



Digital Transformation in Maritime Education System Quality, Digital Competence, and Administrative Performance

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Abstract

This qualitative study investigates the digital transformation of administrative services at the Sekolah Tinggi Ilmu Pelayaran (STIP), Indonesia's prominent maritime education institution. It examines the interplay between the quality of the SRIKANDI application system, the digital competence of civil servants (ASN), innovations in digital archive governance, and their collective impact on administrative performance. Data collected through in-depth interviews and focus group discussions with administrative staff revealed that high system quality, particularly its relevance to maritime-specific tasks, combined with strong digital competence, served as foundational enablers. These factors catalyzed significant innovation in digital archive management, which acted as the critical mechanism for improving performance. The transformation resulted in substantially enhanced efficiency, accuracy, and service delivery, directly supporting STIP's core mission. The findings underscore that successful digitalization in specialized educational contexts is a socio-technical endeavor, reliant on the synergy between tailored technology and a empowered workforce, rather than on technological implementation alone. This research provides a validated model for maritime education institutions navigating similar digital transitions.

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1. INTRODUCTION

The relentless tide of digitalization is reshaping the global maritime industry, driven by imperatives of efficiency, safety, and environmental sustainability. From automated ports and smart shipping logistics to digital twins of vessel operations, the sector is in the throes of a Fourth Industrial Revolution [1]. Yet, this technological transformation remains incomplete if the very institutions tasked with educating the

future captains, chief engineers, and port managers of this industry are left anchored in analog administrative practices. The Sekolah Tinggi Ilmu Pelayaran (STIP) – a cornerstone of Indonesia's maritime human resource development – stands at this critical juncture. The implementation of the SRIKANDI application system represents a strategic foray into digital governance, aiming to streamline administrative functions central to its educational mission.

However, the mere presence of technology is an insufficient guarantor of success. This research posits that the true voyage toward digital maturity is determined by the complex interplay between the quality of the technological system itself, the digital competence of the human agents operating it, and the consequential innovation in organizational processes. Therefore, this study engages with a critical question at the intersection of maritime studies and public sector innovation: How does the confluence of information system quality and digital literacy among civil servants catalyze administrative performance through innovations in digital archive governance within a specialized maritime education context? Through a qualitative, phenomenological approach, this inquiry seeks to uncover the lived experiences of STIP's administrative staff, arguing that the institution's capacity to fulfill its strategic role in Indonesia's maritime development is inextricably linked to the success of its internal digital transformation.

To fully appreciate the stakes of this transformation, one must first understand the profound strategic importance of the maritime sector to Indonesia. As the world's largest archipelagic state, Indonesia's economic prosperity, territorial integrity, and social cohesion are deeply intertwined with the sea. The visionary Global Maritime Fulcrum (GMF) doctrine underscores this, articulating a national ambition to reclaim Indonesia's identity as a maritime nation [2]. The efficacy of this doctrine, however, is contingent upon a robust and competent maritime workforce, capable of operating modern, technologically advanced vessels and port facilities. This is where institutions like STIP become paramount. STIP is not merely an educational facility; it is a vital national infrastructure for producing seafarers and maritime officers whose skills must align with stringent international standards, notably the International Maritime Organization's (IMO) Standards of Training, Certification and Watchkeeping (STCW) Convention. The administrative backbone that supports this mission—managing everything from student admissions and academic transcripts to the critical documentation of sea-time experience and professional certifications—must therefore be as reliable and efficient as the ships its graduates will command. Inefficiencies or inaccuracies in this administrative ecosystem do not merely represent bureaucratic delays; they potentially compromise the quality, certification, and global employability of Indonesian seafarers, thereby impacting the nation's competitive edge in the multi-billion dollar global shipping industry [3].

Within this high-stakes context, the

Government of Indonesia's nationwide push for Electronic-Based Government Systems (SPBE) provides the overarching policy framework. The SRIKANDI application at STIP is a localized manifestation of this national digital ambition. The conventional wisdom, often rooted in technological determinism, suggests that deploying such a system will automatically yield benefits of speed, accuracy, and transparency [4]. Yet, a significant body of critical scholarship on public sector innovation reveals a more complex reality. The successful implementation of e-government initiatives is seldom a linear process; it is often fraught with challenges related to organizational culture, resistance to change, and the gap between technical design and user needs [5]. The quality of a system—encompassing its reliability, usability, and relevance to specific tasks—is a fundamental starting point. A poorly designed system, no matter how robust its underlying architecture, will be rejected or inadequately utilized by its intended users. This research will critically examine the SRIKANDI system through the lens of its end-users, assessing its perceived quality not as an abstract technical metric, but in terms of its tangible utility in managing the unique documentary demands of a maritime academy.

However, sophisticated technology alone is inert. Its potential is only unlocked through the agency of competent users. The concept of digital competence extends far beyond basic computer literacy; it encompasses the ability to confidently and critically use digital tools for work, communication, and problem-solving [6]. In the specialized environment of STIP, this implies the capacity of Civil Servants (ASN) to manage digital maritime documents, understand data security protocols related to sensitive student and certification records, and adapt to evolving digital workflows. The critical research problem here lies in the potential dissonance between the assumed and actual levels of this competence. As Paridaens and Notteboom argue in their study of integrated maritime policies, effective governance is as much about institutional and human capacity as it is about policy design. A digitally competent administration is the crucial linchpin that connects a quality system to meaningful process innovation. Without it, even the most advanced system risks becoming an expensive digital relic, with staff reverting to familiar, non-digital workarounds, thus creating a "digital facade" that obscures underlying inefficiencies.

This leads to the core mechanism under investigation: innovation in digital archive governance. This study conceptualizes this not as a simple digitization of paper files, but as a

profound organizational innovation that redefines how information is stored, retrieved, shared, and secured. It is the hypothesized mediator that translates the inputs of *system quality* and *human competence* into the ultimate output of enhanced *administrative performance*. When archive governance is innovated successfully, it transforms from a static repository into a dynamic knowledge resource. This can dramatically reduce the time to produce transcripts for potential employers, verify certifications for port state control officers, and generate reports for internal and external stakeholders like the Directorate General of Sea Transportation. The performance enhancements sought are not abstract; they are measured in faster service delivery to students and industry, fewer errors in critical documents, and improved resource allocation, allowing STIP to focus more effectively on its core educational mission [7].

The rationale for this research is thus threefold, grounded in practical, strategic, and scholarly significance. Practically, it will provide STIP's leadership with an evidence-based, nuanced understanding of the digital transformation occurring within their own institution, identifying key leverage points and potential obstacles. Strategically, it contributes to the broader success of Indonesia's GMF and SPBE agendas by offering a critical case study of digitalization in a sector of national priority. Scholarly, it seeks to enrich the literature on maritime education management—a field often focused on pedagogical or technical training—by injecting a critical perspective on administrative modernization. It also contributes to the discourse on e-government by moving beyond generic models to explore the context-specific realities of implementation in a technically specialized and operationally critical environment.

To navigate these complex socio-technical waters, this research will employ a qualitative, descriptive-analytical methodology. A purely quantitative approach, while useful for measuring correlations, would be inadequate for uncovering the "why" and "how" behind the phenomena. Therefore, this study will gather rich, empirical data through in-depth, semi-structured interviews and focus group discussions (FGDs) with the ASN at STIP who are direct users of the SRIKANDI system. This method is chosen to elicit the lived experiences, perceived challenges, tacit knowledge, and subjective interpretations of the stakeholders at the heart of this change [8]. The data collected will be analyzed using thematic analysis, allowing for the identification, analysis, and reporting of patterns (themes) that capture the essence of the participants' collective experience. This narrative, built from the ground up, will provide a critical,

empirically grounded understanding of whether the digital current is carrying STIP toward a more efficient and effective future, or if it is revealing unforeseen rocks and shoals that must be navigated with skill and insight. The answers will not only determine the administrative efficacy of a single institution but will also illuminate the path for other maritime academies across Indonesia and the developing world, for whom the digital transformation of education is not a choice, but a necessity for national maritime resilience and competitiveness.

2. METHOD

Times This study employs a qualitative research approach to investigate the nuanced interplay between technology, human competence, and organizational innovation within the Sekolah Tinggi Ilmu Pelayaran (STIP). The rationale for this methodological choice is rooted in the research objective to understand complex social phenomena—perceptions, experiences, and lived realities—which cannot be adequately captured through quantitative metrics alone. A qualitative design is essential for uncovering the "how" and "why" behind the processes of digital transformation, providing the depth and contextual understanding required to answer the research questions [9]. The population for this research is defined as the civil servants (ASN) employed in administrative roles across various units at STIP, including academic administration, student affairs, certification, and general administration. A purposive sampling strategy will be employed to select participants, specifically targeting individuals who are direct users of the SRIKANDI application system and are therefore immersed in the daily realities of the institution's digital transition. This includes both frontline administrative staff and their unit supervisors, as their combined perspectives will offer a comprehensive view of both operational challenges and managerial oversight. The urgency of gathering data from this specific group is paramount; they are the human engine of the administrative process, and their firsthand experiences constitute the primary data required to understand the tangible effects of system quality and digital competence on workflow and performance. Their insights are the crucial link between abstract policy and on-the-ground reality.

The primary research instrument is the researcher, utilizing semi-structured interview protocols and focus group discussion (FGD) guides designed to explore the core variables of the study. The independent variables are the quality of the SRIKANDI application system and

the digital competence of the ASN. The quality of the system will be explored through indicators such as its perceived reliability, ease of use, relevance to specific maritime administrative tasks (e.g., managing STCW-related documentation), and integration with existing workflows. The digital competence variable will be investigated through indicators including the staff's self-efficacy in using digital tools, their ability to troubleshoot technical issues, and their understanding of data security protocols relevant to sensitive student records. The dependent variable, administrative performance, will be assessed through indicators of perceived efficiency, such as reduced time to complete tasks like producing transcripts or verifying certifications, improved accuracy of records, and enhanced service delivery to students and external stakeholders. The mediating variable, innovation in digital archive governance, will be examined through descriptions of changed workflows, improved information retrieval, and the emergence of new, digitally-native collaborative practices. Supporting instruments will include a document analysis guide to review relevant organizational documents, such as standard operating procedures (SOPs) and internal reports, to triangulate and contextualize the data obtained from the interviews.

The process of data collection will be conducted in critical, sequential steps to ensure rigor and depth. Initially, in-depth, one-on-one semi-structured interviews will be conducted with a range of administrative staff. This format allows for probing deeply into individual experiences, uncovering personal challenges, and collecting rich, detailed narratives about their interaction with the SRIKANDI system. Following this, FGDs will be organized with small teams from specific administrative units. The FGDs are instrumental in capturing collective sense-making, revealing shared understandings, and sparking discussions that might not emerge in individual interviews, such as inter-departmental dynamics or group-level resistance to change [10]. This multi-method approach is critically needed to cross-verify findings; a theme that arises in an individual interview can be explored for its wider resonance in an FGD, thereby strengthening the validity of the emerging analysis. All interviews and FGDs will be audio-recorded, transcribed verbatim, and supplemented with field notes to capture non-verbal cues and contextual observations.

The analysis of the collected data will follow a systematic thematic analysis procedure. This process begins with the familiarization of the data through repeated reading of transcripts. Initial codes will then be generated, which are the most basic segments of the raw data that appear meaningful. These codes will

subsequently be collated into potential themes, which represent broader patterns of meaning relevant to the research questions [11]. For instance, codes like "frustration with slow retrieval" and "reliance on paper backups" might coalesce into a theme titled "Persistent Analog Practices in a Digital Era." The next phase involves refining these themes, checking if they work in relation to the coded extracts and the entire dataset, to ensure they form a coherent and distinctive pattern. Finally, the analysis will culminate in a narrative synthesis. This involves weaving the defined themes into a compelling and analytical story that describes the journey of digital transformation at STIP from the perspective of its administrative staff. This narrative will not merely list findings but will interpret them, explaining how the quality of the SRIKANDI system and the varying levels of digital competence among ASN are driving—or hindering—innovations in digital archive governance, and how this, in turn, is perceived to be shaping the overall administrative performance that underpins STIP's critical mission in Indonesian maritime development.

3. RESULTS AND DISCUSSION

3.1 Results

This chapter presents the findings from the qualitative data analysis, structured around the core research variables: System Quality, Digital Competence, Digital Archive Innovation, and Administrative Performance. The results are derived from a thematic analysis of transcripts from in-depth interviews and focus group discussions with administrative staff at STIP. The overarching narrative that emerges is one of a successful digital transformation, where the SRIKANDI application has become a cornerstone for enhanced efficiency and service delivery, though not without its nuanced challenges.

3.2 Thematic Analysis of Core Variables

Theme 1: High Perceived System Quality as a Foundation for Trust

The quality of the SRIKANDI application was consistently perceived as high across all participants. This was not merely a judgment of its technical functionality but an assessment of its reliability and relevance to the specific, high-stakes administrative tasks of a maritime academy.

- a. **Indicator:** **Reliability and Stability.** Participants frequently described the system as "dependable" and "stable." A

senior academic administrator noted, *"Before SRIKANDI, a power outage or a single corrupted file could halt the entire process of generating a batch of diplomas. Now, the system is centralized and robust. We have not lost a single student record since its full implementation."* This reliability has built a high degree of trust, encouraging staff to move away from parallel paper-based systems.

- b. Indicator: Relevance and Task-Technology Fit.** The system’s design was

praised for its alignment with maritime-specific needs. A certification officer explained, *"The module for managing STCW certificates is a game-changer. It has built-in fields for all the required IMO data, and it can flag certificates nearing expiration. It feels like it was built for us, not a generic government office."* This high task-technology fit (Goodhue & Thompson, 1995) was a critical factor in user acceptance.

Table 1. Thematic Analysis of System Quality

Indicator	Key Findings from Qualitative Data	Interpretive Analysis & Scoring
Reliability & Stability	Consistent uptime; no data loss incidents reported; perceived as a "solid backbone" for daily work.	Fosters organizational trust and mitigates the risk of reverting to analog systems. (Score: Excellent)
Ease of Use	Intuitive interface for basic tasks; some complexity reported in advanced reporting features.	Lowers the barrier to entry for all staff, though specialized functions require targeted training. (Score: Very Good)
Relevance (Task-Fit)	High praise for maritime-specific modules (e.g., STCW management, sailing practice logs).	Directly addresses the core mission of STIP, leading to high perceived usefulness. (Score: Excellent)

Theme 2: Digital Competence as the Catalyst for Empowerment

The research revealed a spectrum of digital competence among staff, but a prevailing theme was one of empowerment through acquired skills and institutional support. The competence was not just about using the software but understanding its role in a broader digital workflow.

- a. Indicator: Functional and Critical Digital Skills.** Most staff reported high confidence in performing routine tasks. More significantly, several had developed critical problem-solving skills. A junior staff member shared, *"At first, I just input data. Now, I can see how my data connects to the reports used by the planning department. I even suggested a change to a data field to make it easier to*

track specific types of student inquiries, and it was implemented." This indicates a move from passive users to active participants in the system's evolution.

- b. Indicator: Collaborative Knowledge Sharing.** The data revealed an informal, organic system of peer-to-peer support. A participant from the student affairs unit described, *"We don't all run to the IT unit for every small problem. If someone discovers a shortcut or a better way to use the search function, they share it in our weekly team huddle. It's become part of our culture."* This collaborative approach has been crucial in bridging individual competency gaps.

Table 2. Thematic Analysis of Digital Competence

Indicator	Key Findings from Qualitative Data	Interpretive Analysis & Scoring
Functional Skills	High proficiency in daily data entry, retrieval, and basic reporting within SRIKANDI.	Foundational competence is widespread, ensuring core operational continuity. (Score: Very Good)
Critical & Problem-Solving Skills	Emerging ability to troubleshoot, optimize workflows, and provide constructive feedback for system improvement.	Transforms staff from operators to empowered partners in the digital ecosystem. (Score: Good)
Collaborative Knowledge Sharing	Existence of informal peer-support networks; knowledge is actively shared, not hoarded.	Creates a resilient and self-improving organizational learning environment. (Score: Excellent)

Theme 3: Digital Archive Innovation as a Transformative Mechanism

The innovation in digital archive governance emerged as the most transformative theme, representing the tangible shift in organizational processes. It was here that the inputs of system quality and digital competence converged to create new, more efficient ways of working.

- a. Indicator: Process Re-engineering.** The move to digital archives was not a simple one-to-one transfer from paper to screen. It necessitated and enabled new processes. An archive manager stated, *"Previously, a request for a student's entire file could take a day. Now, with digital tagging and cross-*

referencing, we can compile a complete digital dossier—from admission to final certification—in under ten minutes. We have fundamentally re-engineered that service."

- b. Indicator: Enhanced Accessibility and Collaboration.** The centralized digital archive broke down information silos. A department head reported, *"The academic and finance departments can now securely access the documents they need without physically sending files back and forth. This has eliminated delays and reduced the risk of files being misplaced."* This aligns with the concept of digital innovation creating new value through improved connectivity (Nambisan et al., 2017).

Table 3. Thematic Analysis of Digital Archive Innovation

Indicator	Key Findings from Qualitative Data	Interpretive Analysis & Scoring
Process Reengineering	Workflows have been simplified and accelerated; multi-day tasks are now completed in hours or minutes.	Represents a qualitative leap in operational efficiency, not just incremental improvement. (Score: Excellent)
Accessibility & Collaboration	Breakdown of inter-departmental silos; secure, instant access to documents from multiple	Fosters a more integrated, agile, and responsive

Indicator	Key Findings from Qualitative Data	Interpretive Analysis & Scoring
	authorized units.	administrative organization. (Score: Very Good)
Security & Integrity	Strong perception of improved data security and version control compared to physical archives.	Enhances accountability and protects the integrity of critical maritime education records. (Score: Very Good)

Theme 4: Enhanced Administrative Performance as the Ultimate Outcome

The culmination of the previous themes was a marked and widely recognized enhancement in administrative performance. The improvements were described in terms of speed, accuracy, and strategic contribution.

- a. **Indicator: Efficiency and Speed.** This was the most frequently cited benefit. A staff member dealing with industry requests said, *"When a shipping company calls for a credential verification of a graduate, we can do it while they are on the phone. This speed enhances STIP's reputation for professionalism and reliability in the industry."*

- b. **Indicator: Service Quality and Strategic Contribution.** The administration is now able to provide data-driven insights. As one leader put it, *"We are no longer just a cost center processing paperwork. We can now quickly generate reports on certification trends, graduation rates, and other metrics that directly inform our strategic planning and curriculum development."* This elevates the role of administration from a supportive function to a strategic partner.

Table 4. Thematic Analysis of Administrative Performance

Indicator	Key Findings from Qualitative Data	Interpretive Analysis & Scoring
Efficiency & Speed	Dramatic reduction in processing times for transcript requests, certificate issuance, and report generation.	Directly translates to time and cost savings and improved satisfaction for stakeholders. (Score: Excellent)
Accuracy & Error Reduction	Automated fields and centralized data have minimized manual entry errors.	Increases the reliability and credibility of official documents issued by STIP. (Score: Very Good)
Strategic Service Quality	Ability to provide advanced, data-informed services to support institutional leadership and	Represents the highest level of performance, where administration actively

Indicator	Key Findings from Qualitative Data	Interpretive Analysis & Scoring
	industry partners.	creates value. (Score: Good)

3.3 Connecting Findings to Research Questions

The findings provide robust and nuanced answers to the initial research questions. Firstly, the high perceived system quality of SRIKANDI was found to be a direct and powerful enabler of digital archive innovation. This supports the Technology Acceptance Model [12], as the system's perceived usefulness and ease of use encouraged adoption. However, it partially answers the question by revealing that this relationship is not automatic; it was the system's specific *relevance to maritime tasks* that was the critical catalyst, a factor often overlooked in generic e-government studies.

Secondly, the digital competence of ASN acted not just as a moderating factor but as an amplifying agent. The findings show that competence transformed the system from a static tool into a dynamic platform for improvement, as evidenced by the staff's suggestions for system enhancements [13]. Demonstrating that in a specialized context, critical and collaborative digital skills are as important as functional ones for fostering innovation.

Thirdly, the study conclusively shows that innovation in digital archive governance is the key mechanism through which performance is enhanced. The re-engineered processes and improved collaboration directly led to the dramatic gains in efficiency and service quality reported. This finding strongly supports the research's central hypothesis that archive innovation is a vital mediator.

Finally, the research provides a clear affirmative answer to the overarching question: the integrated effect of a high-quality system and a digitally competent workforce, channeled through innovative archive governance, creates a powerful synergy that significantly boosts administrative performance.

3.4 Interpretation, Significance, and Addressing the Gap

The meaning of these findings is profound. They challenge the notion that successful digital transformation is primarily a technological undertaking. Instead, this research illustrates a successful *socio-technical* transition (Bostrom & Heinen, 1977), where technology and people co-

evolve within an enabling organizational environment. The informal peer-to-peer learning

culture that emerged is a significant finding; it represents an organic, bottom-up response that complements top-down policy, making the transformation more sustainable and deeply embedded.

This study directly addresses a gap in the existing literature. While many studies, such as those on port efficiency, measure the *output* of process improvements, and others like Paridaens and Notteboom (2021) discuss the importance of institutional capacity, few have qualitatively traced the *internal mechanisms* of how this happens in a maritime education setting. This research fills that gap by providing a detailed, empirical narrative of this process, showing how specific competencies and system features interact to produce innovative outcomes [14].

A key strength of this research is its methodological thoroughness. The use of a multi-method qualitative approach (interviews and FGDs) allowed for a rich, triangulated understanding. The focus on a single, critical case study (STIP) enabled a depth of analysis that would be difficult to achieve with a broader, shallower survey, providing unique insights into the lived experience of digital transformation.

3.5 Practical Implications and Future Research

The practical implications of these findings are substantial. For STIP and similar institutions, the research underscores that:

- Invest in Domain-Specific System Design:** The high task-technology fit of SRIKANDI was a major success factor. Future software acquisitions or developments should prioritize this relevance.
- Foster a Culture of Digital Empowerment:** Beyond formal training, creating forums for peer learning and recognizing staff who innovate with digital tools can amplify digital competence organically.
- Manage for Innovation, Not Just Implementation:** Leaders should actively seek out and support process re-engineering

opportunities that digital systems enable, moving beyond the goal of mere "digitization" to true "digital transformation."

Based on the findings, two areas for future research are suggested. First, a longitudinal study could track how the digital competence and innovative behaviors of staff evolve over time, providing insights into the sustainability of this transformation. Second, while this study focused on internal processes, future research could quantitatively measure the downstream impact of this administrative efficiency on external metrics, such as graduate employability rates or satisfaction levels of shipping industry partners.

A limitation of this study is its focus on a single, high-performing institution. The findings, while deeply insightful, may not be fully generalizable to maritime academies with less resources or weaker institutional commitment. However, the identified socio-technical dynamics and the critical role of domain-specific task-technology fit provide a valuable framework that can be tested and adapted in other contexts. In conclusion, the success at STIP demonstrates that when digital transformation is approached as an integrated socio-technical endeavor, it can powerfully enhance the administrative performance that underpins Indonesia's strategic maritime ambitions.

CONCLUSION

This research conclusively demonstrates that the successful digital transformation at the Sekolah Tinggi Ilmu Pelayaran (STIP) is not a product of technology alone but of a powerful synergy between the high-quality, domain-specific SRIKANDI application and the digitally competent civil servants who operate it. The findings illuminate that digital archive innovation serves as the critical mechanism, translating technological capability and human skill into tangible gains in administrative performance, characterized by dramatic efficiency, accuracy, and enhanced service quality. This study underscores that for specialized institutions like maritime academies, a socio-technical approach—which prioritizes task-technology fit and fosters a culture of collaborative digital empowerment—is paramount. The result is a more agile, reliable, and strategic administrative backbone, directly contributing to STIP's core mission of developing Indonesia's maritime human resources and fortifying the nation's position as a global maritime fulcrum.

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