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Analysis of ICT-based office administration readiness in vocational high schools: Perspectives of teachers, students, and alumni

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Abstrak

Digitalisasi administrasi perkantoran menjadi kebutuhan mendesak di era Society 5.0, namun kesiapan implementasinya di lingkungan pendidikan kejuruan masih belum merata dan memerlukan kajian yang komprehensif. Penelitian ini bertujuan menganalisis implementasi pembelajaran administrasi perkantoran berbasis teknologi informasi dan komunikasi (TIK) pada Program Keahlian Manajemen Perkantoran dan Layanan Bisnis (MPLB) di SMK dalam menghadapi era Society 5.0. Penelitian ini menggunakan pendekatan kualitatif dengan desain deskriptif multi kasus melalui wawancara semi-terstruktur terhadap guru, siswa, dan alumni. Hasil penelitian menunjukkan bahwa pembelajaran telah mengarah pada pemanfaatan teknologi digital. Namun dalam implementasinya masih belum optimal, konsisten, dan terintegrasi. Proses pembelajaran masih berada pada tahap transisi antara metode konvensional dan digital. Faktor utama yang memengaruhi implementasi meliputi kompetensi guru, ketersediaan infrastruktur, kemampuan siswa dalam pengelolaan dokumen digital, serta manajemen keamanan data. Selain itu, ditemukan kesenjangan kemampuan digital antar siswa, rendahnya ketelitian, serta minimnya pemahaman keamanan informasi. Meskipun demikian, pembelajaran digital berkontribusi positif terhadap kesiapan kerja siswa. Penelitian ini menghasilkan framework konseptual sebagai dasar penguatan implementasi pembelajaran berbasis TIK secara terintegrasi.

Kata kunci : kesiapan kerja; kompetensi digital; literasi digital; pengelolaan dokumen; transformasi digital

Abstract

The digitalization of office administration has become a critical necessity in the Society 5.0 era; however, readiness for its implementation in vocational education settings remains uneven and warrants systematic examination. This study aims to analyze the implementation of ICT-based office administration learning within the Office Management and Business Services (MPLB)

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Program at Indonesian vocational high schools (SMK) amid the transition toward the Society 5.0 era. This study employed a qualitative approach with a multi-case descriptive design, with data collected through semi-structured interviews conducted with teachers, students, and alumni. The findings reveal that instructional practices have shifted toward digital technology; however, implementation remains suboptimal, inconsistent, and inadequately integrated. The learning process continues to occupy a transitional phase between conventional and digital pedagogical approaches. Key factors influencing implementation encompass teacher digital competencies, infrastructure availability, students' digital document management proficiency, and data security management. Furthermore, the study identified digital skill gaps among students, insufficient attention to procedural accuracy, and limited understanding of information security. Nevertheless, ICT-based learning was found to contribute positively to students' workforce readiness. This study proposes a conceptual framework to advance the integrated and sustainable implementation of ICT-based learning in vocational education.

Keywords : digital competency; digital literacy; digital transformation; document management; workforce readiness

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Introduction

The Society 5.0 era requires educational institutions, particularly Vocational High Schools (SMK), to comprehensively integrate Information and Communication Technology (ICT) into all aspects of learning, including office administration. Ideally, office administration learning in the Office Management and Business Services (MPLB) program should be transformed into an integrated and effective ICT-based system that supports the automation of administrative processes (Putri et al., 2025). The integration of ICT in office administration at SMK is not merely about using software, but rather about transformation of work culture toward an integrated and secure system (Suherman et al., 2024). This requires teachers to serve as digital facilitators, and students to possess strong digital literacy skills (Hasanah et al., 2024; Suherman et al., 2024).

However, empirical evidence reveals that the implementation of ICT-based learning continues to encounter persistent challenges. Such challenges encompass insufficient teacher competency in adapting to technological advancements, inequitable distribution of technological infrastructure across institutions, and inadequate student digital literacy particularly as evidenced during the administration of the Vocational Competency Assessment (Fadillah & Marsofiyati, 2024). Furthermore, deficiencies in data management and security systems within educational environments suggest that digital transformation has not yet been accompanied by sufficient institutional readiness, particularly regarding the establishment of robust systems and policy frameworks (Coalliani et al., 2026).

The gap between the digital competency demands within the Society 5.0 context and the current state of learning in SMK presents significant challenges. Graduates of the Office Management and Business Services (MPLB) program in SMK who lack adequate digital competencies may encounter substantial barriers to workforce entry, as proficiency in office applications, digital document management, and data security awareness has become a fundamental competency across industries (Putri et al., 2025; Suherman et al., 2024). Limited digital literacy development at the vocational high school level may also increase workforce vulnerability to procedural errors and cyber threats in professional environments (Kovacs et al., 2021; Yuliansah et al., 2025). Therefore, empirical research is required to comprehensively identify the underlying causes of these challenges as a basis for developing more systematic and targeted ICT-based learning strategies.

Several studies have examined the integration of information technology in vocational education, particularly in the field of office administration at vocational high schools (SMK). Research findings indicate that teacher competence, student motivation, and instructional quality significantly influence student learning outcomes (Ahyani & Dhuhani, 2024; Endang Purnawati, 2022; Permata & Sojanah, 2024). In addition, the use of technology-based learning media has been demonstrated to enhance student engagement and improve comprehension (Basuki et al., 2021; Diana & Sutirman, 2021). On the other hand, digital transformation in educational management through the utilization of information systems also contributes to improving the efficiency of academic services and school administration (Sinaga et al., 2024), supported by the availability of infrastructure such as computer laboratories and other supporting facilities (Fisca Marliany et al., 2025). Nevertheless, previous studies have tended to examine these aspects separately such as teacher competency (Pratiwi et al., 2024), technology infrastructure (Riordan & Rapih, 2026), and students' digital literacy (Rohmawati et al., 2024). Studies that comprehensively integrate these three aspects particularly in relation to students' actual practices during competency examinations and from the perspectives of alumni, students, and teachers are still limited. This highlights a persistent gap between classroom learning and real-world practices that approximate authentic workplace conditions.

Therefore, the novelty of this study lies in its qualitative, interview-based approach involving three perspectives, namely teachers, students, and alumni who have completed the Vocational Competency Assessment. This study aims to analyze the implementation of ICT-based office administration learning in vocational high schools within the Office Management and Business Services program in the Society 5.0 era. Accordingly, the study integrates these three perspectives comprehensively and develops a conceptual framework based on empirical findings as a systematic guideline for the digitalization of office administration in SMK.

Theoretically, this study contributes to the enrichment of vocational education, particularly in developing a more comprehensive understanding of ICT-based office administration learning readiness at SMK. It also highlights an interconnected system in which various components mutually influence students' digital competencies.

Research Method

This study employs a qualitative method with a descriptive multi-case design to analyze the challenges of office administration digitalization in SMK from the perspectives of teachers, alumni, and students. Data were collected through semi-structured interviews involving direct interaction between the researcher and participants. An interview guide was used as a reference while allowing flexibility to adjust questions according to the flow of conversation. Thus, the interview process was flexible and enabled in-depth exploration of information. (Rachmawati, 2007).

The interviews in this study were conducted using a hybrid approach, combining online and offline methods. Offline interviews were carried out with teachers through direct visits to three schools located within the Bandung area. Online interviews, meanwhile, were conducted with students and alumni of the Office Management and Business Services (MPLB) program at vocational high schools (SMK) who had completed the Vocational Competency Assessment, using video call platforms from each participant's respective location. All interview sessions took place from April 4 to April 20, 2026, with each session lasting approximately 40 minutes. The interview questions were structured to examine six thematic areas: 1) the forms and methods of office administration instruction (manual or digital); 2) the intensity of digital application use in learning; 3) students' proficiency in managing digital documents; 4) procedural accuracy and error rates in digital data management; 5) understanding and application of data security practices; and 6) students' readiness for a technology-driven workplace. Data are presented through three forms of representation: tables to systematically summarize findings, direct quotations from participants' statements as empirical evidence, and descriptive

narratives to explain and interpret both forms of presentation. The characteristics of all research participants are summarized in Table 1.

Table 1.
Participant Characteristics

Code	Status	Age	Description	School
A-G1	Teacher	46	MPLB Teacher	SMK [A]
A-G2	Teacher	35	MPLB Teacher	SMK [A]
B-G1	Teacher	55	MPLB Teacher	SMK [B]
B-G2	Teacher	55	MPLB Teacher	SMK [B]
C-G1	Teacher	44	MPLB Teacher	SMK [C]
A-A1	Alumni	19	Graduated in 2025	SMK [A]
A-A2	Alumni	21	Graduated in 2023	SMK [A]
A-A3	Alumni	19	Graduated in 2025	SMK [A]
A-A4	Alumni	20	Graduated in 2024	SMK [A]
B-A1	Alumni	20	Graduated in 2024	SMK [B]
B-A2	Alumni	20	Graduated in 2024	SMK [B]
B-A3	Alumni	19	Graduated in 2025	SMK [B]
C-A1	Alumni	19	Graduated in 2025	SMK [C]
C-A2	Alumni	19	Graduated in 2025	SMK [C]
C-A3	Alumni	19	Graduated in 2025	SMK [C]
A-S1	Student	17	12th Grade	SMK [A]
A-S2	Student	17	12th Grade	SMK [A]
A-S3	Student	18	12th Grade	SMK [A]
B-S1	Student	17	12th Grade	SMK [B]
B-S2	Student	18	12th Grade	SMK [B]
B-S3	Student	17	12th Grade	SMK [B]
C-S1	Student	18	12th Grade	SMK [C]
C-S2	Student	18	12th Grade	SMK [C]
C-S3	Student	18	12th Grade	SMK [C]

Source : Researcher's Data Participant Characteristics

As shown in Table 1, the participants in this study consisted of 24 individuals, including 5 teachers, 10 alumni, and 9 students from the Office Management and Business Services Program across three vocational high schools in Bandung. Participants were selected using purposive sampling based on explicitly defined criteria for each group.

The criteria for selecting teachers were as follows: (1) having a minimum of three years of teaching experience in the Office Management and Business Services Program; (2) being actively involved in the implementation of the Vocational Competency Assessment (UKK), either as a supervisor or examiner; and (3) having direct involvement in the integration of Information and Communication Technology (ICT) into the learning process. The criteria for selecting students were as follows: participants were required to be enrolled in Grade 12 and to be in the preparation or implementation phase of the Vocational Competency Assessment at the time of the study, thereby enabling them to provide relevant and current information regarding their experiences with the assessment. The criteria for selecting alumni were as follows: participants were required to be graduates who had completed the Vocational Competency Assessment within the previous one to three years and had entered the workforce. These criteria were established on the assumption that alumni would still be able to recall their experiences during the assessment with sufficient accuracy while also reflecting on the relevance of those experiences to their professional environments.

The distribution of participants by school is presented in Table 2.

Table 2.
Distribution of Participants by School

School	Teachers	Students	Alumni	Total
SMK [A]	2	3	4	9
SMK [B]	2	3	3	8
SMK [C]	1	3	3	7

Source: Research's Data

Table 2 shows the distribution of research participants from the three groups at each school. The data collection process for interviews using a hybrid format was based on methodological considerations; in-person interviews were prioritized for participants who could be reached directly to allow researchers to capture nonverbal cues, build deeper rapport, and obtain richer data; while online interviews were conducted for 12th-grade students who, at the time of the study, were in the preparation phase for the Vocational Competency Assessment (UKK) and were no longer engaged in regular school instruction, as well as alumni who were geographically unable to attend in person. Thus, the hybrid format was chosen not merely for practicality, but to balance data depth and participant accessibility without compromising interview quality.

To uphold research ethics, particularly regarding confidentiality and privacy, participants' identities were disguised using specific codes so they could not be directly identified. Data obtained from the interviews were systematically documented as the primary material for the study.

The instruments used in this study included an interview guide, an analysis sheet, and mobile phones. To ensure data validity, this study employed source triangulation, which involves comparing perspectives from three groups: teachers, students, and alumni on the same issue. Convergences and divergences among these perspectives were analyzed to yield a more comprehensive understanding that does not rely on a single viewpoint alone (Vogl et al., 2019). The interview guide was developed through several stages. First, the researcher conducted a literature review on the digitization of office administration and the implementation of the UKK to identify relevant aspects to focus the questions on. Second, based on the results of this review, the researcher drafted initial interview questions covering six main aspects: (1) forms and methods of office administration instruction; (2) the intensity of digital application use in instruction; (3) understanding of digital document management; (4) accuracy in managing digital data; (5) understanding and application of data security; and (6) students' readiness to face a digital-based workplace.

In addition to these six main aspects, the researcher also explored further information that emerged during the interview process, such as school infrastructure conditions, teacher competencies, student motivation, and barriers to digital-based learning. Third, the draft interview guidelines were reviewed and discussed (peer review) to obtain feedback on the clarity, completeness, and alignment of the questions with the research objectives. Fourth, the interview guidelines were pilot-tested through preliminary interviews (pilot interviews) with three individuals who shared similar characteristics with the research participants, to assess the readability and smooth flow of the questions before the guidelines were used in the research data collection process.

Data Analysis

The interview data in this study were analyzed using thematic analysis (Braun et al., 2008). The analysis process began by systematically transcribing all interview notes from the 24 participants into written form so that they could be read and examined thoroughly. Next, the researcher carefully read the notes to label or code each relevant unit of meaning so that initial patterns in the data could be identified. Codes with related meanings were then grouped into themes representing findings based on the six aspects of the interviews.

Results and Discussion

Research Findings

The Shift in Learning Toward Digital Technology

The interview results indicate that office administration instruction at vocational high schools has shifted toward the use of digital technology. Most students stated that, during class, they already use computers to complete administrative tasks, such as drafting letters, processing data, and preparing documents.

> "Now it's mostly digital already, pretty much everything uses a computer, though the teacher still explains it manually first." (A-S1, 17 years old)
>
> "Now it's more digital, though there's still some manual stuff. Like for financial stuff and admin tasks like business trips, we use apps like Microsoft Excel. But yeah, manual is still taught too it's just that digital is used more." (C-A2, 19 years old)

Nevertheless, students' use of digital applications is still not optimal and is not yet consistent. Their use tends to be limited to specific practical subjects, occurring about two to three times a week. Additionally, the learning process is still dominated by a theoretical approach rather than hands-on practice.

> "We don't really use digital apps that often, only when there's a practical session. Maybe around 2–3 times a week. And it's not all practical either, there's still a lot of theory." (A-S2, 17 years old)
>
> "It depends on the subject really, I don't use digital apps on a set schedule. For practical or tech-based subjects I'm on the computer more, but sometimes even for subjects that should be practical, theory ends up taking over." (B-S1, 18 years old)

Cross-School Variations in Research Findings

Although all three schools exhibited similar patterns in the implementation of digital-based learning, variations were found in terms of infrastructure, teacher competencies, and students' ability to manage digital documents. Schools with more adequate computer lab facilities tended to implement technology-based learning more consistently, whereas schools with limited devices still relied on manual learning methods under certain conditions. Furthermore, students' ability to manage digital documents also varies, particularly regarding file archiving, procedural accuracy, and independent use of digital applications. To help readers grasp the overall picture of the research findings, the main patterns across cases are summarized in Table 3 below.

Table 3.
Summary of Themes and Patterns of Findings Across Cases

Theme	SMK [A]	SMK [B]	SMK [C]

Digital-Based Learning	Computer use in the classroom has become increasingly routine.	Digital applications are employed in select subjects.	Digital learning remains inconsistent and is frequently conducted through manual methods.
Digital Infrastructure	Computer and internet facilities are comparatively adequate.	Facilities are available; however, usage remains on a rotational basis.	Limited access to devices and internet connectivity constitutes a significant impediment.
Digital Document Management	A proportion of students are capable of independently managing files and performing data backups.	Document management is relatively competent but remains inconsistent.	A number of students continue to experience difficulty with file storage, organization, and nomenclature.
Digital Data Security	A proportion of students are beginning to appreciate the importance of data backup procedures.	File storage practices remain rudimentary, with no supplementary security measures in place.	Awareness of data security protocols remains low.
Student Motivation and Readiness	Students demonstrate a positive disposition toward digital learning.	Students exhibit greater enthusiasm during applied, hands-on activities.	Students maintain learning motivation despite resource constraints.
Teacher Competencies	Teachers actively integrate technology into their instructional practices.	Teachers' integration of technology into instruction remains inconsistent.	Instruction continues to be predominantly conventional in approach.

Source : Compiled by the Researcher (2026)

Table 3 shows that all three schools follow a relatively similar pattern in the implementation of digital-based learning, though the level of implementation varies. These differences are primarily evident in terms of infrastructure, the consistency of technology use in learning, the ability to manage digital documents, and the readiness of students and teachers to adapt to technology.

Digital Learning Infrastructure

Teachers indicated that the use of technology in learning remains contingent upon the availability of facilities and classroom conditions. In certain situations, instruction is still conducted through manual methods due to equipment limitations.

> "We do use technology in learning, but it can't be done consistently because the computers aren't enough for all students, they have to take turns. Sometimes we end up going manual because the students can't get into the computer lab, especially when another class is using it." (C-G1, 44 years old)

The availability of technological infrastructure in schools varies. Some participants stated that the available facilities are sufficient to support digital-based learning, while others still face device limitations and internet connectivity issues.

> "The computers at school are still limited, so not everyone can practice at the same time, we have to take turns. The internet is also sometimes really slow, so our work gets delayed." (C-A2, 19 years old)
>
> "Actually the facilities at my school back then were pretty good, computers were there and we could use them, even though sometimes we still had to take turns. The internet was usually fine, but it varied

sometimes there were issues, but most of the time it was smooth and helped a lot with finishing assignments." (A-A2, 21 years old)

Students Competency in Digital Document Management

Students' competency in digital document management during the Vocational Competency Assessment is an important consideration. Most students demonstrated an adequate understanding of how to manage files in a systematic and structured manner. However, a number of students had not yet fully mastered these skills, resulting in difficulties organizing documents, creating folders, and completing digital archiving within the allocated time during the examination.

> "During the Competency Test I felt okay with managing the digital documents. I made separate folders for each question, named the files following the instructions, then backed them up and saved to Google Drive just in case the files got lost or something." (A-S2, 17 years old)
>
> "During the Competency Test last year I was confused and disorganized about how to create proper folders, so I placed all files indiscriminately in one location. I did not follow the instructions carefully either, so I named the files arbitrarily, I didn't realize there were rules for naming them." (C-A3, 19 years old)

Time constraints and insufficient attention to detail in following instructions led to inconsistencies in the submission of digital assignments. Some students failed to adhere to established guidelines, such as including the required email subject line when submitting documents. This resulted in an inefficient collection and review process that extended well beyond the scheduled completion time.

> "At that time I was overseeing several classes at once, and I asked the students to submit their test work through Gmail following the set guidelines. But because they were rushed, a lot of them sent it without putting a subject line like they were supposed to, so what should've been done by 2 PM dragged on for another 2 hours and only finished at 4 PM." (B-G1, 55 years old)

Inconsistencies in digital data management frequently arise from students' insufficient attention to procedural detail, particularly during the data storage and input stages. Common errors include neglecting to save files after editing and making data entry mistakes, which necessitate restarting the work from the beginning a particularly serious problem under time-pressured conditions.

> "Sometimes I forget to save after editing, or I type the wrong numbers in Excel, so I have to redo everything from scratch, especially stressful when the exam time is almost up." (B-S2, 18 years old)

Students' Understanding of Digital Data Security

Students' understanding of digital data security remains relatively limited. Most students store their data without implementing additional safeguards, such as systematic backups or file protection measures.

> "I just save everything on my laptop, no backup anywhere else and no extra security. It's only when something goes wrong, like the laptop breaks or files go missing, that I realize I should've been backing things up, before that I just never thought about it." (C-S1, 18 years old)
>
> "When I was doing my internship, I used to store all files without any structure in a single folder, and eventually everything was lost. Now that I am working, I fully appreciate how critical that practice is especially since I now handle a lot of confidential documents, the security really has to be tight. At my workplace, there's a document protection system that the company made." (C-A2, 19 years old)

Student Motivation and Digital Skills Disparities

In addition to technical skills, students' motivation and readiness to adapt to technology are also key factors. Not all students have the same level of interest and confidence in using digital devices.

> "Honestly I still get nervous when there's a new app, anxious about making mistakes or encountering errors. I usually wait for the teacher or a classmate to demonstrate it first before attempting it myself. Once I understand the procedure, I learn quickly, though there is still much I have yet to fully grasp." (C-S2, 18 years old)

There is a digital skills gap among students during learning. Differences are evident in the level of app proficiency, the speed of completing tasks, and independence in operating digital devices. Students who are already accustomed to using technology tend to grasp instructions and complete assignments more quickly, while those less accustomed require more time and frequently encounter technical difficulties.

> "In class the gap is really visible. Some of my friends are already really good at Excel or Word so they finish fast, but others are still confused with the basics, they fall behind a lot and always need help." (C-S1, 18 years old)

Digital-based learning in office administration has a positive impact on students' workforce readiness, particularly with respect to proficiency in office technology applications.

> "For me personally, what I learned at vocational school has really helped at work, turns out apps like Word and Excel are used every single day. So at least I already had the basics and some practice from school. Especially Excel for managing money and formulas." (B-A1, 20 years old)

Teacher Competence in Digital-Based Learning

Based on interview data, students observed that teachers have begun incorporating technology into their instruction, particularly during practical activities. However, this integration has not been consistent across all sessions. Lessons typically begin with the teacher providing a direct explanation of the material before transitioning to the practical phase involving computers. This approach was perceived as beneficial, as it allowed students to first develop a conceptual understanding before proceeding to hands-on tasks.

> "Before the practical, the teacher would explain the material first so we understood it, only after that we'd be directed to the practical part. So we didn't just jump straight into using the tools without knowing anything first, and that actually made it easier to follow, it wasn't like being thrown straight into the practical work with no explanation." (A-A4, 20 years old)

Although teachers actively guided students during practical sessions, the support provided was largely limited to facilitating task completion. Teachers' primary focus tended to be on the final product to ensure tasks were submitted on time. As a result, important aspects such as systematic work procedures and technical precision were not sufficiently emphasized, leaving students capable of completing their work but not yet independent in applying orderly and organized working standards.

> "During the practical the teacher did guide us a lot, but the focus was really just on the final result. We weren't really pushed to pay attention to the process or working step-by-step properly. So yeah, the tasks got done on time, but if you look at how we actually worked, the process was quite disorganized, as our sole focus was on completing the task." (A-S1, 17 years old)

Discussion

The research findings presented above demonstrate that the implementation of ICT-based office administration instruction in vocational high schools continues to face complex and multidimensional challenges. These challenges do not arise in isolation but rather emerge from the interaction of multiple interrelated factors within the learning process (Denmar et al., 2025). This underscores the systemic nature of digital learning effectiveness; the unpreparedness of any single element has the potential to undermine the entire learning process (Fitriyadi, 2012; Voenli, 2019).

From a multi-case design perspective, this study reveals both convergent and divergent patterns across the three schools, as summarized in Table 3. Convergent findings indicate that all schools have commenced implementing digital-based learning and show awareness of the importance of technological proficiency in modern office administration. There is also a shared positive orientation toward the use of technology in learning and recognition of its relevance to workforce demands. Divergently, however, notable differences in readiness were found across schools, particularly with respect to infrastructure, teacher competencies, and students' capacity to manage digital documents.

Schools with more adequate computer laboratory facilities were better positioned to implement digital learning consistently, whereas schools with limited devices and internet connectivity continued to rely on manual methods under certain conditions. These differences indicate that the implementation of technology-based learning is shaped not only by individual readiness but also by institutional context and school infrastructure. Infrastructure may therefore be understood as a contextual moderating factor in the effectiveness of technology integration in learning.

The findings indicate that while digital learning has been implemented, its execution remains suboptimal and has not yet been systematically structured. This reflects that digital transformation in education is still in a transitional phase, in which conventional methods continue to coexist alongside technological tools (Hasanah et al., 2024; Saripudin et al., 2024). In several schools, technology use remains confined to specific practical activities and has not yet been fully integrated into the overall learning process.

Teacher competencies constitute a critical factor in the success of technology integration in learning. Teachers are required not only to master technical skills but also to design innovative, structured, and

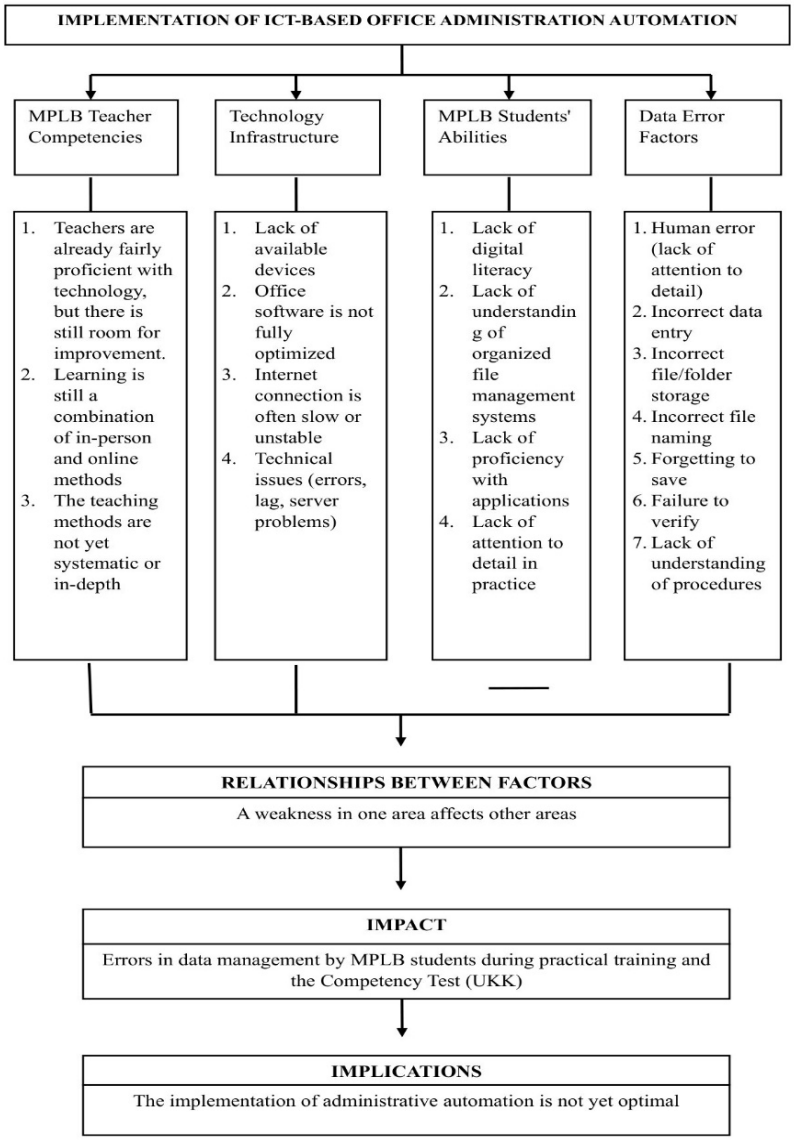
contextually appropriate instructional approaches that address the needs of their students (Permata & Sojanah, 2024).

Students' capacity to manage digital documents also requires improvement. Low levels of digital literacy and a high frequency of data management errors indicate that students have not yet fully acquired the necessary competencies (Suherman et al., 2024). Errors in student data management reflect deficiencies in procedural understanding and practical application, and may be categorized as human errors stemming from insufficient knowledge (Higgins & Carter, 2025; Kovacs et al., 2021).

Beyond competency-related factors, limitations in technological infrastructure also pose a significant challenge. Insufficient device availability and unstable internet access hinder the full implementation of digital learning. The success of technology-based learning is therefore not determined solely by individual capability but also by the availability of adequate supporting facilities (Hamilaturroyya, 2025). Furthermore, data security in administrative processes has not yet been fully incorporated into the learning curriculum. Students' limited understanding of the importance of data protection signals that digital literacy particularly with respect to information management and security requires further development. In the digital workplace, information security is a fundamental concern, encompassing data confidentiality, integrity, and availability (Kovacs et al., 2021; Yuliansah et al., 2025)

To clarify the research findings, the interrelationships among these factors can be seen in Figure 1 below.

Figure 1.
Diagram of the interrelationship of factors in learning implementation



Source: Processed by researchers (2026)

As illustrated in Figure 1, the interrelationships among factors reveal that teacher competence, student ability, infrastructure, and data management errors are interconnected within a single learning system. Deficiencies in student ability such as low digital literacy and insufficient attention to procedural detail contribute directly to the occurrence of data management errors. This situation is further compounded by infrastructure limitations and the use of suboptimal instructional methods.

The cumulative interaction of these factors results in elevated rates of data management errors among students both during practical learning activities and during the Vocational Competency Test (UKK) and ultimately signifies that the implementation of ICT-based office administration automation remains suboptimal.

These findings underscore the need for a more systematic and integrated approach to addressing the challenges of implementing digital-based office administration learning in vocational high schools (SMK). Such an approach is realized through the development of a framework for ICT-based office administration learning readiness one that emphasizes the interdependence of four key aspects that together constitute the learning system.

In practice, the study found that teachers tend to prioritize the final outcomes of students' work over the process itself and the application of standard operating procedures (SOPs). This orientation is consistently constrained by contextual factors, including limited instructional time, pressure to meet curriculum targets, and inadequate learning facilities. It also reflects an evaluation culture that has long been embedded in school practices (Yan et al., 2021). Understanding these contextual dynamics helps clarify the distinct contribution of the framework developed in this study. When compared with the TPACK model (Harris et al., 2009) which has long served as the primary reference for technology integration in education, the difference is fundamental. TPACK centers on the integration of technological, pedagogical, and content knowledge at the individual teacher level, while broader systemic factors are not explicitly accommodated within that model (Crompton et al., 2024).

The framework developed in this study addresses this gap by establishing a systemic conception of readiness that encompasses the enhancement of teacher competencies, the development of student capabilities, the optimization of technological infrastructure, the prevention of data management errors, and the fostering of cross-stakeholder monitoring and collaboration. All these components function as an integrated and mutually reinforcing system aimed at achieving optimal ICT-based office administration implementation in preparation for the Society 5.0 era. The framework is visualized in Figure 2.

As shown in Figure 2, the framework illustrates that readiness for digital-based office administration learning at MPLB Vocational High Schools (SMK) is shaped by four principal aspects: teacher competencies, technological infrastructure, students' digital capabilities, and data management and security practices.

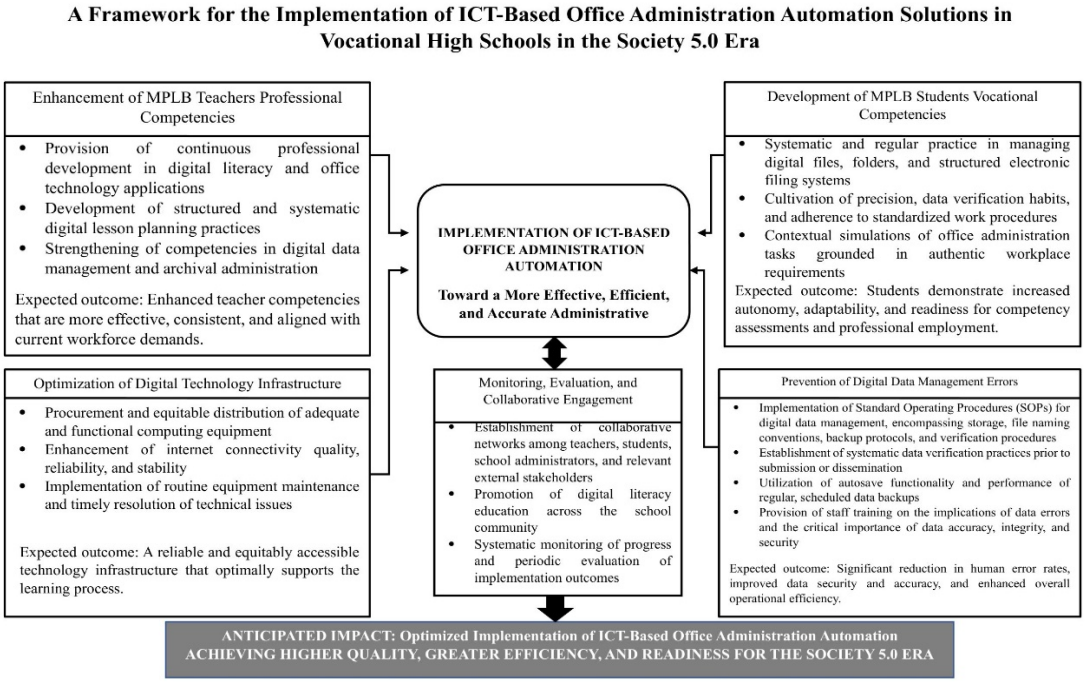
First, enhancing the competencies of MPLB teachers is a key factor in the success of digital learning. Although teachers already possess foundational technology skills, further development of their capacity for digital-based instruction is necessary to promote more effective learning and to produce positive outcomes for students (Basuki et al., 2021; Endang Purnawati, 2022). The quality of teachers' instructional delivery has also been shown to significantly influence student learning outcomes (Permata & Sojanah, 2024; Saripudin et al., 2024).

Second, the optimization of technological infrastructure serves as a primary enabling factor in ICT-based learning implementation. The availability of facilities such as computer laboratories, digital devices, and stable internet connectivity is essential to the success of the digital learning process (Fisca Marliany et al., 2025; Masri Nong et al., 2022; Saripudin et al., 2024). Inadequate infrastructure can function as a significant barrier to the attainment of optimal learning outcomes.

Third, the development of MPLB students' competencies must focus on strengthening digital literacy and practical skills in data management. Research indicates that digital literacy exerts a significant effect on learning outcomes and students' workforce readiness (Setiawan et al., 2023). Accordingly, learning must be

oriented toward authentic practice so that students not only acquire theoretical knowledge but are also able to apply it effectively in real-world contexts.

Figure 2.
ICT-Based Office Administration Implementation Framework



Source: Processed by researchers (2026)

Fourth, strengthening data management and security practices is critical to minimizing human error in digital administration. While digital transformation in office management enhances operational efficiency, it also requires robust data management systems and a deeply embedded institutional culture of data security (Ahyani & Dhuhani, 2024; Coalliani et al., 2026). Without sound management practices, errors in data input, storage, and processing will directly affect students' professional effectiveness.

These four aspects are interdependent in shaping readiness for digital-based office administration learning. The optimal integration of these four aspects will yield more effective learning outcomes, reduce data management errors, and enhance students' preparedness to meet the demands of the workplace in the Society 5.0 era.

Conclusion

This study makes a theoretical contribution to the body of research on technology integration in vocational education by demonstrating that readiness for ICT-based learning is shaped not only by individual teacher competencies but also by the interaction of broader systemic factors, including infrastructure, students' capacity to manage digital documents, and data management and information security practices. The proposed framework offers a conceptual foundation for future research on ICT-based office administration learning in vocational high schools. The practical implementation of this framework should be evaluated through a quasi-

experimental design to assess its effectiveness in improving students' digital competencies, workforce readiness, and the overall quality of digital-based office administration.

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