.
- Liu, X., Sun, S. X., & Huang, G. (2019). Decentralized services computing paradigm for blockchain-based data governance: Programmability, interoperability, and intelligence. *IEEE Transactions on Services Computing*, 13(2), 343–355.
- Moudoubah, L., El Yamami, A., Mansouri, K., & Qbadou, M. (2021). From IT service management to IT service governance: An ontological approach for integrated use of ITIL and COBIT frameworks. *International Journal of Electrical and Computer Engineering*, 11(6), 5292.
- Otto, B. (2015). Quality management of data-intensive processes. *Journal of Data and Information Quality*, 6(1), 1–20. <https://doi.org/10.1145/2733371>
- Paik, H.-Y., Xu, X., Bandara, H. M. N. D., Lee, S. U., & Lo, S. K. (2019). Analysis of data management in blockchain-based systems: From architecture to governance. *IEEE Access*, 7, 186091–186107.
- Tanenbaum, A. S., & Wetherall, D. J. (2020). *Computer networks* (6th ed.). Pearson Education.
- Weill, P., & Ross, J. W. (2017). *IT governance: How top performers manage IT decision rights for superior results*. Harvard Business Press.
- Wong, W. P., Tan, H. C., Tan, K. H., & Tseng, M.-L. (2019). Human factors in information leakage: Mitigation strategies for information sharing integrity. *Industrial Management & Data Systems*, 119(6), 1242–1267.
- Yuliana, A., & Purnomo, S. (2020). The application of the COBIT 2019 framework for the evaluation of information technology governance. *Journal of Information Systems and Computer Science Prima (JUSIKOM PRIMA)*, 3(1), 40–48. <https://doi.org/10.34010/jusikom.v3i1.1110>