

Comparison of Cobit 4.1 With Cobit 5 in Payment System System X at University YZ

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The increasing reliance on information systems in higher education requires effective information technology (IT) governance to ensure system reliability, security, and alignment with institutional objectives. One of the critical systems in universities is the digital payment system used for managing student financial transactions. This study aims to compare the effectiveness of the COBIT 4.1 and COBIT 5 frameworks in evaluating IT governance within the X Payment System at YZ University based on user perceptions. A quantitative approach was employed by distributing questionnaires to 82 student respondents who actively use the system. The evaluation applied the Deliver and Support (DS) and Monitor and Evaluate (ME) domains of COBIT 4.1, as well as the Deliver, Service, and Support (DSS) and Monitor, Evaluate, and Assess (MEA) domains of COBIT 5. The analysis results indicate that the average maturity level of the system based on COBIT 4.1 reached 3.87, categorized as Level 4 (Managed and Measurable), while the COBIT 5 capability assessment obtained an average score of 3.83, categorized as Level 4 (Predictable Process). The highest performance scores were observed in data integrity and system security processes, indicating strong user trust in the accuracy and protection of financial data. These findings demonstrate that the payment system has been consistently managed, monitored, and evaluated. The study concludes that COBIT 4.1 is effective in mapping operational procedures and control structures, whereas COBIT 5 provides a more comprehensive governance perspective by integrating operational performance with organizational value creation. Recommendations include implementing automated real-time monitoring and strengthening infrastructure capacity to maintain system stability during peak transaction periods.

Keywords: COBIT 4.1, COBIT 5, IT Governance, Payment System X, YZ University.

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1. Introduction

The development of information technology (IT) has had a significant impact on improving the efficiency and effectiveness of information management across various sectors, including higher education. One crucial implementation of information technology within universities is the academic information system, which includes student payment services. University YZ has implemented the X Payment System to facilitate the integrated management of academic and financial data. However, despite the implementation of this system, several challenges remain. Issues such as data security, information integrity, process reliability, and alignment between the system and the institution's strategic objectives continue to be major concerns. These challenges highlight the importance of implementing effective IT governance to ensure that information systems operate in accordance with organizational expectations and are able to deliver optimal value to all stakeholders.

One of the frameworks widely used in the implementation of IT governance is COBIT (Control Objectives for Information and Related Technology). COBIT version 4.1 is known for its process structure that focuses on technology control, while COBIT 5 offers a more holistic approach by emphasizing the integration of

governance and management in supporting the achievement of business objectives. COBIT 5 is also more flexible in adapting to technological developments and the needs of modern organizations [1].

In the context of higher education institutions, it is important to identify which framework is more effective for implementing payment information systems. Previous studies indicate that COBIT 4.1 has advantages in terms of the simplicity of its process structure; however, it is limited in integrating governance and management aspects [2]. In contrast, COBIT 5 provides a comprehensive framework that encompasses five principles of IT governance and management, which are capable of enhancing process capability [3].

Evaluating payment information systems using the COBIT approach is crucial, considering the high volume of transactions and the sensitivity of the data managed within such systems. Poorly governed payment systems can lead to financial irregularities, data breaches, and a decline in stakeholder trust in the institution [4]. Therefore, comparing the effectiveness of COBIT 4.1 and COBIT 5 in the context of their implementation at University YZ will provide strategic insights for strengthening campus IT governance.

This research is also relevant to current industry demands, which increasingly emphasize good governance, information system security, and compliance with IT governance standards. The implementation of an appropriate governance framework not only improves internal efficiency but also enhances institutional competitiveness in the era of digital transformation [5].

2. Literature Review

Information technology governance is an essential element in ensuring that organizational information systems operate effectively, securely, and in alignment with institutional objectives. One of the most widely used frameworks for evaluating IT governance is COBIT, which provides a structured model for assessing the maturity of IT processes and controls within an organization. The COBIT 4.1 framework focuses on control objectives and process maturity to support operational management and monitoring of information systems. Through its maturity model, organizations can evaluate the effectiveness of IT processes and identify areas requiring improvement [23]. Previous studies have shown that the implementation of COBIT 4.1 is effective in assessing operational procedures, data management, and internal control mechanisms within academic information systems. For example, research conducted on higher education information systems demonstrates that COBIT 4.1 can systematically measure IT governance maturity and provide recommendations for improving service quality and security [1], [4]. Nevertheless, several studies also indicate that COBIT 4.1 primarily emphasizes operational control and procedural compliance, which limits its ability to integrate governance processes with broader organizational value creation and strategic objectives [2].

To overcome these limitations, the COBIT 5 framework was introduced as a more comprehensive model that integrates governance and management of enterprise IT. COBIT 5 emphasizes five governance principles that focus on value creation, stakeholder needs, and alignment between IT services and organizational goals [22]. Previous research indicates that COBIT 5 provides a more holistic approach for evaluating IT governance because it assesses both operational performance and strategic alignment simultaneously [3], [5]. However, most previous studies tend to evaluate the implementation of COBIT 4.1 or COBIT 5 separately rather than conducting a comparative analysis within the same organizational environment. This situation creates a research gap regarding how both frameworks differ in assessing the effectiveness of governance in a specific information system, particularly in financial or payment systems within higher education institutions. Based on this gap, the research problem in this study is formulated as follows: How do COBIT 4.1 and COBIT 5 compare in evaluating the effectiveness of IT governance in the X Payment System at YZ University based on user perceptions? Addressing this problem is important to

determine which framework provides a more suitable approach for evaluating governance in academic payment systems and to identify areas for improving system performance, security, and monitoring processes.

3. Method

Research Methodology

Research is a systematic activity conducted to obtain solutions to problems or phenomena through scientific procedures (Riadi, 2016:1).

This study employs a quantitative research approach that focuses on user perceptions of the system. Quantitative research can be defined as a method grounded in positivist philosophy, used to examine a specific population or sample. Sampling techniques are generally conducted randomly, data are collected using research instruments, and data analysis is quantitative or statistical in nature, with the objective of testing predetermined hypotheses (Muhajirin, Risnita, & Asrulla, 2024:86).

Research Location

This research was conducted at University YZ, located at Jl. Imam Bonjol No. 15–17, Dadapsari, North Semarang District, Semarang City, Central Java 50173, Indonesia.

Research Stages

Prior to data collection, several stages were completed until the research was finalized. The research workflow is described as follows:

1. Planning

This stage involved conducting a literature review and analyzing documents related to the audit of academic information systems, particularly the payment system. Direct observation of the payment system in System X was also carried out through the student portal to examine user interaction processes, including system constraints and available technical support.

The determination of respondents was conducted by selecting individuals who were considered knowledgeable about the information system environment at University YZ. Respondents were also selected from among system users to obtain insights into service delivery from the user perspective. This stage was strengthened by an extensive literature review to identify relevant COBIT domains as the theoretical foundation, followed by the systematic design of audit activities.

2. Fieldwork

To support the analysis, supporting data were collected through interview sessions with Information Technology (IT) developers. At this stage, data validation was performed; if the collected data were deemed insufficient, the research returned to the literature review and domain determination stages. Once the data were considered adequate, questionnaires were developed, distributed, and subsequently confirmed. The collected data were then processed and analyzed.

3. Reporting

After the questionnaires were distributed, the resulting data were processed and analyzed. The researcher measured the maturity level using the COBIT 4.1 framework and the capability level using the COBIT 5 framework.

1) Maturity Level (COBIT 4.1)

This stage involved evaluating the level of conformity of the payment system in System X at University YZ based on selected domains, namely DS (Deliver and Support) and ME (Monitor and Evaluate).

Analysis steps:

- a. Mapping Questionnaire Results to DS and ME Domains
Data obtained from the questionnaires were processed to generate average maturity level values for each control process relevant to the payment system, including:
 - a) DS5: Ensure Systems Security
 - b) DS11: Manage Data
 - c) ME1: Monitor and Evaluate IT Performance
 - d) ME2: Monitor and Evaluate Internal Control
- b. Maturity Level Assessment
Maturity levels were assessed using a scale of 0–5 based on user perceptions and observational results (Likert scale converted to maturity levels).
- c. Gap Identification
Gaps were identified by comparing the current maturity level (current state) with the ideal maturity level (expected level), for example, a target of Level 4 (*Managed and Measurable*).

2) Capability Level (COBIT 5)

This stage represented a continuation of the analysis using the COBIT 5 framework to assess the extent to which the payment system meets IT service management and evaluation requirements based on the following domains:

- a. DSS (Deliver, Service, and Support)
Relevant processes:
 - a) DSS01: Manage Operations
 - b) DSS05: Manage Security Services
- b. MEA (Monitor, Evaluate, and Assess)
Relevant processes:
 - a) MEA01: Monitor, Evaluate, and Assess Performance and Conformance
 - b) MEA02: Monitor, Evaluate, and Assess the System of Internal Control

Data from interviews, observations, and questionnaires were used to assess the level of IT governance alignment using the COBIT 5 capability maturity model on a scale of Level 0–5.

If further verification was required, the calculation process was repeated. The research activities concluded with the formulation of audit recommendations as solutions or improvement suggestions for the organization, after which the study was considered complete.

4. Result and Discussion

Respondent Profile

The research data were obtained through the distribution of questionnaires to users of the X payment system at University YZ, consisting primarily of students as the main users of the system. Data collection was conducted using a questionnaire instrument based on a five-point Likert scale, which was employed to measure respondents' perceptions of service quality, system security, process reliability, and monitoring and evaluation mechanisms within the payment system. The questionnaire was developed based on relevant domains and processes from the COBIT 4.1 and COBIT 5 frameworks, enabling the collected data to serve as the basis for assessing maturity levels and capability levels.

A total of 82 (eighty-two) questionnaires were distributed, and all returned questionnaires were deemed valid for analysis. The respondents were active students of University YZ who had used the payment module in System X, and therefore were considered to have sufficient experience to evaluate the system under study.

The characteristics of the respondents in this study represent payment system users who directly interact with financial features, such as tuition fee payments and billing status inquiries. Consequently, the data obtained are relevant for describing the actual condition of the payment system from the users' perspective. The respondents' answers were processed by converting the Likert scale into numerical values as follows.

Table 1. Likert Scale

Likert Scale	Value
Strongly Agree	5
Agree	4
Neutral	3
Disagree	2
Strongly Disagree	1

The average score is measured using the formula:

$$\text{Average score} = \frac{\text{Total score}}{\text{Number of respondents}}$$

The results of each statement are used to assess the level of conformity of payment system services based on the COBIT 5 domains.

Table 2. Value Range

Value Range	Maturity Level	Capability Level
0.00 – 0.50	Level 0	Level 0
0.51 – 1.50	Level 1	Level 1
1.51 – 2.50	Level 2	Level 2
2.51 – 3.50	Level 3	Level 3
3.51 – 4.50	Level 4	Level 4
4.51 – 5.00	Level 5	Level 5

The collected data was then processed and analyzed to determine the maturity level of information technology governance using the COBIT 4.1 framework and the process capability level using the COBIT 5 framework. The results of this analysis are presented in the next subsection as a basis for comparing the effectiveness of the two frameworks in supporting the governance of the X payment system at YZ University.

Results of Analysis Using COBIT 4.1

COBIT 4.1 Process Mapping in the X Payment System

The COBIT 4.1 framework was selected based on its ability to assess the maturity level of IT governance processes in a structured manner. In this study, the Delivery and Support (DS) and Monitoring and Evaluation (ME) domains were chosen because they are directly related to operational services, security, data management, and monitoring of payment system performance.

The COBIT 4.1 processes analyzed include:

DS5 – Ensure Systems Security, related to access security, payment data protection, and preventing unauthorized access.

Table 3. MEA02 Results

Indicator	Statement	Average Score
DS5.01	The system login mechanism has a good level of security	3.70
DS5.02	Payment data are well protected within the system	3.81

DS5.03	Students feel secure when conducting transactions through the X Payment System	3.84
DS5.04	The system prevents unauthorized access to payment information	3.77
Average	DS5 Maturity Value	3.78

The average score of 3.78 indicates that the system's security maturity is at Level 4. This means that security procedures are managed in a measurable manner. Students feel secure, but the university needs to ensure these security standards are monitored through consistent metrics.

DS11 – Manage Data, related to the accuracy, integrity, and availability of student payment data.

Table 4. Results of DS11 (Manage Data) Maturity Level Assessment in Payment System X

Indicator	Statement	Average Score
DS11.01	Payment data in System X accurately reflect actual conditions	3.97
DS11.02	Payment history is easily accessible to students	3.92
DS11.03	Data are securely stored without risk of loss	3.99
Average	DS11 Maturity Value	3.96

The average score of 3.96 places data management at Level 4. This is the highest score in the DS domain, indicating that data integrity is a key strength of System X. Users have high confidence that their data will not be lost or misrepresented.

ME1 – Monitor and Evaluate IT Performance, relates to monitoring the performance of the payment system.

Table 5. Results of ME1 (Monitor and Evaluate IT Performance) Maturity Level Assessment

Indicator	Statement	Average Score
ME1.01	Billing information is updated in a timely manner	3.85
ME1.02	System performance supports academic administration	3.89
ME1.03	System performance meets student needs	3.92
ME1.04	Overall satisfaction with the performance of System X	3.86
Average	ME1 Maturity Value	3.88

The average score of 3.88 is at Level 4. This indicates that management has established performance indicators and conducts regular evaluations based on user feedback.

ME2 – Monitor and Evaluate Internal Control, related to the effectiveness of internal controls in the payment system.

Table 6. Results of ME2 (Monitor and Evaluate Internal Control) Maturity Level Assessment

Indicator	Statement	Average Score
ME2.01	Payment procedures in System X are clearly defined	3.95
ME2.02	The system is able to detect transaction errors	3.72
ME2.03	Payment status recording is performed accurately	3.85
ME2.04	The system provides clear information when problems occur	3.90
Average	ME2 Maturity Value	3.85

With an average score of 3.85, ME2 is at Level 4. Procedures are very well defined (score 3.95), but the system's ability to automatically detect errors (score 3.72) remains the lowest and needs to be improved to be more preventative. These processes are mapped using questionnaire indicators that represent students' experiences and perceptions of using payment system X.

COBIT 4.1 Maturity Level Calculation Results

Based on the questionnaire data processing, the maturity level scores for each process are as follows:

Table 7. Maturity Level Results

COBIT 4.1 Process	Maturity Score	Level Interpretation
DS5 – Ensure System Security	3.78	Level 4 – Managed and Measurable
DS11 – Manage Data	3.96	Level 4 – Managed and Measurable
ME1 – Monitor and Evaluate IT Performance	3.88	Level 4 – Managed and Measurable
ME2 – Monitor and Evaluate Internal Control	3.85	Level 3 – Defined Process
Average	3.86	Managed and Measurable

These results indicate that, in general, payment system X has documented procedures and is consistently implemented, although performance evaluation and measurement are not yet fully optimized.

COBIT 4.1 Maturity Gap Analysis

The expected target maturity level is Level 4 (Managed and Measurable). A comparison between the current and expected conditions is shown in the following table:

Table 8. Gap Maturity Level

Process	Current Level	Expected Level	Gap
DS5	3.78	5.00	1.22
DS11	3.96	5.00	1.04
ME1	3.88	5.00	1.12
ME2	3.85	5.00	1.14

Analysis Results Using COBIT 5

COBIT 5 Process Mapping in Payment System X

The COBIT 5 framework is used to assess the level of process capability with a more comprehensive approach based on governance principles. The domains used in this study are:

DSS01 – Manage Operations

The DSS01 process assesses the extent to which payment system X operates reliably, stably, and supports student payment activities.

Table 9. DSS01 Results

Indicator	Statement	Average Score
DSS01.01	The payment system rarely experiences disruptions	3.72
DSS01.02	The payment system has a fast response time	3.86
DSS01.03	The system can be accessed at any time when needed	3.84
DSS01.04	System performance supports financial administration	3.91
Average	DSS01 Capability Value	3.83

Based on data processing results, the average DSS01 score of 3.83 indicates that the X payment system's operations are running well. The majority of students agreed that the system is accessible and supports payment administration needs. However, several respondents still gave a neutral assessment, indicating the need for improved service consistency, particularly in terms of uptime stability.

DSS01 Capability Level: Level 4 – This means that the system's operational processes have been documented and are being implemented consistently.

DSS05 – Manage Security Services

The DSS05 process assesses the security aspects of the payment system, specifically financial data protection and prevention of unauthorized access.

Table 10. DSS05 Results

Indicator	Statement	Average Score
DSS05.01	The system has secure control mechanisms	3.70
DSS05.02	Student payment data are well protected	3.81
DSS05.03	The system prevents unauthorized access	3.77
DSS05.04	The risk of data misuse is relatively low	3.76
Average	DSS05 Capability Value	3.76

These results indicate an average score of 3.76. In terms of security, students tend to feel safe using payment system X. The security mechanisms are considered quite good, although the login mechanism needs to be further strengthened to minimize concerns regarding data protection. DSS05 Capability Level: Level 4.

MEA01 – Monitor, Evaluate, and Assess Performance

MEA01 assesses the extent to which payment system performance is monitored and evaluated to ensure it meets user needs.

Table 11. MEA01 Results

Indicator	Statement	Average Score
MEA01.01	The system operates in accordance with its intended functions	3.85
MEA01.02	The system supports smooth academic administration	3.87
MEA01.03	System performance meets student needs	3.92
MEA01.04	Users are satisfied with the system's performance	3.88
Average	MEA01 Capability Value	3.88

These results show an average score of 3.88. Students rated the performance of payment system X as very effective. The system was deemed to have supported the academic payment process very well and to have a high level of suitability for student needs. MEA01 Capability Level: Level 4

MEA02 – Monitor, Evaluate, and Assess Internal Control

MEA02 focuses on the effectiveness of the system's internal controls in detecting and minimizing transaction errors.

Table 12. MEA02 Results

Indicator	Statement	Average Score
MEA02.01	The system is able to detect payment errors	3.72
MEA02.02	Payment data rarely experience errors	3.77
MEA02.03	The system provides clear information when problems occur	3.90
MEA02.04	Payment system controls operate effectively	3.82
Average	MEA02 Capability Value	3.80

The average score of 3.80 indicates that the system's internal controls are functioning well. The system is deemed capable of providing clear information when problems occur, but payment data accuracy (rare errors) remains a point that requires regular monitoring. MEA02 Capability Level: Level 4.

These four processes directly reflect the operational, security, performance, and internal control aspects of payment system X.

COBIT 5 Capability Level Assessment Results

The results of the capability level assessment are as follows:

Table 13. Capability Level Results

COBIT 5 Process	Capability Level	Level Interpretation
DSS01 – Manage Operations	3.83	Level 4 – Predictable Process
DSS05 – Manage Security Services	3.76	Level 4 – Predictable Process
MEA01 – Monitor, Evaluate, and Assess Performance	3.88	Level 4 – Predictable Process
MEA02 – Monitor, Evaluate, and Assess Internal Control	3.80	Level 4 – Predictable Process
Average	3.81	Predictable Process

These results indicate that the payment system governance process is well-functioning, documented, and consistently implemented.

COBIT 5 Capability Level Gap Analysis

The expected target capability level is Level 4 (Predictable Process). The gap table is shown below:

Table 14. Gap Capability Level

Process	Current Level	Expected Level	Gap
DSS01	3.83	5.00	1.17
DSS05	3.76	5.00	1.24
MEA01	3.88	5.00	1.12
MEA02	3.80	5.00	1.20

COBIT 5 is considered superior in identifying governance aspects due to its integrated approach and focus on value creation.

Comparison of COBIT 4.1 and COBIT 5 Results

The comparison of analysis results from COBIT 4.1 and COBIT 5 for the Payment System X at University YZ is shown below:

Table 15. Comparison of COBIT 4.1 and COBIT 5

Comparison Aspect	COBIT 4.1	COBIT 5
Average Result	3.86 (<i>Managed and Measurable</i>)	3.81 (<i>Predictable Process</i>)
Assessment Focus	Procedures and controls	Capability and goal achievement
Strengths	Easier to assess procedural compliance	More detailed in operational aspects
Gap Identification	Adequate for basic standards	More in-depth for modern IT governance

The analysis results show that payment system X performed very well overall according to students' perceptions, with an average score above 3.75 across both frameworks. The highest score was found in DS11/Data Management (3.96), indicating that students strongly believe that their payment history is accurately stored.

Although the average score for COBIT 4.1 (3.87) was slightly higher than for COBIT 5 (3.83), this was due to differences in the questionnaire indicators, which were more specific to COBIT 5's technical operations. This finding indicates that while payment procedures are well established, operational flexibility (DSS01) still has room for improvement to achieve full optimization.

Recommendations for Improvement of Payment System Governance

Based on the analysis results, the recommended improvements are:

- a. Short-term: Maintain security performance (DS5/DSS05) as it is the foundation of student trust.
- b. Long-term: Automate the real-time input error detection system to close gaps in the ME2/MEA02 process.
- c. Specific (DSS01): Ensure 24/7 system availability especially during peak payment periods (such as KRS period) to improve operational scores.

5. Conclusion

Based on the data analysis and discussion regarding the comparative effectiveness of the COBIT 4.1 and COBIT 5 frameworks in the governance of the X payment system at YZ University, the following conclusions can be drawn: Maturity and Capability Level: Based on the perceptions of 82 student respondents, the governance of the X payment system has reached an excellent level. For COBIT 4.1, the average score was 3.87 (Level 4 – Managed and Measurable), while for COBIT 5, the average score was 3.83 (Level 4 – Predictable Process). This indicates that the system not only operates according to procedures, but its performance is consistently measurable and controlled. Framework Effectiveness: * COBIT 4.1 is effective in mapping the maturity of operational procedures and internal controls in detail (focusing on how things are done). COBIT 5 has proven to be more effective and comprehensive in evaluating governance because it integrates operational aspects with value creation and stakeholder needs (focusing on why and for whom things are done). User Perception: Students gave the highest ratings for data integrity (DS11) and security (DS5/DSS05). This indicates that System X has successfully built user trust in billing accuracy and financial data protection.

Recommendations

Based on the research findings and the gap to the optimal level (Level 5), here are some recommendations to consider:

1. For University YZ (System X Administrator):
 - a. Monitoring Automation: Given that the system is already at Level 4, the next step is to reach Level 5 (Optimizing). It is recommended to implement a real-time monitoring dashboard that can provide automatic alerts if server performance declines before students complain.
 - b. Periodic Security Audits: Despite the high security score (3.79), periodic external audits are necessary to ensure the system remains resilient to the latest and evolving cyber threats.
 - c. Improved Response Speed: Improve the infrastructure in the DSS01 (Manage Operations) domain to minimize lag during peak hours (during the KRS (Student Registration) period or payment deadlines).
2. For Future Researchers
 - a. Expanding Respondents: It is recommended to involve respondents from the financial administrator (BAU) and university management, not just students, to gain a governance perspective from the service provider (supply side).
 - b. Adding Domains: Future research could explore the APO (Align, Plan, and Organize) domain in COBIT 5 to determine the extent to which System X's IT strategy aligns with the university's long-term strategic plan.
 - c. Using the Latest Framework: Given the continued evolution of technology, future researchers could compare COBIT 5 with COBIT 2019, which has more flexible design components.

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