

Efficiency is not Effectiveness: How to Design Strategically Aligned Public Sector Information Systems (IS) to Increase the Organizational Effectiveness in Highly Contingent Operational Contexts

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ARTICLE INFO		ABSTRACT
Article History:		<i>This research will explore the interplay between the efficiency and the effectiveness in the public sector Information System (herein after referred as the IS). This research also employs the institutional theory and the qualitative research methodology to examine how IS design the impacts overall Public Sector Organizations (herein after referred as PSO) effectiveness. In this research, presents the key findings and the propositions emphasizing the human centered IS design, iterative assumption validation, and the contextual adaptability. Further, by using the semi structured interviews with the IS experts, the paper outlines the framework for designing the IS that align strategically with highly contingent operational context, offering the policy and the managerial recommendations to enhance the public service delivery.</i>
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Introduction

Across the World, the PSOs are under increasing pressure to enhance or improve operational efficiency while ensuring their effectiveness in delivering the public services. The traditional approach to the IS innovation in the PSOs has primarily focused on the procedural efficiency, often neglecting the strategic alignment with the highly contingent operational contexts in which these organizations function (Jennifer, 2024). The public sector increasingly relies on the IS to improve or enhance the service delivery, transparency, and decision-making (Siddiqui, 2020). However, the key challenge remains: efficiency does not always translate into effectiveness. The PSOs operate in the highly contingent environments where the political, social, and the economic uncertainties demand adaptable and strategically aligned IS.

In the Modern Public Administration (herein after referred as PA), the efficiency refers to the optimal use of the resources to achieve the operational goals, such as reducing the costs, and improving the service delivery speed. However, the effectiveness encompasses the broader scope, including the stakeholder engagement, policy alignment, and the societal impact. The failure to differentiate between these two concepts often results in the IS implementations which streamline the processes without delivering the meaningful organizational improvements (Siddiqui, 2020). For example, an IS that automates the tax collection may reduce the processing time but fail to address the systemic compliance issues among the taxpayers.

Furthermore, this research also argues that the strategic alignment is crucial for the public sector IS effectiveness. The strategic alignment ensures that the IS investments align with the long term governmental goals and also address the specific needs of the stakeholders. The lack of the strategic alignment often leads to the expensive Information Technology (herein after referred as IT) failures, as seen in the large scale government IT projects that exceeds the budget, while failing to deliver the expected benefits (Knott, & Medina, 2012).

The strategic alignment in the public sector involves the synchronizing IS with the organizational strategies to achieve the desired outcomes. This process requires the deep understanding regarding the both; technological landscape and the strategic objectives of the organization. As per scholars, achieving alignment necessities positioning IS within the organizational structure in a manner that supports continuous leverage of the IT resources to maintain the competitive advantage (Issa-Salwe, Ahmed, Aloufi, & Kabir, 2010). So, this perspective underscores the significance of viewing the IS not merely as the support tools but as integral components of the strategic planning and the execution.

The basic aim of this research is to answer the question "how can an IS be designed to achieve and maintain the strategic alignment within the highly contingent operational context, and how does this affect the PSO effectiveness"? So, this research paper explores how design of the strategically aligned information systems in the PSOs can enhance the organizational effectiveness, particularly in the environments marked by the constant change and the unpredictability. Hence, by examining the relationship between the IS design, organizational context, and the effectiveness, this research paper poses the new framework for designing the IS, which focus not only on the efficiency but on the overall effectiveness of the PSOs in achieving their strategic goals.

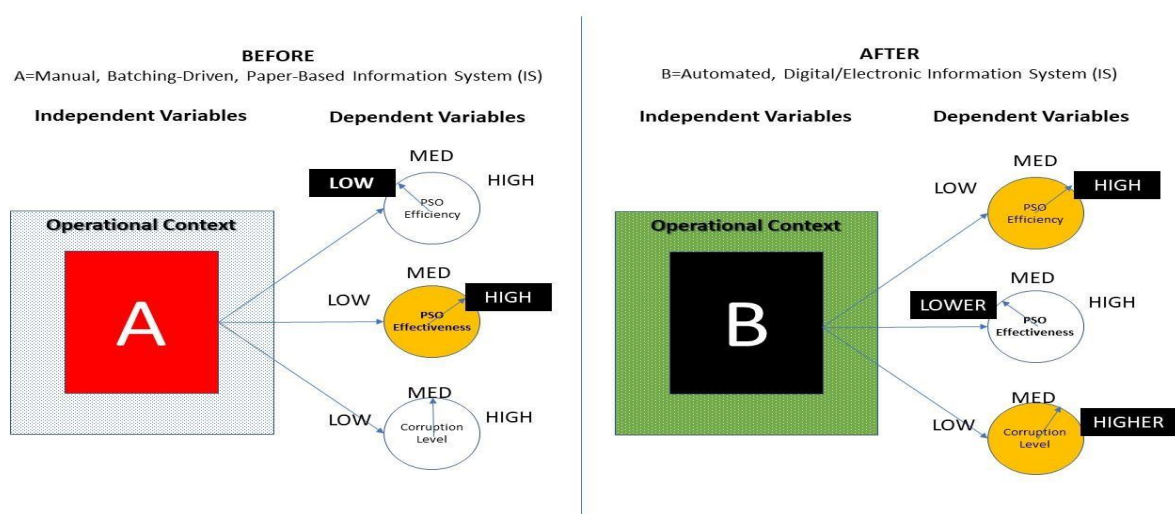


Figure 1: PSO before and after introducing a digital information system

Source:Author

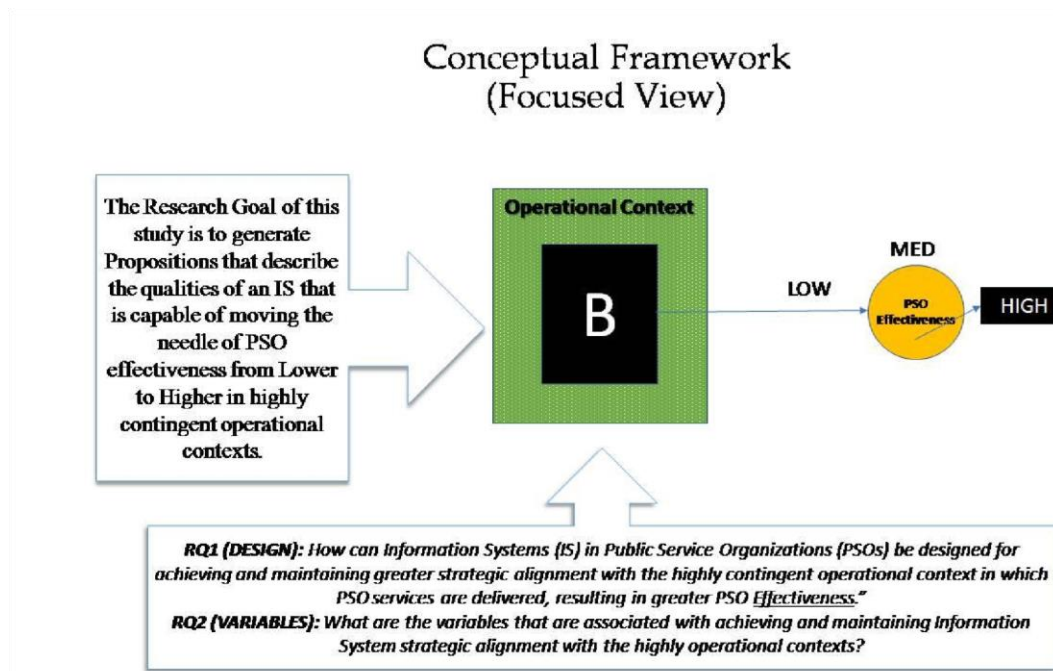


Figure 2: Conceptual Framework (focused view)

Source: Author

Theoretical Framework

The "**Institutional Theory**" provides the lens for understanding the socio-technological interactions between the organizations and their information systems. It suggests that the organizations function within an institutional environment shaped by the social, political, and the economic pressures (DiMaggio & Powell, 1983). In the PSOs, the IS innovations are often driven by the international best practices and the donor-funded initiatives, ignoring the localized contingencies (Avgerou, 2008). Hence, this research paper integrates the **contextualist approach**, emphasizing that the IS effectiveness depends upon its alignment with the operational realities, as argued by Wiredu (2012) and Avgerou (2001). This research contributes to this framework by proposing the IS strategies that incorporate the institutional and the contextual factors.

Foundations of Institutional Theory



Figure 3: Fundamentals of Institutional Theory

Source: Author

The **institutional theory**-based perspective offers an alternative to the traditional determinist approach in managing information systems (IS) within the public sector. Research adopting this

perspective has been particularly effective in explaining IS failures in public organizations (Mignerat & Rivard, 2009). In this research study, follows the "**contextual approach**" that emphasizes the link between strong links between the ICT based IS innovations and the environment in which they operate (Avgerou, 2001).

Wiredu (2012) further supports the institutional theory perspective, arguing that the IS innovation in public organizations should be evaluated based on institutional realities rather than organizational ones, as the latter often lead to unrealistic expectations regarding transformation and reform (Wiredu, 2012).

At the theoretical level, this research aims to fill the gap identified in prior studies by generating practical and strategic recommendations for public sector IS management. At the phenomenological level, it seeks to provide a more holistic framework for aligning IS innovation with dynamic operational realities.

Literature Review

This section of the paper explores the key concepts in the public sector IS literature, including the efficiency vs effectiveness, the strategic alignment, and the role of contingency theory in the IS design. It reviews the scholarly works on the public sector digital transformation (Janssen & van der Voort, 2016; Atobishi, et al., 2024), IS strategic alignment models (Henderson & Venkatraman, 1993), and case studies of IS failures due to misalignment with organizational goals (Heeks, 2002). This literature review highlights that while the efficiency gains are measurable through the cost reduction and speed, effectiveness encompasses broader the organizational goals such as citizen satisfaction and policy impact.

The traditional IS design approaches in PSOs have often been focused on enhancing operational efficiency. However, a growing body of research highlights that operational efficiency alone does not lead to greater organizational effectiveness, especially in the context of public sector organizations (DeLone & McLean, 2003). Strategic alignment between an IS and its operational context is crucial for increasing effectiveness (Henderson & Venkatraman, 1993; Smits, et al., 2009).

Several studies emphasize that the public sector organizations tend to prioritize efficiency due to budget constraints and performance audits. However, Heeks (2002) highlights that the IS failures often stem from a lack of strategic vision rather than technical shortcomings (Heeks, 2002). Similarly, Gregor et al. (2006) argue that true IS value emerges from transformational impact rather than mere automation (Gregor et al. 2006).

The concept of "strategic alignment" in IS refers to the alignment between an organization's strategies and the design and implementation of its information systems (Luftman, 2003; Ngo, 2023). Scholar Luftman given the concept of the "strategic alignment maturity" that measures how well the Information Technology objectives align with the organizational strategy (Luftman, 2003). The Organizations with the low alignment maturity often experience the Information Technology project failures due to disconnect between the operational efficiency and the policy effectiveness (Luftman, 2003). For PSOs operating in the highly contingent environments, achieving the strategic alignment is more challenging because their operating contexts are dynamic and shaped by the range of the internal and external pressures.

The concept of "strategic alignment" between IS and the business strategy has been extensively explored in the academic literature. The comprehensive review by Issa-Salwe et al, (2010)

emphasizes that achieving such alignment necessitates the positioning IS within the organizational structure in a manner that supports the continuous leverage of the IT resources to maintain a competitive advantage (Issa-Salwe, et al., 2010). In the context of the public sector, the strategic alignment presents the unique challenges and opportunities (Sharma, & Behl, 2023). Sharma and Behl (2023) examined the impact of the IT capabilities on the IT business strategic alignment in the both; public and private organizations (Sharma, & Behl, 2023). In this study, researchers found that the IT connectivity, infrastructure, and the human resources significantly influence alignment, suggesting that the investments in these areas are crucial for the public sector entities aiming to enhance their strategic alignment (Sharma, & Behl, 2023). Furthermore, this research also highlights that the PSOs often faced the distinct challenges compared to their private counterparts, including the bureaucratic hurdles and resource constraints, which can impede the effective alignment (Sharma, & Behl, 2023).

Furthermore, this literature underscores the significance of the adaptability in public sector IS design. Scholars Weill and Ross (2004) suggest that the rigid IS architectures often become obsolete in dynamic policy environments (Weill, & Ross, 2004). Adaptive governance frameworks, as proposed by Janssen and van der Voort (2016), permit the IS to evolve with changing regulatory and social conditions (Janssen, & van der Voort, 2016). Therefore, the effective IS design must incorporate mechanisms for continuous improvement and stakeholder feedback to ensure the long-term impact and relevance.

Several other scholars have emphasized the importance of understanding the organizational workflows, particularly in the public sector environments (Rahiman, et al., 2021). The PSOs are often burdened by stakeholder diversity, the bureaucratic processes, and the regulatory constraints (King, & Zmud, 1981). However, the adoption of the human-centered design approaches has been identified as a way to bridge the gap between the technological solutions and the socio-political realities of the PSOs (Thatcher & Gable, 2007). The human-centered IS design, which emphasizes the importance of end-users, their cognitive and behavioural traits, and their involvement in the design process, can foster better alignment between IS and the operational needs of PSOs (Norman, 2013).

The effectiveness of the performance enhancing interventions in the PSOs relies on how well they align with the institutional and motivational factors influencing the public sector performance, as well as how these factors are integrated into the governance design decisions. If there is disconnect between the performance drivers and the governance structures, interventions may fail or even have the negative effects (Virani, & van der Wal, 2023). This paper also explores theoretical basis for such misalignment and introduces an interactional causal model to analyze how the governance design can either support or hinder the institutional and the motivational elements that influence the performance (Virani, & van der Wal, 2023). Hence, this review of literature underscores the importance of the strategic alignment between the IS and the organizational objectives within the public sector, particularly in the highly contingent operational contexts.

Research Design and Methods

In this research adopted the "qualitative research approach" to generate the untested hypotheses, offering the practical recommendations and guiding the future quantitative research. The choice of "qualitative methods" stems from the absence of the relevant theoretical frameworks that could support the meaningful deductive studies on the IS strategic alignment in PSOs operating in the complex environments.

Furthermore, in this research, the contextualist approach has been adopted that focusing on the institutional realities rather than a deterministic technological perspective. Four IS experts were interviewed, selected based on their experience in both the private and public-sector IS design.

The research follows the following steps:

- Development of a conceptual framework based on institutional theory.
- Semi-structured interviews with IS experts.
- Thematic analysis of responses to generate key findings.

Internal and External Validity

Internal Validity: Ensured by using an institutional perspective to analyze the PSO's transition from an analog to a digital IS. Established performance indicators, including efficiency, effectiveness, and corruption levels, serve as dependent variables, while IS strategic alignment represents the independent variable. The researcher's experience in the studied PSO strengthens the validity of causal relationships.

External Validity: Given the study's exploratory nature, its findings generate propositions rather than confirm hypotheses. While the results provide direction for future research, their applicability to other PSOs should be approached cautiously.

Variables

- **Independent Variable:** IS strategic alignment with the operational context.
- **Dependent Variables:**
 1. **Efficiency:** Time taken for a single customs clearance transaction.
 2. **Effectiveness:** Balance between enforcement and facilitation in public service delivery.
 3. **Corruption Level:** Incidence of bribery and undue service requests.

The study focuses on the relationship between effectiveness and IS alignment.

Participants

Institutional Review Board

Since interview-based research in Japan is typically exempt from IRB review, this study did not undergo formal screening.

Participant Demographics

This study involved four IS experts with diverse expertise, job roles, and geographic locations. Interviews were conducted via face-to-face meetings and online sessions.

Field	Participants	Name (Anonymous)	Mode
Private-Sector IS Experts	2	Digital Strategy Director (Tokyo) & AI Engineer (Munich)	Face-to-Face & Skype
IS Researcher	1	AI Research Scientist (Tokyo)	Face-to-Face

Field	Participants	Name (Anonymous)	Mode
IS Design Specialist	1	MIS Professor (Pakistan)	Skype

This diverse group provided valuable insights, enhancing the study's depth and cross-regional applicability.

Measures

Unit of Analysis

The study examines the impact of IS strategic alignment on PSO effectiveness.

Interview Protocol

A structured interview protocol was developed and refined based on advisor feedback. It included a case study of a PSO undergoing digital transformation, supported by graphical comparisons of expected versus actual outcomes. The final protocol, containing six open-ended questions, was shared with participants before interviews to ensure clarity and in-depth responses.

Analysis and Discussion

This analysis identifies the following key factors that contributing to the IS effectiveness:

1. **Strategic Alignment** – The IS must align with the organizational mission, policy objectives, and the user needs (Luftman, 2003).
2. **Adaptability** – The Systems should be flexible to accommodate the changing policies and the unforeseen contingencies (Weill & Ross, 2004).
3. **Stakeholder Engagement** – The effective IS design incorporates input from the end-users, policymakers, and the IT professionals (Cordella & Iannacci, 2010).
4. **Governance and Accountability** – The strong governance mechanisms ensure the IS contribute to the effectiveness rather than just operational efficiency.
5. **Performance Metrics Beyond Efficiency** – The success metrics should include the service quality, citizen engagement, and the policy outcomes (Gregor et al., 2006).

Research Questions and Findings

RQ1 (Design): How can the PSOs design the IS to align strategically with their operational context, ensuring greater effectiveness?

RQ1 Findings: This analysis shows that the human-centered digital design approach can help to create an effective IS capable of handling emerging challenges. This key is focusing on the user acceptance and the ownership. Further, the success depends upon understanding the needs of the end users, and sincere efforts in this area lead to the more sustainable and effective system. Hence, the human-centered, adaptable IS design helps to maintain the alignment with the operational contexts, and improving the effectiveness.

RQ2 (Variables): What variables affect the alignment of IS with operational contexts in PSOs?

RQ2 Findings: There are no fixed variables for measuring IS alignment. Instead, defining IS goals based on stakeholder assumptions and regularly validating them is crucial to ensure alignment with expected outcomes. Awareness of evolving workflows and constant validation of assumptions are crucial to sustaining alignment.

RQ3 (Alternatives): What alternative approaches exist to large-scale transformation projects in PSOs?

RQ3 Findings: IS digitization should be approached in phases, tailored to the context. Public officials with international experience should lead the process, focusing on stakeholder needs. The process should begin with areas of agreement, such as standardization or key business processes, and be driven by business process management, not IT professionals. Trust integration and iterative, small-scale transformations with stakeholder involvement can boost effectiveness.

This study suggests that the human-centered design approach is key for successful public sector IS design. Understanding the social, cultural, and cognitive effects of IS innovations is crucial at every organizational level. The most effective design teams are those that empathize with end users and stakeholders, addressing the complexities of operational contexts. Mistaking efficiency for effectiveness in digitization is a common mistake; the primary goal should be maintaining or improving organizational effectiveness, even in manual systems.

Findings and Conclusion

The study investigates how information systems (IS) in public service organizations (PSOs) can be designed to align with dynamic operational contexts, leading to improved PSO effectiveness. The researcher drew from experiences at Organization Alpha, a PSO that underwent a digital transformation. This research focused on understanding how strategic alignment between IS and operational contexts influences PSOs performance, especially regarding efficiency, effectiveness, and corruption levels.

Furthermore, this research study also reveals that while automating the IS in highly contingent PSOs is challenging, it is achievable with proper planning. The strategic approach that involves the continuous feedback and adaptability enhances or increases the chances of a successful transformation. In addition, the digital IS projects should start small, focusing on micro-services and constant stakeholder engagement to prevent unintended consequences.

Moreover, this research aims to answer the following research question: "How can information systems (IS) in public service organizations (PSOs) be designed to achieve and maintain better strategic alignment with the dynamic operational contexts in which PSO services are delivered, ultimately improving PSO effectiveness?"

The conceptual framework of this study is based on the researcher's experiences as an Executive Officer in a PSO functioning in a highly variable operational context, referred to as Organization Alpha. The organization transitioned from a manual, paper-based IS to a fully automated, web-based paperless IS. However, this digital transformation did not lead to the expected outcomes. Instead, some unintended disruptions and consequences were observed, which prompted the creation of a contextual framework illustrating both the current and previous IS within their respective operational environments. This framework emphasizes the operational context in which each IS operates and compares actual and anticipated outcomes based on PSO key performance indicators, such as efficiency, effectiveness, and corruption levels post-digital transformation. The study's scope, constrained by the time limitations of a one-year master's degree program, is

limited to understanding the link between IS strategic alignment with a highly contingent operational context and how this influences or maintains PSO effectiveness in delivering public services.

To address the three research questions, a qualitative research approach was chosen, considering the subjective nature of the topic and the absence of existing theoretical frameworks to support quantitative or mixed-method approaches. This study follows an inductive approach, employing semi-structured interviews with four IS experts working in different roles across various organizations.

The Key findings reveal that automating an IS for a PSO operating in highly variable contexts is challenging but not impossible. While automation is feasible for both public and private organizations, the more pertinent question is not whether automation is possible, but how it can be effectively implemented. For RQ1, the study suggests that digital IS transformations are more likely to succeed when they are conceptualized and designed by relevant personnel from the organization itself, considering the evolving requirements of end users and stakeholders.

For RQ2, it was found that there is no fixed set of variables to monitor IS alignment with its operational context. However, an Information System is more likely to remain strategically aligned if stakeholders' assumptions are made explicit from the beginning, and a robust feedback mechanism is embedded within the design to regularly validate those assumptions.

The findings for RQ3 highlight that developing countries may experience unintended consequences due to poorly planned IS transformations, often funded by international financial institutions (herein after referred as IFIs). The study suggests that digital transformation is an iterative process, with success relying on starting small, leveraging micro-services, and involving key stakeholders throughout the design and post-implementation phases.

Limitations of the Study

The scope of this research was limited to examining the relationship between IS design and PSO effectiveness due to time constraints. It did not explore the broader impact on PSO efficiency or corruption levels. In addition, the lack of existing theoretical frameworks on IS strategic alignment in highly contingent PSOs posed a challenge.

Furthermore, another important key limitation of this research is its reliance on the qualitative data, which may be subject to interpretation biases. In addition, the findings of the case study may not be universally applicable because of the variations in the economic, political, and the technological contexts. Future research should aim to distinguish between the overlapping research questions and broaden the scope of dependent variables. Moreover, future research could also incorporate in the quantitative analysis to measure the impact of the IS on the public sector performance systematically. Despite these limitations, this research provides the valuable insights into the best practices for designing strategically aligned IS in the highly contingent environments.

Recommendations

This study has derived propositions that can be interpreted as recommendations for those responsible for Information System (IS) management in Public Sector Organizations (PSOs). These propositions are explored individually in the following sections:

Proposition 1: *Other factors being equal, the more accurate the IS design team's assumptions about existing workflows, the higher the probability of aligning the information system strategically with the operational context at time t_1 .*

This proposition stems from the RQ1, which explores that designing an IS that can achieve the better performance while maintaining the strategic alignment with the operational context. The recommendation for the policy-makers and the managers is to recognize the importance of gaining deep and realistic insights into the existing information and communication systems of the PSO.

The findings indicate that the likelihood of creating a strategically aligned IS increases significantly if the assumptions about current workflows and communication channels are valid. Three main aspects should guide this process:

1. The IS design team must include public sector domain experts and consultants, with the necessary technical skills and experience in designing IS for public organizations.
2. Practical, contextually valid data should be collected from key stakeholders, particularly from end users.
3. A thorough understanding of existing workflows within their operational contexts is essential.

The first recommendation to policy-makers is to adopt a human-centered approach in managing IS transformation projects. Increasing the effectiveness of the existing workflows should be prioritized over efficiency, which should be considered an additional benefit of digitalization. If a digital IS does not perform as effectively as the existing manual system, this indicates a significant flaw in its design. This problem is more pronounced in PSOs with highly contingent operational contexts.

It is also recommended that the IS design team engage in iterative feedback processes to identify and define possible contingencies. In many PSOs, these contingencies are often related to human cognitive or behavioral traits, which should be addressed by an empathetic IS design approach.

To understand stakeholder assumptions, mixed-method surveys can be employed, and when detailed information is unavailable, the design team should observe end-user behavior in both existing and controlled environments. This approach helps identify contingencies that should be addressed in parallel, while workflows with standardization potential should be prioritized for automation.

Additional general recommendations include:

1. Clearly define PSO effectiveness during the conceptualization phase and, where applicable, develop measurable performance indicators.
2. Identify contingencies related to stakeholder needs.
3. Conduct exhaustive consultations with stakeholders and users to reduce unpredictability and risks.
4. Facilitate in-depth consultations and interviews with end users, considering language and cultural differences.
5. Avoid making assumptions or generalizations not grounded in the contextual realities.

6. Incorporate end-user feedback into the design process.

Proposition 2: *Other factors being equal, the more frequently the IS design team tests its assumptions about evolving workflows, the greater the probability of maintaining the system's strategic alignment with operational contexts at time.*

Building on Proposition 1, this recommendation emphasizes the need for regular audits and reviews of workflows within the PSO. Frequent validation of assumptions made during the IS design phase increases the chances of maintaining alignment between the IS and its operational context over time.

Policy-makers should recognize that organizations are constantly evolving. Therefore, an information system needs a continuous improvement mechanism to adapt to changing contextual realities. Successful e-business models typically employ 'digital services' support teams to ensure systems remain relevant and effective in the face of change.

The general recommendations for policy-makers and managers regarding this proposition include:

1. Ensuring close collaboration between the IS design team and the PSO's strategic management division.
2. Establishing a robust data gathering and dissemination feedback system.
3. Regularly testing stakeholder assumptions through both qualitative and quantitative methods.
4. Implementing systems for periodic audits and reviews.
5. Validating assumptions regularly.

Proposition 3: *Other factors being equal, the more trust is integrated into the IS design, the greater the effectiveness of the information system.*

This proposition is derived from the interviews and suggests that the incorporating existing informal organizational trust into the IS design can increase its effectiveness. The human-centered approach to the IS design is key to successfully integrating the trust into the system.

The PSOs often faced the trust-related challenges in their decision making and daily workflows. Thus, it is important for the managers and the policy-makers to recognize and factor in the existing trust between stakeholders as a contributor to IS effectiveness.

Recommendations for integrating trust into IS design include:

1. Acknowledge informal communication channels and trust mechanisms between stakeholders when designing IS for PSOs in highly contingent operational contexts.
2. Understanding the informal constraints such as trust can reduce the risk of incorrect assumptions.
3. Ignoring organizational trust can result in resistance to digitization efforts.
4. Building trust is a gradual process, and informal trust protocols are often established after years of interaction.
5. Engage stakeholders regularly to capitalize on micro-services success.

6. Prioritize user-defined design strategies, considering language, social roles, and hierarchy.
7. Ensure the system protects users' data privacy, especially in sensitive matters.
8. Facilitate secure informal communication between stakeholders through channels like EDI, texting, and document sharing.

This research contributes to the understanding of IS strategic management challenges in public sector organizations. It underscores the importance of context analysis before initiating any IS transformation, particularly in the public sector. This study advocates for a people-centered approach when addressing socio-technological issues in PSOs. Despite its limitations, this research suggests that any PSO can be automated if the IS design team thoroughly understands the operational context and is attentive to the requirements of key stakeholders and end users.

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