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Audit And Evaluation Of CBT Examination System At SMK Muhammadiyah-10 Kisaran Using Cobit 2019 Framework

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Abstract - This study aims to audit and evaluate the Computer Based Test (CBT) system for Academic Ability Tests (TKA) at SMK Muhammadiyah 10 Kisaran using the COBIT 2019 framework through a mixed-methods descriptive approach with data collection techniques including observation, semi-structured interviews, questionnaires based on COBIT 2019 capability indicators, and documentation studies, focusing on five COBIT 2019 domains: EDM03 (Ensure Risk Optimization), APO12 (Manage Risk), APO13 (Manage Security), DSS01 (Manage Operations), and DSS05 (Manage Security Services), with 8 respondents consisting of the principal, curriculum vice principal, IT team, proctors, technicians, and teachers determined through purposive sampling based on RACI chart analysis. The results show that the overall capability level of CBT system governance is at Level 2 (Managed Process) with an average score of 2.22, while DSS01 reaches Level 3 (Established Process) with a score of 3.01, and the gap analysis reveals significant discrepancies between actual conditions and the expected Level 4 (Predictable Process), with EDM03 having the largest gap (2.08) and only 48% achievement, identifying EDM03, APO12, APO13, and DSS05 as priority domains requiring immediate improvement due to their high impact on TKA implementation reliability and security. This research contributes a comprehensive evaluation model integrating risk analysis, IT-Related Goals, and COBIT 2019 capability levels for CBT systems in vocational high schools, which is still rarely studied in the Indonesian educational context, providing both theoretical contributions to the development of information system audit studies in education and practical benefits as evaluation material and a basis for CBT system improvement for school management.

Keywords: Information Technology Audit; Computer Based Test; COBIT 2019; Capability Level; Vocational High School.

1. INTRODUCTION

The rapid advancement of information technology has fundamentally transformed educational practices, particularly in the domain of student learning evaluation[1]. One of the most significant innovations in this area is the implementation of Computer Based Test (CBT) systems, which have been widely adopted by educational institutions to replace traditional paper-based examinations[2]. CBT systems offer numerous advantages including improved efficiency in test administration, enhanced objectivity in scoring, greater accuracy in result processing, and the ability to accommodate large-scale assessments with reduced logistical complexity[3]. These systems represent a critical component of digital transformation in education, enabling institutions to conduct evaluations that are more reliable, timely, and cost-effective while minimizing opportunities for academic dishonesty when properly implemented[4][5][6].

Despite the growing adoption of CBT systems in Indonesian vocational high schools, the implementation of these systems often faces significant challenges that compromise their effectiveness and reliability[7][8]. At SMK Muhammadiyah 10 Kisaran, a vocational secondary school that has implemented a CBT system for conducting Academic Ability Tests (TKA), preliminary observations have revealed a series of critical problems that threaten the success of computer-based examinations[9][10]. The implementation of TKA as a CBT-based evaluation faces multifaceted challenges that span technical, operational, and governance dimensions. Research by Sukamto et al. (2026) confirms that TKA as an educational evaluation innovation requires proper technological support to achieve its objectives effectively[10]. Similarly, Syutri and Julhadi (2026) emphasized that technology-based evaluation systems like CBT demand robust governance frameworks to ensure their reliability and validity[11]. Siregar et al. (2025) found that limited facilities and infrastructure, such as computer laboratories that are not proportional to the number of students, cause CBT implementation to be less than optimal in vocational high schools[7]. These problems manifest across multiple dimensions: technical infrastructure issues including unstable internet connections during simultaneous examinations, limited server capacity that causes system slowdowns when participant numbers increase, non-uniform computer specifications across examination stations, the absence of backup server systems, and inadequate security policies[4][8]. Research by Gaol et al. (2022) on CBT services in improving competency and educational personnel in North Sumatra found that while CBT has potential benefits, its implementation faces significant challenges including technical infrastructure limitations and the need for enhanced human resource capacity[12]. Hartati and Mardiana (2018) evaluated CBT implementation for national examinations in remote schools in South Sumatra, finding that technical constraints, particularly internet connectivity and infrastructure readiness, significantly impacted the effectiveness of computer-based testing[6]. Imanda et al. (2024) identified challenges in CBT learning implementation including infrastructure limitations, resistance to change, and the need for comprehensive planning and stakeholder engagement[13].

On the governance side, the school faces equally concerning challenges including the absence of written policies specifically governing CBT operations, Standard Operating Procedures (SOPs) that have not been updated to

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reflect current conditions, unclear documentation of roles and responsibilities among the CBT implementation team, the lack of formal risk analysis and mitigation planning, and undocumented post-examination evaluations[6][9][14]. Research by A'yuni et al. (2023) on literature review of IT governance audits using COBIT 2019 framework found that many educational institutions still lack proper IT governance structures, leading to suboptimal technology utilization[15]. Cahyono and Widianti (2025) studied IT governance and risk management implementation using COBIT 2019 at the Army Polytechnic, finding that governance weaknesses in risk management and security are common challenges in educational institutions[14]. These conditions create a situation where the CBT system operates in an ad-hoc manner, with technical problems being addressed reactively rather than preventively, and governance practices that lack the structure necessary for continuous improvement[1][16][17]. Research by Anggraini et al. (2024) on information system audit using COBIT 5 found similar governance weaknesses in educational information systems, particularly in risk management and security domains[18]. Hardinata et al. (2019) conducted IT governance audits at universities using COBIT 5, identifying gaps in IT management processes, including insufficient documentation and unclear role definitions[19]. Hariyono et al. (2025) audited e-payment information systems using COBIT 2019 at a vocational high school, finding that governance structures, particularly in risk management and security, require significant improvement[9]. The cumulative effect of these problems is a CBT system that cannot consistently deliver reliable, secure, and fair examinations, thereby potentially compromising the validity of student competency assessments and the credibility of the school's evaluation processes[1][4][10].

The anticipated solution to these multifaceted problems lies in conducting a comprehensive audit and evaluation of the CBT system's governance and management practices using a structured and internationally recognized framework[1][16]. The COBIT 2019 (Control Objectives for Information and Related Technologies) framework, developed by ISACA, provides a comprehensive approach to IT governance and management that is particularly well-suited for this purpose[1][20][21]. A'yuni et al. (2023) confirmed through their literature review that COBIT 2019 is the most widely used and effective framework for IT governance auditing in various sectors, including education[15]. According to research by Ikhsan et al. (2021), the Deliver, Service, and Support (DSS) domain is the most dominant in implementing COBIT 2019 in companies and agencies in Indonesia, confirming the relevance of the DSS domain in this study. This framework offers several critical capabilities: it provides a systematic methodology for assessing the capability level of IT processes, enabling organizations to understand their current state of IT governance maturity[20][22]; it establishes clear standards and best practices against which current practices can be benchmarked, facilitating the identification of gaps and weaknesses[1][14]; it offers a structured approach to risk management that can help schools anticipate and mitigate technical and operational risks before they impact examination delivery[23][14] and it provides guidance for formulating actionable improvement recommendations that are aligned with organizational goals and resource constraints[14][22]. Anwar (2025) developed a questionnaire system for COBIT 2019 capability assessment, providing a structured tool for evaluating IT governance maturity[23]. Viamianni et al. (2023) studied COBIT 2019 information security focus area implementation for digital transformation, demonstrating the framework's effectiveness in addressing security challenges [24]. Wulandari et al. (2025) conducted an information system audit using COBIT 2019 at SMK IT Al Izhar Pekanbaru, finding that COBIT 2019 effectively identifies governance gaps and provides actionable recommendations[25].

Through the application of COBIT 2019, the research expects to produce a detailed assessment of the school's current IT governance capability levels, identify specific gaps that need to be addressed, and formulate practical recommendations that can guide the school in systematically improving its CBT system management[4][22]. According to Prasetya and Muhammad (2025), the COBIT 2019 framework can enhance IT governance quality, particularly in risk management, resource efficiency, and operational sustainability in the education sector[22]. Simatupang and Fianti (2023) assessed capability levels and provided improvement recommendations using COBIT 2019 for the IT consulting industry, confirming the framework's utility in identifying gaps and providing targeted recommendations[26]. Tafdhilla et al. (2023) evaluated the use of COBIT 2019 in IT management at higher education institutions, finding that the framework effectively identifies governance gaps and provides structured recommendations[17]. Siddik et al. (2024) conducted IT governance audits at Hang Tuah University using COBIT 4.1, finding that systematic auditing using COBIT frameworks identifies governance weaknesses and provides clear improvement pathways[16]. The ultimate expected outcome is a CBT system that operates reliably, securely, and sustainably, thereby ensuring that TKA examinations can be conducted with the integrity and credibility that students, teachers, and stakeholders deserve[4][10][11].

Several previous studies have examined the application of COBIT frameworks in educational contexts, though significant gaps remain that this research addresses. Felicia, et al. (2024) leveraged COBIT 2019 to measure accounting software implementation in high schools for better transparency, demonstrating the framework's relevance in educational environments, though focusing on financial rather than academic systems[5][27]. Gorgona (2021) developed a maturity model for COBIT 2019 based on CMMI (Capability Maturity Model Integration), thus providing a systematic method for calculating IT process capability levels from level 0 to level 5 based on specific activities that have been achieved by the organization[28]. Artana et al. (2023) conducted an IT governance audit at Denpasar Industrial Training Center using COBIT 5, finding capability levels of 2-3 across four domains and identifying gaps requiring improvement[29]. This study demonstrated the effectiveness of COBIT-based capability assessment but focused on training center administration rather than examination systems. Nabila (2024) specifically mapped core-processes using the COBIT 2019 design factor approach for IT governance in vocational high schools, identifying

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APO13 (Manage Security) and DSS05 (Manage Security Services) as core processes requiring priority attention in the vocational school context. This research is particularly relevant as it confirms the importance of security domains in vocational education IT governance. Wulandari et al. (2025) audited the CBT information system using COBIT 2019 at SMK IT Al Izhar Pekanbaru, evaluating governance and management objectives including EDM03 (Ensure Risk Optimization) and EDM04 (Ensure Resource Optimization)[25]. This research is the most directly relevant to the current study, finding that EDM03 was at Level 5 (Fully Achieved) and EDM04 at Level 3 (Largely Achieved), though it did not include comprehensive security domains[25]. Vista and Rapina (2024) designed IT governance at MA Darussalam Pangkalpinang using COBIT 2019, focusing on design factors and process mapping to create governance recommendations[30].

Research at SMK Muhammadiyah 1 Palembang by Fiqri (2025) analyzed IT governance using COBIT 2019 for the EduMU learning management system, finding that capability levels were at Level 1 for domains APO01, APO02, and APO04, with recommendations including policy development, human resource capacity building, and infrastructure improvement. This research confirms the applicability of COBIT 2019 in Muhammadiyah vocational schools and provides a relevant comparison point. Syaifuddin et al. (2022) analyzed CBT application utilization at MI Badrussalam Surabaya, finding that while CBT improves efficiency, proper governance and technical support are essential for successful implementation[8]. Amri et al. (2024) studied client-server based online CBT implementation at SMK Negeri 2 Lhokseumawe, finding that CBT implementation faces challenges including server capacity limitations and network stability issues[4]. Efendi et al. (2021) designed and implemented CBT in vocational education, finding that CBT effectively addresses conventional testing problems but governance aspects remain underexplored[5]. Gamaliel et al. (2024) analyzed risk management on the School Activity Plan and Budget Application Information System (ARKAS) using COBIT 2019, demonstrating the framework's utility in educational IT risk management[19][31]. Research by COBIT 2019 Implementation for Enhancing IT Governance in Educational Institutions (2023) at Yayasan Bunda Hati Kudus found that the organization operates at IT governance level two, employing COBIT 2019 domains BAI04, BAI05, and BAI11, facing challenges including decentralized systems, operational disruptions, and unmet needs. This research demonstrates COBIT 2019's efficacy in addressing IT-related challenges in educational contexts .

The gap analysis reveals that while COBIT frameworks have been applied in various educational contexts, no previous study has specifically conducted a comprehensive audit and evaluation of a CBT examination system in a vocational high school that integrates multiple critical domains including risk optimization (EDM03), risk management (APO12), security management (APO13), operations management (DSS01), and security services (DSS05) simultaneously [1][9][14]. The existing research either focuses on non-examination systems, applies only limited domains, does not include comprehensive security assessment, or is conducted in different educational contexts[8][17]. Furthermore, no previous study has integrated risk analysis with COBIT 2019 capability assessment specifically for CBT systems, nor have they established the relationship between IT-Related Goals and capability levels in the vocational education examination context [14][23]. This research fills this gap by: (1) applying the comprehensive COBIT 2019 framework to audit a CBT examination system across five integrated domains; (2) measuring actual capability levels across EDM03, APO12, APO13, DSS01, and DSS05; (3) identifying specific gaps between current and expected capability levels; (4) conducting root cause analysis to understand the sources of identified gaps; (5) integrating risk analysis with IT-Related Goals mapping; and (6) formulating domain-specific improvement recommendations tailored to the vocational high school context [1][14][15][16][23].

Based on the identified problems and research gap, this study has four primary objectives. First, to conduct a comprehensive audit and evaluation of the TKA-CBT examination system at SMK Muhammadiyah 10 Kisaran using the COBIT 2019 framework, with the aim of producing an objective assessment of current governance and management practices across selected domains [1][16]. Second, to determine the capability level of IT governance and management in the CBT examination system through the application of COBIT 2019's process capability assessment methodology, providing a clear baseline understanding of the school's current IT governance maturity[20][22][23]. Third, to identify and analyze gaps between current practices and COBIT 2019 standards for each assessed domain, enabling the prioritization of improvement efforts based on the magnitude of gaps and their impact on examination quality[14][18][22][23]. Fourth, to formulate strategic and operational recommendations that can guide the school in systematically improving the effectiveness, security, and reliability of its CBT examination system, with specific recommendations for each domain that are realistic given the school's resource constraints and organizational context[4][17][22][25]. Through achieving these objectives, the research aims to contribute both theoretically to the development of information system audit studies in education and practically by providing the school with a clear roadmap for improving its CBT system governance [1][7][15][4]

2. RESEARCH METHODOLOGY

2.1 Research Type and Approach

This research employs a descriptive study with a mixed-methods approach (qualitative and quantitative)[13]. The descriptive approach aims to describe the actual conditions of CBT system management at SMK Muhammadiyah 10 Kisaran, while the quantitative approach is used to measure the capability level of IT processes based on the COBIT

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2019 framework[13]. This research falls into the category of information system audit, as it focuses on assessing the conformity between actual system conditions and established IT governance standards[16].

2.2 Time and Place of Research

This research was conducted at SMK Muhammadiyah 10 Kisaran, located in Asahan Regency, North Sumatra. The school was selected because it has implemented a CBT system for learning evaluation. The research was conducted over a six-month period, adjusted to the school's academic calendar[13].

2.3 Population and Sample

The population in this study includes all parties directly involved in the management and implementation of the CBT examination system at SMK Muhammadiyah 10 Kisaran. The sample was determined using purposive sampling technique, selecting individuals who have knowledge, experience, and authority in CBT system management[13]. Based on RACI chart analysis, 8 respondents were identified: Principal, Curriculum Vice Principal, Proktor TIM IT RPS 1, Technician RPS 1, Proktor TIM IT RPS2, Senior Teacher, Teacher, and Examination Coordinator[15][23][26].

2.4 Research Instruments and Measurement Scale

The research instrument used a questionnaire developed based on COBIT 2019 capability level indicators for each process [1]. Each question used an ordinal scale of 0-5 corresponding to COBIT 2019 capability levels, where Level 0 is Incomplete Process, Level 1 is Performed Process, Level 2 is Managed Process, Level 3 is Established Process, Level 4 is Predictable Process, and Level 5 is Optimizing Process [1][23].

The target capability level for each domain was set at Level 4 (Predictable Process), considering that at this level processes operate within defined and measurable boundaries, enabling the TKA-CBT system to be managed reliably, securely, and sustainably [1][22].

2.5 Data Collection Techniques

Data collection was conducted through: (a) observation of CBT implementation, supporting infrastructure, and operational procedures[13]; (b) semi-structured interviews with selected respondents to explore policies, constraints, and CBT system management practices[13]; (c) questionnaires to measure IT process capability levels based on COBIT 2019 framework[20][23]; and (d) documentation studies analyzing supporting documents such as examination SOPs, school IT policies, and examination reports[13][16].

2.6 Data Analysis Techniques

Qualitative data from observations, interviews, and documentation were analyzed using descriptive analysis techniques with data reduction, data presentation, and conclusion drawing[13]. Quantitative data from questionnaires were analyzed by calculating capability level values for each COBIT 2019 process [20][22]. The results were then compared with the expected capability level to identify gaps (gap analysis). The formula used was: Gap = Target Level - Actual Level, and Percentage Achievement = (Actual Level / Target Level) × 100%[14][18][22].

The Capability Level calculation used the formula: Capability Level = (Σ Respondent Scores) / (Number of Respondents)[22][23][26].

2.7 Research Validity and Reliability

To ensure the validity and reliability of the research, triangulation of data sources and methods was conducted[13]. The questionnaire was tested on a limited basis before being distributed to respondents to ensure understanding of the instrument. Additionally, member checking was conducted by confirming the research results to the respondents to ensure data accuracy[13]. Anwar (2025) emphasized the importance of properly designed questionnaire systems for COBIT 2019 capability assessment to ensure accurate and reliable results[23].

3. RESULT AND DISCUSSION

3.1 Capability Level Results for Each Domain

Based on questionnaire processing, the capability level results for each COBIT 2019 domain are presented in Table1.

Table 1. Capability Level of COBIT 2019 Processes in TKA-CBT System

COBIT 2019 Domain	Process Description	Actual Capability Level	Expected Capability Level	Gap	% Achievement
EDM03	Ensure Risk Optimization	1.92 (Level 2)	4 (Level 4)	2.08	48.0%
APO12	Manage Risk	2.03 (Level 2)	4 (Level 4)	1.97	50.8%
APO13	Manage Security	2.02 (Level 2)	4 (Level 4)	1.98	50.5%
DSS01	Manage Operations	3.01 (Level 3)	4 (Level 4)	0.99	75.3%

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DSS05	Manage Services	Security	2.12 (Level 2)	4 (Level 4)	1.88	53.0%
Average			**2.22**	**4.00**	**1.78**	**55.5%**

Source: Research Results (2025)

Table 1 shows that most CBT system management processes are at Level 2, indicating that processes have been implemented and controlled but have not yet been formally standardized and are not based on consistent performance measurement [1]. The DSS01 domain is at Level 3 (Established Process), indicating that TKA-CBT operations have been running consistently and following procedures understood by the implementation team [1][22]. This finding aligns with Ikhsan et al. (2021) who found that the Deliver, Service, and Support (DSS) domain is the most dominant in implementing COBIT 2019 in Indonesian organizations, suggesting that operational aspects tend to be more developed than governance aspects.

3.2 Detailed Analysis per Domain

a. **EDM03 (Ensure Risk Optimization)** achieved a capability level of 1.92 (Level 2). This indicates that the school has awareness of risks that may arise in TKA implementation, but risk management is not based on formal policies and documented risk management frameworks [1]. A'yuni et al. (2023) found that many educational institutions still lack proper risk management structures, resulting in reactive rather than proactive risk handling [15]. Cahyono and Widianti (2025) similarly found that risk management in educational institutions using COBIT 2019 requires significant improvement to achieve proper governance [14].
b. **APO12 (Manage Risk)** achieved a capability level of 2.03 (Level 2). Findings indicate that risk identification and mitigation for the TKA-CBT system are conducted on a limited basis and have not been integrated into overall school management processes[14][19]. Gamaliel et al. (2024) found similar risk management weaknesses in educational information systems, emphasizing the need for structured risk assessment and mitigation [19]. Research on COBIT 2019 implementation for enhancing IT governance in educational institutions found that organizations face challenges in implementing IT across campuses, requiring remedies for decentralized systems, operational disruptions, and unmet needs.
c. **APO13 (Manage Security)** achieved a capability level of 2.02 (Level 2). The school has implemented basic security controls such as individual account usage and exam time restrictions [1]. However, there is no written information security policy, security audit mechanisms, or role-based access control [24][25]. Viamianni et al. (2023) studied COBIT 2019 information security focus area implementation for digital transformation, finding that comprehensive security management requires structured approaches across multiple domains[24]. Wulandari et al. (2025) audited CBT information systems using COBIT 2019 at SMK IT Al Izhar Pekanbaru, finding that security domains require significant improvement to achieve desired capability levels[25].
d. **DSS01 (Manage Operations)** achieved a capability level of 3.01 (Level 3), the highest among all domains. This indicates that TKA-CBT operations have been running consistently and following understood procedures [1][22]. Ikhsan et al. (2021) found that the DSS domain is the most dominant in COBIT 2019 implementation in Indonesian organizations, suggesting that operational processes tend to be more developed than governance and management processes. Research by Fiqri (2025) at SMK Muhammadiyah 1 Palembang found that operational aspects of educational IT systems require development to achieve proper governance maturity.
e. **DSS05 (Manage Security Services)** achieved a capability level of 2.12 (Level 2). Security services for the TKA-CBT system are still basic and not fully integrated [1][24]. Nabila (2024) identified APO13 and DSS05 as core processes in vocational high school IT management, emphasizing the importance of security services in educational contexts. Wulandari et al. (2025) found that security services in CBT systems require comprehensive improvement to ensure reliable and secure examination implementation[25].

3.3 Gap Analysis

Based on table 1, consolidates the gap analysis and target achievement calculations. The gap represents the difference between actual and target levels (Target 4 - Actual). EDM03 has the largest gap (2.08) and lowest percentage achievement (48.0%), making it priority 1. APO12 and APO13 follow with gaps of approximately 1.97-1.98. DSS05 has a gap of 1.88 (priority 4), while DSS01 has the smallest gap (0.99) and highest achievement (75.3%), making it the lowest priority for improvement. Percentage Achievement of Target Level 4 for each domain presented in Figure 1.

Figure 1. Percentage Achievement of Target Diagram

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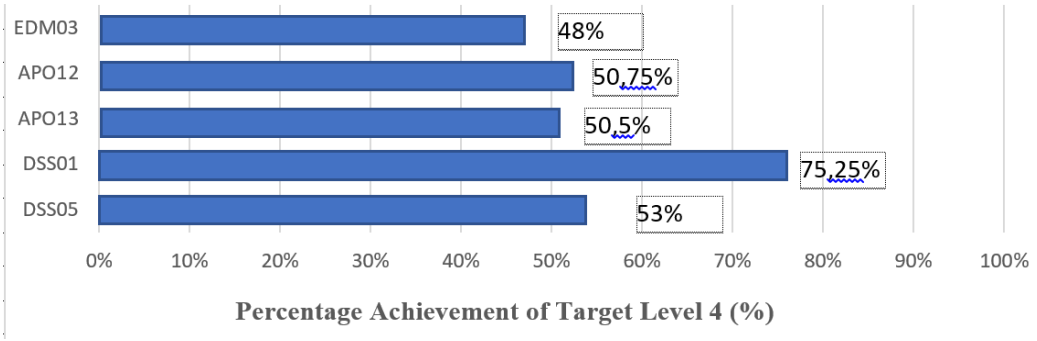

Figure 1 presents the percentage achievement of target Level 4 for each domain. EDM03 achieved 48%, APO12 50.8%, APO13 50.5%, DSS01 75.3%, and DSS05 53.0%, with an overall average of 55.5%. This means that on average, the school has only achieved slightly more than half of the expected capability level. DSS01 shows the best performance at three-quarters of the target, while EDM03 shows the lowest achievement at less than half.
The average gap across all domains is 1.78 levels, with EDM03 having the largest gap (2.08) and only 48% achievement. This confirms the research hypothesis that there is a significant gap between actual conditions and expected COBIT 2019 standards[1][14][15]. Artana et al. (2023) found similar gaps in IT governance audits using COBIT 5, with capability levels of 2-3 across four domains[29]. Fiqri (2025) found even larger gaps at SMK Muhammadiyah 1 Palembang, with capability levels at Level 1 for some domains.

3.4 Root Cause Analysis of Capability Gaps

Table 2. Root Cause Analysis per Domain

Domain	Root Causes	Impact on TKA-CBT
EDM03	No formal risk policy; reactive evaluation; no risk tolerance documentation	Unprepared for technical disruptions; recurring issues without mitigation
APO12	Non-systematic risk identification; shallow impact analysis; unpreserved risk portfolio	Recurring network/server problems; no contingency plan
APO13	No written security policy; non-RBAC access; minimal compliance monitoring	Potential data leakage; exam result manipulation risk
DSS01	Undocumented procedures; no operational KPIs; incomplete incident logs	Individual-dependent consistency; difficult performance measurement
DSS05	Basic network security; no continuous threat monitoring; non-standard incident handling	Vulnerability to cyber attacks; slow threat detection

Table 2 identifies the root causes of gaps for each domain. EDM03 and APO12 share similar root causes related to reactive risk management without formal documentation. APO13 and DSS05 both suffer from missing policies and standards. DSS01 shows operational consistency but lacks formal documentation and metrics. These root causes directly impact TKA exam reliability and security.

The root cause analysis reveals that governance weaknesses in risk management, security, and operations are the primary sources of capability gaps[1][14][15][19]. A'yuni et al. (2023) found that many educational institutions lack proper IT governance structures, leading to suboptimal technology utilization[15]. Research on COBIT 2019 implementation for enhancing IT governance in educational institutions found that organizations face challenges including decentralized systems, operational disruptions, and unmet needs.

3.5 Integration Analysis with IT-Related Goals

Table 3. IT-Related Goals Mapping with COBIT Processes

IT-Related Goal	Risk Faced	Actual Capability Level	Achievement Status
ITRG 04 (Managed IT Services)	R-001, R-002, R-004, R-007	3.01 (DSS01)	Approaching Target
ITRG 05 (Information Security)	R-005, R-008	2.02 (APO13) & 2.12 (DSS05)	Far from Target
ITRG 07 (Service Continuity)	R-001, R-002, R-004, R-009	2.03 (APO12) & 1.92 (EDM03)	Far from Target
ITRG 08 (Policy Compliance)	R-006, R-007, R-010	1.92 (EDM03) & 2.02 (APO13)	Far from Target
ITRG 10 (Risk Management)	R-001 s/d R-010	1.92 (EDM03) & 2.03 (APO12)	Far from Target

Table 3 shows that IT-Related Goals requiring Risk Management (ITRG 10) and Security (ITRG 05) have the largest gaps, indicating that these areas require priority improvement [1][14][22]. Prasetya and Muhammad (2025) found that COBIT 2019 can enhance IT governance quality, particularly in risk management, resource efficiency, and

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operational sustainability in the education sector[22]. Simatupang and Fianti (2023) similarly found that risk management and security are priority areas requiring improvement in COBIT 2019 capability assessment[26].

3.6 Priority Improvement Analysis

Table 4. Priority Improvement Based on IT-Related Goals

Priority	IT-Related Goal	Gap	Critical Risks	Main Recomendation
1	ITRG 10 (Managed IT Risk)	2.08	R-009	4
2	ITRG 05 (Information Security)	1.98	R-005, R-008	4
3	ITRG 07 (Service Continuity)	1.97	R-001, R-002, R-004	4
4	ITRG 08 (Policy Compliance)	1.98	R-006, R-007, R-010	4
5	ITRG 04 (Managed IT Services)	0.99	R-001, R-002, R-003	4

The priority analysis identifies risk management and security as the highest priority areas for improvement[1][14][15][24]. Tafdhilla et al. (2023) found that risk management and security are critical areas requiring improvement in higher education IT governance using COBIT 2019 [17]. Siddik et al. (2024) similarly found that risk management and security require priority attention in IT governance audits[16].

3.4 Improvement Recommendations by Domain

Domain	Process Name	Current Level	Target Level	Gap	Priority	Key Finding	Main Recommendation
EDM 03	Ensure Risk Optimization	1.92 (Level 2)	Level 4	2.08	**1 (Highest)**	No formal risk management policy; reactive evaluation only; no risk tolerance documentation; no structured risk communication	Develop IT risk management policy via Principal's Decree; conduct bi-annual risk evaluations with all stakeholders; establish documented risk tolerance; build risk communication mechanism
APO 12	Manage Risk	2.03 (Level 2)	Level 4	1.97	**2 (High)**	Non-systematic risk identification; shallow impact analysis; unpreserved risk portfolio; no formal mitigation plan	Create risk register covering technical, operational, security risks; perform Business Impact Analysis (BIA); maintain dynamic risk portfolio updated post-exam; develop mitigation plan for network, server, security
APO 13	Manage Security	2.02 (Level 2)	Level 4	1.98	**3 (High)**	No written security policy; non-RBAC access; minimal security monitoring; no information classification	Develop written information security policy; implement Role-Based Access Control (RBAC) for admin, operator, teacher, student; deploy access audit logs; establish confidential/restricted/public classification
DSS 05	Manage Security Services	2.12 (Level 2)	Level 4	1.88	**4 (High)**	Basic malware protection; no network segmentation; no continuous monitoring; non-standard incident handling; no encryption; no secure backup	Implement layered security (antivirus, anti-malware, whitelisting); deploy VLAN for traffic separation; install IDS/IPS for threat monitoring; create incident response procedure; enable HTTPS and database encryption; establish backup with recovery testing 2x/year
DSS 01	Manage Operations	3.01 (Level 3)	Level 4	0.99	**5 (Medium)**	Undocumented operational procedures; no operational KPIs;	Document CBT operational SOP (preparation, execution, post-exam); establish KPIs (server uptime, response time,

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Domain	Process Name	Current Level	Target Level	Gap	Priority	Key Finding	Main Recommendation
						incomplete incident documentation; no preventive maintenance schedule	user satisfaction); create incident log; schedule routine maintenance for server, network, clients

These recommendations align with findings from previous research. A'yuni et al. (2023) emphasized that COBIT 2019 provides structured approaches for improving IT governance in educational institutions[15] Nabila (2024) identified APO13 and DSS05 as core processes requiring priority attention in vocational high school IT management[32]. Vista and Rapina (2024) designed IT governance using COBIT 2019 at MA Darussalam Pangkalpinang, similarly recommending policy development, RBAC implementation, and operational documentation[30]. Hariyono et al. (2025) found that e-payment information system auditing using COBIT 2019 requires similar improvements in risk management, security, and operations[9]. Fiqri (2025) found that IT governance at SMK Muhammadiyah 1 Palembang requires policy development, human resource capacity building, and infrastructure improvement, supporting the recommendations in this study.

4. CONCLUSION

Based on the audit and evaluation results of the TKA-CBT examination system at SMK Muhammadiyah 10 Kisaran, using the COBIT 2019 framework, the overall IT governance capability is at Level 2 (Managed Process), with an average score of 2.22 across the five assessed domains. This indicates that the CBT system governance processes have been implemented and managed, but they have not yet been fully standardized, formally documented, or supported by consistent performance measurement. Among the assessed domains, DSS01 (Manage Operations) achieved the highest capability level at 3.01 (Level 3), indicating that operational activities are carried out more consistently than other governance and security-related processes. However, significant gaps remain between the current condition and the expected Level 4 (Predictable Process), with an average gap of 1.78 and an average target achievement of 55.5%. The largest gap was found in EDM03 (Ensure Risk Optimization), followed by APO13 (Manage Security), APO12 (Manage Risk), and DSS05 (Manage Security Services), indicating that risk optimization, risk management, security management, and security services are the main priority areas for improvement. These gaps are mainly caused by the absence of formal risk and security policies, reactive risk evaluation, undocumented procedures, limited access controls, and inadequate implementation of basic security services. Therefore, implementing the TKA-CBT system requires a more strategic, measurable, and sustainable IT governance approach to ensure the examination system operates reliably, securely, and credibly. This study also provides a practical evaluation model by integrating risk analysis, IT-Related Goals mapping, and COBIT 2019 capability-level assessment, which can serve as a reference for improving CBT system governance in vocational high schools and other educational institutions.

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