Strengthening Data Governance and Data Quality in Immovable Asset Management toward Digital Transformation in Public Works Department of Malaysia

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Abstract As new waves of innovation reshape asset management, the digitization of immovable asset data becomes crucial for the public sector. This paper explores how emerging trends in asset management impact data quality, focusing on the strategic roles of people, processes, and technology. Public sector organizations often struggle with fragmented operations and inconsistent data management practices in immovable assets leading to challenges in maintaining high-quality data. A survey was conducted among 303 asset managers and personnel involved in asset management to gain insights into practical challenges, assessing their understanding of immovable asset management and data quality issues. The research highlights the strategic role of people as change agents, who are essential in driving improvements in data governance and data quality in immovable asset management practices. By fostering a culture of continuous improvement and embracing digitalization, these individuals play a pivotal role in improving data quality and strengthening data governance. The study identifies how human expertise, process refinement, and technological innovation can address data quality and data governance gaps. The findings emphasize that to harness the latest trends in asset management, a balanced approach is needed where people act as change agents, working alongside improved processes and technology to ensure reliable and actionable immovable asset data across the public sector.

Keywords

1 Introduction

The digital transformation of asset management is reshaping public sector operations globally, with governments leveraging technology to improve efficiency, transparency, and decision-making. However, many countries face persistent challenges in ensuring data governance and data quality, particularly in the management of immovable assets. The digital transformation of public sector operations hinges on robust data governance and high-quality data. However, challenges such as fragmented data systems, limited adoption of asset management tools, and inconsistent data practices hinder progress. This paper explores the role of immovable data governance and quality in advancing digital transformation within Public Work Department (PWD) of Malaysia. The management of immovable assets in the public sector is fundamental to ensuring the sustainability, efficiency, and effectiveness of government operations. Immovable assets, such as buildings, infrastructure, and land, require comprehensive management strategies to maximize their utility and lifespan. For instance, Mohd Nasir et. al. (2022) emphasizing the importance of effective and efficient practices to ensure assets are utilized for their intended purposes. Effective asset management involves proper planning, maintenance, monitoring, and evaluation to ensure that resources are utilized optimally. In many countries, particularly in developing economies, the management of immovable assets has been plagued by numerous challenges, including inadequate data governance, fragmented administrative practices, and a lack of technological integration. These inefficiencies result in suboptimal asset performance, increased maintenance costs, and ineffective decision-making. Further, data governance involves establishing policies, standards, and procedures to ensure data integrity, security, and accessibility. This paper aims to explore the significance of data governance in the context of immovable asset management within the Public Works Department of

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Malaysia. By examining current asset management challenges, evaluating existing digital transformation efforts, and analyzing empirical data from asset managers, this study provides insights into effective strategies for improving data governance and data quality. The findings contribute to the growing body of knowledge on public sector asset management and offer practical recommendations for policymakers, practitioners, and researchers interested in leveraging digital transformation to enhance data-driven decision-making and operational efficiency.

2 Literature Review

2.1 Data Governance and Data Quality

In the context of immovable asset management, robust data governance frameworks provide the foundation for digital transformation by enabling seamless data integration and real-time decision-making. Without structured data governance, organizations risk inefficiencies, poor decision-making, and non-compliance with regulatory requirements. This is because in the context of Asset Management, particularly with immovable assets, Data Governance plays a pivotal role in ensuring data quality, integrity, and effective decision-making. One of the primary components of data governance is Data Ownership and Stewardship, which defines clear responsibility for the ownership and management of asset data. This includes the designation of data custodians who are entrusted with maintaining the integrity of the data and ensuring it is accurate and reliable. Another critical element is Data Classification and Security, which involves organizing data into appropriate categories—such as confidential, public, or historical—and implementing robust security measures. These measures are essential to ensure that sensitive asset data is protected from unauthorized access and tampering, using secure storage and access control protocols. Additionally, Compliance with Regulations and Standards ensures that the handling of asset data aligns with both national and international standards, such as ISO 55000 for asset management or GDPR for data privacy. This adherence to regulations ensures that data is managed ethically, legally, and with full accountability, minimizing the risk of legal or financial repercussions.

Data quality, on the other hand, ensures that asset-related data is accurate, complete, and up to date, reducing the risks associated with misinformation and mismanagement. Despite the recognized importance of data governance and data quality, organizations often struggle with fragmented datasets, outdated record-keeping methods, and limited technical expertise among personnel. As governments worldwide embrace digital transformation, data governance has become a critical enabling of efficient asset management. Digital transformation involves the integration of advanced technologies such as cloud computing, artificial intelligence (AI), the Internet of Things (IoT), and blockchain to improve data accessibility, accuracy, and security. In the Malaysian context, the Public Works Department (PWD) of Malaysia plays a crucial role in overseeing immovable assets owned by the government. However, the absence of a well-structured and standardized data governance framework has led to significant inefficiencies in asset management practices. These inefficiencies are often attributed to inconsistent data collection methods, lack of interdepartmental coordination, outdated records, and resistance to digital adoption. In many cases, immovable asset data is stored across multiple platforms with varying degrees of accessibility and reliability. Without a centralized repository, departments within the government struggle to maintain consistent and accurate asset records. This leads to duplication, errors, and inconsistencies, making it difficult to assess the true value, condition, and status of assets. Consequently, poor data quality affects asset maintenance schedules, financial planning, compliance with regulatory frameworks, and the ability to make informed policy decisions. These issues underscore the need for a robust data governance framework that ensures standardization, integration, and quality control across all asset management activities.

Robust data governance ensures that asset data remains compliant with standards such as accounting or environmental regulations, reducing the risk of reporting inaccuracies. Norbib et. al. (2021) emphasizes the

importance of structured data management to ensure data standardization, consistency, and security across educational institutions. The insights from this research can inform strategies for implementing robust data governance in public sector organizations. Continuous improvement and learning are facilitated by good data governance and high-quality data. As organizations gather more data on asset performance, they can refine their lifecycle cost models and optimize future decision-making. Data governance ensures that lessons learned are captured and applied to future investments, supporting ongoing improvements in asset management strategies. For instance, Sulaiman et. al. (2017) explores the critical factors influencing successful data governance implementation within an Enterprise Resource Planning (ERP) system in a Malaysian utility company. They proposed a comprehensive framework for enterprise data governance, emphasizing the importance of high-quality, reliable data in organizational operations as they find out that it is particularly relevant for public sector entities aiming to enhance their data governance practices. Effective optimization involves identifying areas where cost savings are possible, such as energy usage patterns or maintenance schedules. With high-quality data and strong governance, organizations can target optimization strategies that improve both the performance and cost-effectiveness of their assets. By ensuring data is accurate, consistent, and up-to-date, organizations can implement strategies that enhance asset performance while minimizing costs. Furthermore, Ridwan Radzi et. al. (2021) emphasized that governance has a significant impact on digital transformation awareness, implementation, and quality overall. Thus, highlight the crucial role of governance in supporting strategic decision-making for effectively deploying digital transformation in the manufacturing sector of an emerging economy.

2.2 People, Process and Technology in Immovable Asset Management

Asset management is the process of organising, planning and controlling the acquisition, care, refurbishment, and disposal of infrastructure and engineering assets. It is a systematic, structured process covering the whole life of physical assets. By referring on the findings arising from a research project funded by the Cooperative Research Centre for Integrated Engineering Asset Management, it is necessarily to integrate the management of human factors, the management of technology and information and organizational management to achieve comprehensive asset management. (Laue et. al. 2014). As Figure 1 shows, it is necessary for the integration of asset management to investigate 'heavily in the merger of new technical solutions, management processes and the human factors' and simultaneously and equally address all three factors in the management of the asset.



Figure 1 Organizational dimension of asset management adopted from Laue, Brown, Scherrer, & Keast, 2014

From the strategic perspective, the principles of asset management must be soundly based upon the alignment and fit of the organisation's resources to best meet the needs of the customer within the environment in which it is required to compete to maximise returns to stakeholders. The knowledge management base in the field of technology and information management and effective human resource development in the field of human factors management, are probably the most pressing challenges facing asset management. In similar veins, de Best, 2006 emphasizes that integration of technology, processes, and resources are the three key components of his 'Smart fields- Making the most of our assets' research

area in the petroleum asset management industry. Reliability of the data; tools to interpret the data and transform it into workable information; and skilled operational advisors who can use the information the best interests of the organisation were the three main dimensions which can affected the effectiveness of asset management services. Table 1 describes the process areas grouped by management areas and listed against the three dimensions of the integrated asset management Organizational approach. (Laue et. al. 2014).

Current Factors and Variables	Measurement and Classification	Statistical Relationships and Effects		
	Organizational	Corporate Governance		
	Management	Corporate Policy		
		Corporate Strategy		
		Strategic Management (Strategic		
		Analysis Techniques)		
		Innovation Management		
		Financial Management (Accounting		
Asset Management		Techniques)		
Organisational	Technology and Information Data Management			
	Management	Document Management, Asset		
	Register Information System			
		Knowledge Management		
	Human Factors Management	Competence Management		
		Leadership Communication		
		Organisational Culture		
		Change Management		

Table 1	Dimensions	of the integrate	d asset management	Organizational	approach.	(Laue et al.	. 2014)
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Consequently, the dependency of dimensions of integrated asset management with the quality of the data used becomes critical. Ali et. al., 2013 indicates that there is a strong correlation between people, process and technology factors of immovable asset management as it supports the business to align its data/information needs and enabling infrastructure with its operating model. As a result of this strategic alignment the organisation ensures that the business not only meets its strategic goals but that its data resources become a cohesive component of its operations - data governance framework for asset lifecycle management (Ali et. al., 2013). The adopted TOP model was used to described People, Process and Technology in Immovable Asset Management. Using the TOP multiple- perspective approach, the TOP model allows analysts to look at the problem context from either Technical or Organizational or Personal points of view:

- The technical perspective (T) sees organizations as hierarchical structures or networks of interrelationships between individuals, groups, organizations and systems.
- The organizational perspective (O) considers an organization's performance in terms of effectiveness and efficiency. For example, leadership is one of the concerns.
- The personal perspective (P) focuses on the individual's concerns. For example, the issues of job description and job security are main concerns in this perspective.

The effective management of immovable assets hinges on the seamless integration of people, processes, and technology, as emphasized in the TOP model. While this framework provides a structured foundation for asset governance, its relevance is being redefined by the accelerating pace of digitalization. Technology has evolved beyond a mere enabler; it now serves as a transformative force reshaping asset management strategy, enhancing efficiency, and optimizing decision-making. The shift from traditional approaches like

the TOP model to a fully digitalized ecosystem necessitates a proactive embrace of data-driven decisionmaking, automated workflows, and real-time asset monitoring. This transformation is driven by emerging technologies such as artificial intelligence (AI), the Internet of Things (IoT), and predictive analytics, all of which are driving unprecedented efficiencies and operational advancements. Against this backdrop, the next section delves into how digital transformation is revolutionizing asset management, examining the key enablers of this shift, the challenges associated with digital adoption, and the strategic approaches essential for a successful and sustainable transition toward a technology-driven asset management framework.

2.3 Digital Transformation in Immovable Asset Management

When managing immovable assets, maintaining high-quality data is not just a procedural need, but a crucial strategic priority. The asset management industry is constantly changing due to the impact of digital revolution. This trend signifies the introduction of technical solutions that tackle long-standing difficulties related to the accuracy of data. The latest advancements include a variety of technologies and approaches that are ready to greatly improve the management, monitoring, and maintenance of public assets (Walter et al., 2007). Shifting our attention to digital transformation necessitates examining its significant influence on asset management frameworks. Digital transformation goes beyond just adopting new technology; it signifies a monumental change in how we connect with, analyse, and strategically utilize physical resources to benefit society. The use of smart sensors and Internet of Things (IoT) technologies enables the immediate collection and distribution of data. By integrating artificial intelligence (AI) with predictive analytics, these innovations have the potential to profoundly transform the field of immovable asset management (Pramanik et al., 2018). The preceding discussion has proven the utmost significance of data quality in asset management. High-quality data forms the foundation of strong asset management strategies, enabling organizations to make well-informed decisions, improve maintenance processes, and meet legal requirements. However, conventional techniques for ensuring data quality, despite their systematic approach, sometimes struggle with the large amount and dynamic nature of data, as well as the intricate and linked characteristics of static assets (Chen et. al. 2014).

In terms of opportunities for Digital Transformation, implementing robust data governance can lead to significant cost savings and efficiency gains. Improved data quality reduces errors in asset procurement, enhances energy management, and minimizes downtime. By making better use of data, organizations can streamline their operations, leading to financial savings and operational improvements. Another opportunity is proactive maintenance, where predictive maintenance, enabled by accurate and real-time data, helps prevent unplanned asset failures. By leveraging advanced analytics, organizations can extend the lifespan of their assets, reduce maintenance costs, and improve overall reliability. Better decision-making is another significant benefit of improved data governance. Access to integrated and reliable data allows decision-makers to make informed choices in planning, budgeting, operations, and asset disposal, which ultimately optimizes asset utilization. Furthermore, accurate data supports sustainability goals, allowing organizations to make better decisions regarding energy consumption, resource usage, and environmental impact. This contributes to Corporate Social Responsibility (CSR) initiatives and helps meet sustainability targets.

As for future trends in Data Governance for Digital Asset Management, several innovations are poised to revolutionize asset management practices. AI-Powered Decision Support Systems will likely become more advanced, using AI to predict asset failures and optimize resource allocation, maintenance scheduling, and capital investment decisions based on a deep understanding of the asset's lifecycle. In addition, the rise of Smart Cities presents a new frontier for immovable asset management. As cities adopt smart infrastructures such as energy-efficient buildings and intelligent traffic management systems, integrating these innovations with strong data governance frameworks will become critical for ensuring their successful operation and sustainability. Another emerging trend is Automated Asset Valuation, where AI and big data analytics are used to assess asset value and condition in real time, enabling more efficient investment tracking and depreciation monitoring. Digital Twins, virtual replicas of physical assets, will also grow in significance. By providing a real-time, accurate digital representation of immovable assets, digital twins enable organizations

to optimize asset management, improve maintenance schedules, and make more precise forecasts for future performance.

Furthermore, digital transformation in asset management must account for the human element. People are integral to the success of data governance initiatives, as asset managers, policymakers, and IT personnel must collaborate to implement and maintain digital systems effectively. Resistance to change, lack of training, and a limited understanding of digital tools can hinder the adoption of new technologies. Therefore, fostering a culture of digital literacy and continuous learning among government employees is essential for the success of digital transformation efforts. The implementation of capacity-building programs, training workshops, and change management strategies can enhance digital adoption and improve asset management efficiency.

3 Methodology

This study utilized a mixed methods approach to collect and analyze data from 303 respondents engaged in asset management across various public sector organizations. A structured survey incorporating both quantitative and qualitative insights into the challenges faced with data governance and quality. The survey covered key themes, including system adoption, data accuracy, digital literacy, and process efficiency. Descriptive statistics and inferential analysis were applied to identify patterns and validate hypotheses regarding the relationship between data governance and digital transformation outcomes. The following hypotheses were formulated to guide the analysis:

H1: The majority of respondents agree on the importance of data quality in immovable asset management.

H2: There is a significant positive perception of the benefits of digitalization in asset management.

H3: System adoption rates are lower than awareness rates due to barriers such as lack of training and accessibility.

H4: Dissatisfaction with government infrastructure management correlates with challenges in asset management processes.

H5: Increased usage of digital tools and systems improves operational efficiency and overall satisfaction.

A hierarchical model study based on the give hypotheses and survey data was conducted since there are several variables which include data quality awareness, digitalization perception, system adoption in influencing asset management effectiveness at different levels. Furthermore, the survey data itself involves different backgrounds of respondents with varying levels of digital tool adoption, experience and satisfaction. Hierarchical models work by considering multiple levels of influence. Based on the hypotheses, the structure are as follows:



Figure 2 Hierarchical Model of Influencing Factors in Data Quality and Digitalization in Immovable Asset Management

Current Factors and Variables	Measurement and Classification	Statistical Relationships and Effects		
Level 1: Individual Perceptions and Responses	Data Quality Awareness (Binary: Yes/No)	Dependent Variable: Data Quality Importance (Yes/No)		
(Micro-Level Factors)	Perceived Benefits of Digitalization (Binary: Yes/No)	Independent Variables:		
	System Usage Adoption Rate) (Binary: Yes/No)	Benefits, System Adoption		
	Challenges in Asset Management Processes (Binary: Yes/No)	Random Effect: Organizational Influence Item		
	Satisfaction with Infrastructure Management (Binary: Yes/No)	-		
Level2:Organization TypeOrganizational Context(Government Agency, Local Authority Ministry, etc.)		Dependent Variable: System Adoption (Yes/No) Independent Variables:		
(Meso-Level Factors)	Existing Data Governance Policies (Structured vs. Unstructured)	Training Availability, System		
	Level of Digitalization in Asset Management (High, Medium, Low)	Random Effect:		

Table 2 Hierarchical Model Framework for Analysing Data Quality and Digitalization in Immovable Asset Management

Organizational Context

Level 3: Structural and Policy-Level Factors	Regulatory Compliance Requirements Budget Allocation for Digitalization and Training	Dependent Variable: Satisfaction with Infrastructure Management
(Macro-Level)	IT Infrastructure and Technical Support Availability	Independent Variables: Asset Management Challenges, Digitalization Adoption, Budget Allocation Random Effect: Organizational and Policy Influence

4 **Results and Discussion**

Understanding the relationship between data governance, digitalization, and asset management challenges is crucial for improving public sector efficiency. The study's results confirm several key hypotheses, starting with the overwhelming agreement on the importance of data quality (H1), where 98% of respondents recognize its role in ensuring optimal asset utilization, cost efficiency, and regulatory compliance. Despite this awareness, many organizations still face challenges such as data fragmentation, duplication, and outdated records, emphasizing the need for a structured data governance framework. Similarly, the positive perception of digitalization (H2) is evident, with 99% of participants acknowledging its benefits in streamlining processes, improving decision-making, and enhancing asset tracking. However, while awareness is high, adoption rates remain significantly lower (H3), as only 58% of respondents report using digital asset management systems. Barriers such as lack of training, system complexity, and infrastructure limitations contribute to this gap, preventing organizations from fully leveraging digital tools. Further analysis supports H4, revealing that dissatisfaction with infrastructure management is closely linked to inefficiencies in asset maintenance, poor interdepartmental coordination, and reliance on reactive maintenance strategies rather than proactive planning. These shortcomings result in delayed repairs, increased costs, and misallocation of resources. On the other hand, findings affirm H5, demonstrating that organizations that actively use digital tools experience greater operational efficiency, improved real-time data access, and enhanced collaboration. Digital platforms enable predictive maintenance, reduce paperwork, and streamline decision-making, leading to higher satisfaction levels among users. Overall, these findings highlight the urgent need for comprehensive data governance policies, targeted training programs, and better integration of digital asset management systems. Strengthening these areas will help overcome existing barriers, drive efficiency, and ensure long-term sustainability in public sector asset management.

4.1 Equations The Importance of Data Governance in Asset Management

H1: The majority of respondents agree on the importance of data quality in immovable asset management.

Asset management within the public sector relies heavily on accurate and reliable data to ensure optimal asset utilization, cost efficiency, and regulatory compliance. The findings indicate that 98% of respondents

recognize the importance of data quality in asset management. This near-unanimous agreement underscores the widespread acknowledgment that data serves as the backbone for effective decisionmaking, maintenance scheduling, and financial planning. Despite this awareness, most organizations still struggle with inconsistent data governance practices. A significant proportion of respondents reported challenges such as data duplication, outdated records, and fragmented data sources. Without a structured governance framework, asset data often remains unreliable, leading to misinformed decisions, suboptimal asset performance, and increased maintenance costs. A well-structured data governance framework ensures that asset information remains accurate, complete, and accessible to all stakeholders. However, many government agencies operate in siloed environments, where departments use different data management systems without proper integration. This lack of standardization leads to discrepancies in asset records, making it difficult to determine asset conditions, historical maintenance records, and real-time asset availability. Furthermore, poor data governance can lead to financial inefficiencies, as inaccurate records may result in unnecessary asset replacements, over-budgeting for maintenance, and misallocated resources. These issues highlight the need for robust policies and technological interventions to enhance data consistency, transparency, and accuracy in immovable asset management.

4.2 Perceived Benefits of Digitalization

H2: There is a significant positive perception of the benefits of digitalization in asset management.

The transition toward digital asset management systems is seen as a transformative step in ensuring real-time data access, automation of manual processes, and improved asset tracking. The study found that 99% of respondents believe digitalization makes asset management easier, strongly supporting H2. This overwhelming consensus suggests that digital transformation is widely viewed as a necessary advancement for improving efficiency, accessibility, and operational effectiveness. Qualitative responses further reinforce this perspective. Many participants noted that digitalization reduces paperwork, minimizes human errors, and enables better communication between asset managers and policymakers. The automation of data entry, report generation, and predictive maintenance can significantly improve response times and asset lifecycle management. However, while the perceived benefits are evident, the actual implementation of digitalization is not without challenges. Digital transformation requires a shift in organizational culture, training, and infrastructure investment. Without proper change management strategies, the adoption process may face resistance from personnel accustomed to traditional asset management practices. Thus, while digitalization is recognized as a key enabler of efficiency, its success hinges on proper training, system integration, and long-term commitment from leadership.

4.3 Perceived Benefits of Digitalization System Adoption vs. Awareness

H3: System adoption rates are lower than awareness rates due to barriers such as lack of training and accessibility.

While 98% of respondents acknowledge the importance of data, only 58% reported using digital asset management systems. This gap between awareness and adoption confirms H3, highlighting the presence of significant barriers that hinder system utilization.

Several key factors contribute to this adoption gap which include lack of training and technical knowledge as many asset managers lack the necessary technical expertise to fully utilize asset management systems. Without proper training, employees may struggle with data entry, report generation, and analytics features within these platforms. Moreover, system complexity and usability issues in which some respondents mentioned that existing systems are not user-friendly and require frequent troubleshooting, discouraging users from consistent engagement with digital platforms. This highlights the limited accessibility and infrastructure gaps in addition to resistance to change among others. In some public sector agencies, internet connectivity, outdated hardware, and insufficient IT support limit system performance and prevent real-time data entry and retrieval. While remains a major obstacle to digital transformation. Employees accustomed to manual documentation and traditional workflows may perceive digital systems as an additional burden rather than an improvement. Addressing these barriers requires comprehensive training programs, improved system interfaces, and a more supportive IT infrastructure. Without addressing these adoption challenges, the full benefits of digitalization cannot be realized.

4.4 Dissatisfaction and Challenges

H4: Dissatisfaction with government infrastructure management correlates with challenges in asset management processes.

Efficient asset management is crucial for maintaining the functionality, safety, and longevity of governmentowned infrastructure. However, the survey reveals that 83% of respondents faced difficulties in asset management processes, while 21% expressed dissatisfaction with current infrastructure management practices. This correlation strongly supports H4, suggesting that existing inefficiencies negatively impact user satisfaction. Several underlying issues contribute to this dissatisfaction including ineffective maintenance strategies and lack of data-driven decision making. Many respondents reported delays in asset repairs, leading to deterioration in facility conditions. Poor maintenance tracking results in reactive maintenance instead of proactive planning while, without reliable data, policymakers struggle to allocate budgets effectively, leading to underfunded maintenance programs and overlooked asset deterioration. On top of that, inefficient processes and interdepartmental communication gaps lead to asset inspections and reporting being conducted manually, leading to slow response times and data inaccuracy. Digital solutions could address these inefficiencies, but system adoption challenges hinder progress. Most importantly, asset management requires collaboration between various departments, yet many organizations operate in silos, preventing efficient coordination. Thus, it can be deduced that improving government infrastructure management requires a more integrated approach to asset data sharing, predictive maintenance strategies, and streamlined decision-making processes.

4.5 Dissatisfaction and Challenges Impact of Digital Tools

H5: Increased usage of digital tools and systems improves operational efficiency and overall satisfaction.

The survey findings reveal that respondents who actively use digital tools report improved workflows, real-time data access, and better decision-making capabilities. This supports H5, suggesting that digitalization positively influences operational efficiency. The reason is that increased system usage rapidly steers real-time asset tracking and predictive maintenance. For instance, digital platforms enable real-time monitoring, reducing unexpected breakdowns and repair costs. Predictive analytics help in identifying potential failures before they occur. On top of that, digital systems allow instant retrieval of asset information, reducing reliance on paper-based records and improving auditability and compliance tracking. Through streamlined data access and reporting. While cloud-based asset management tools promote better communication between field teams, maintenance personnel, and decision-makers, leading to quicker problem resolution thus, faster response times and enhance collaboration. Furthermore, employees who use asset management software report greater job efficiency, as digital tools automate repetitive tasks, allowing them to focus on more strategic asset planning thus, reflecting higher satisfaction levels among digital users. For the full potential of digitalization to be realized, government agencies must ensure proper user training, system enhancements, and consistent IT support. Without these measures, the benefits of digital tools may remain underutilized.

5 Conclusion

The research on strengthening data governance and data quality in immovable asset management toward digital transformation highlights the critical role of structured, high-quality data in ensuring efficient asset management. The findings demonstrate that while there is a strong awareness of the importance of data quality in asset management, several challenges persist, including fragmented data sources, inconsistent governance frameworks, and barriers to digital adoption. Addressing these challenges requires a multifaceted approach that integrates robust data governance policies, technological advancements, and capacity-building initiatives.

A key takeaway from this study is that data quality is not merely a technical concern but a strategic imperative that directly impacts decision-making, budget allocation, regulatory compliance, and operational efficiency. The research findings indicate that while 98% of respondents acknowledge the importance of data quality in asset management, the presence of outdated records, duplication issues, and fragmented databases continues to hinder effective asset tracking and planning. This underscores the need for a structured data governance framework that ensures data integrity, accuracy, and accessibility across all levels of asset management.

Furthermore, the study reinforces the importance of digital transformation in asset management, with 99% of respondents believing that digitalization enhances efficiency and accessibility. However, despite this positive perception, system adoption rates remain lower than awareness levels due to barriers such as a lack of training, system complexity, and organizational resistance to change. The gap between system adoption and awareness suggests that more focused efforts are required to improve user engagement, enhance digital literacy, and simplify system interfaces to encourage wider adoption.

The hierarchical model analysis reveals that asset management challenges and dissatisfaction with government infrastructure management are strongly correlated. A significant proportion of respondents (83%) reported experiencing difficulties in asset management processes, while 21% expressed dissatisfaction with infrastructure management. These findings suggest that inefficiencies in data handling, outdated maintenance practices, and poor governance structures contribute to operational challenges and overall dissatisfaction. To mitigate these issues, organizations must prioritize investment in digital tools, enhance technical support, and implement standardized protocols for data management.

Moreover, the role of organizational and policy-level factors in shaping asset management outcomes cannot be overlooked. The study highlights that structured data governance policies, regulatory compliance, and adequate budget allocation for digitalization significantly influence the effectiveness of asset management practices. Organizations that operate under structured governance frameworks tend to exhibit better data quality standards, improved operational efficiency, and higher satisfaction levels among stakeholders. Thus, policymakers and decision-makers must advocate clear data governance guidelines, enforce compliance measures, and allocate sufficient resources for technological advancements.

Capacity-building initiatives and continuous training programs emerge as crucial factors in bridging the gap between digitalization awareness and actual system usage. Many respondents cited the lack of training and system complexity as major barriers to system adoption. Addressing these challenges requires a proactive approach that involves regular training sessions, user-friendly system designs, and active stakeholder engagement. By fostering a culture of digital readiness, organizations can empower employees to leverage technology effectively and contribute to data-driven decision-making.

The findings also underscore the impact of budget allocation on digital transformation efforts. Limited financial resources often impede the adoption of modern asset management systems, resulting in continued reliance on outdated and inefficient processes. Therefore, organizations must prioritize investments in IT infrastructure, cybersecurity measures, and software solutions to ensure a seamless transition to digital asset management. Additionally, collaborations with technology providers and industry experts can facilitate the implementation of best practices and innovative solutions tailored to the specific needs of public sector asset management.

Looking ahead, the future of immovable asset management lies in the integration of emerging technologies such as artificial intelligence (AI), the Internet of Things (IoT), and blockchain for enhanced data security and transparency. AI-driven predictive analytics can optimize maintenance schedules, reduce downtime, and improve asset lifecycle management. IoT-enabled sensors can provide real-time data on asset conditions, facilitating proactive decision-making and reducing maintenance costs. Blockchain technology can enhance data security by ensuring tamper-proof records and transparent transactions, thus strengthening trust in asset management practices.

In conclusion, strengthening data governance and data quality in immovable asset management is fundamental to achieving digital transformation in the public sector. The study highlights the existing challenges, identifies key drivers of success, and provides actionable recommendations for improving data governance frameworks, enhancing digital adoption, and optimizing asset management processes. By embracing digital transformation, fostering a culture of data-driven decision-making, and investing in capacity-building initiatives, organizations can unlock the full potential of asset management and ensure sustainable infrastructure development for the future.

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