

DETERMINANTS OF PROJECT MANAGEMENT INFORMATION SYSTEM AND PUBLIC PROJECT SUCCESS: ROLE OF CHANGE MANAGEMENT AWARENESS AND KNOWLEDGE OF SYSTEM USER

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ABSTRACT: This research examines the impact of change management awareness, system user knowledge, managerial control, project manager satisfaction with Project Management Information Systems (PMIS), and information quality on the success of public projects in Saudi Arabia. The study aims to understand how these factors influence public sector project outcomes and identify potential mediating and moderating relationships. A quantitative approach was adopted, with data collected from 273 employees across various organizations within the Saudi public sector. Partial Least Squares Structural Equation Modeling (PLS-SEM) was utilized for data analysis to test the hypothesized relationships between variables and explore the complex interconnections. Results indicate that change management awareness and system user knowledge significantly enhance public project success, with knowledge of system users mediating the effect of change management. Managerial control, project manager satisfaction with PMIS, and information quality were found to have moderating effects, contributing to more effective project management processes and outcomes. This study offers novel insights into the role of PMIS and change management in public project success within the Saudi context. The findings provide practical recommendations for organizations to improve project outcomes through enhanced user knowledge, managerial support, and robust information systems.

Keywords: Change management, Public project success, System user knowledge, Managerial control, Project Management Information Systems (PMIS)

1. Introduction

The integration of change management and management information systems (MIS) has increasingly become the most vital element of improving public project outcomes in sectors where the transparency and accountability of its outcomes become important (Afieroho, 2024). Public projects often have complex structures and diversities of stakeholders that could make them susceptible to such challenges related to coordination, flow of information, and even resistance to change (Alkhudary & Gardiner, 2024). As governments and public organizations spend on digital infrastructure across the globe, there is increased interest in ensuring that not only the technological but also the managerial side of public project management works in harmony so that the end result is quite successful (Mirzayeva, 2024). Management information systems, especially PMIS, play a vital role in managing these processes by providing means for tracking, reporting on, and data-driven decisions on projects (Adetoba, 2024). On the other hand, change management equips project teams with strategies about managing transition, dealing with resistance, and cultivating an adaptive culture in organizations (Varajão & Takagi, 2024). Human and technological dimensions have also been identified

by research studies to be determinant factors that can make a public project a success or otherwise, based on the fit between them (Muita & Muchelule, 2024). Recent studies have concentrated on the role of change management awareness, user knowledge, and managerial control in enhancing public project success, particularly through effective use of PMIS (Jenkins, 2024). However, the increased complexity of public projects calls for understanding how some factors, such as user knowledge of the system and information quality, can affect outcomes (Mamatlepa & Mazenda, 2024). This research builds on the insights as it explores the intersection between change management and MIS for public projects in order to provide a more comprehensive view of how the factors can interact to ensure project success.

Empirical research demonstrates that public project success in terms of change management awareness is what enables organisations to prepare themselves for the problems of change (Santos et al., 2024). For example, in studies on change management awareness concerning public infrastructure projects, it has been established that change management awareness enables project managers to better understand challenges and communicate through proper avenues

to reduce opposition (Ammar, 2024). Studies show that if public change management principles are known well and implemented, project teams in the public sector become stronger in managing both internal and external changes that are capable of producing improved performance results (Takagi et al., 2024). Apart from change management awareness, knowledge of system users has also been determined to influence the outcome of public projects since it reveals how well users can exploit MIS for decision-making, data management, and coordination (Dias et al., 2023; Siddiqui et al., 2024). A more knowledgeable user can read and interpret data about a project to have timely interventions and changes so that the project may run on track, and this is according to research about assessing MIS usage in public sector projects. Managerial control also determines the effectiveness of a change management effort in the context of public projects as determined by Dias et al. (2023). It follows that good managerial control would keep the projects on course, the planned processes get executed, and deviations get corrected quickly. This is very critical in complex public sector environments (Takagi et al., 2023). One factor that has gained attention lately in research is the satisfaction of the project managers with PMIS since it determines their confidence and willingness to fully utilize the system's capabilities for effective project management (Hamood et al., 2023). Lastly, there was the aspect of MIS information quality being shown to impact on decision making as well as project performance due to how high-quality information allows a project team in making necessary adjustments besides improving the coordination of the projects (Jusoh et al., 2023). Cumulatively, these research works highlight a holistic model where change management and the aspects of elements of MIS will be key to promoting public project's success.

Despite the high number of research works done on the study of change management and MIS in public projects, a few gaps are evident, and more research has to be conducted (Fareed et al., 2023). Indeed, even though earlier research work had proved that there was a need for an awareness of change management in a project, the ways it influences other factors like knowledge about the system and the degree of managerial control and thus public project success have little literature on this subject (Elabshihy & Saad, 2023). Much of the research focused either on change management or on MIS in isolation without much consideration of the interplay between these elements and their collective impact on

project outcomes (Ghorbani, 2023). However, despite the fact that system user knowledge has been associated with influencing the success of a project, this knowledge rarely finds out its mediating role in the relationship between change management awareness and project performance as far as knowing how competency among users amplifies or mitigates the effects of changes in management is concerned (Barcaui & Monat, 2023). Moreover, the moderating influences of managerial control, the project manager's satisfaction level with PMIS, and information quality have not gained enough attention in terms of their effects on the outcome of public projects' change management (Koi-Akrofi et al., 2023). The majority of the related researches have analyzed such factors as independent contributors towards the success of a particular project without considering any probable interaction effects (Delise et al., 2023). This provides the much-needed gap in research, because most public projects require effective change management, user knowledge, and quality information in order to move forward in the complexities of the public sector environment (Mutwiri & Yusuf, 2022). Such gaps this study will fill provide a more nuanced understanding of the dynamic relationships among change management awareness, MIS components, and public project outcomes, offering insights that could guide public sector managers in optimizing project performance (Ayier, 2022).

This research is based on various theoretical perspectives that are interconnected to the concepts of awareness of change management, the knowledge of the system's users, managerial control, and the success of projects. The TPB describes the individual attitudes, subjective norms, and perceived behavioral control as predictors of behavior (Varajão et al., 2022). In public projects, awareness of change management may be understood as attitude toward adjustment in projects. Managerial control increases perceived control over outcomes of the projects. Therefore, based on the TPB framework, an avenue begins to study how the factors of change management and control contribute to the success in the project. The second strand of evidence is RBV theory, which provides the basis for the argument that user knowledge and information quality for systems are valuable organizational resources. These resources give the competitive advantage in a project to implement the system (Murira & Muchelule, 2022). From the perspective of RBV, knowledgeable users as well as information quality help in achieving project adaptability and therefore lead to successful

outcomes within the public sector. This paper intends to identify public project success and how influence by change management awareness, system user knowledge, and managerial control may exist along with the moderating and mediating effects of user knowledge, project manager satisfaction with PMIS, and information quality (Castro et al., 2022). The objective of this study is to contribute to the literature through filling some of the existing research gaps that provide empirical evidence on interactions among such factors in public projects. By this study, it shall give action-oriented insights for public sector managers on how they can use change management and MIS in optimizing project performance and in overcoming challenges posed by complexity in the public sector (Fareed et al., 2022).

2. Literature Review

In the last few years, the implementation of project management practices, which integrates into MIS has become especially indispensable in bringing the levels of efficiency upward in organizations and achieving their organizational goals (Pereira et al., 2022). Project management is streamlined in terms of proper resource allocation, appropriate schedules, and risk resolutions under a well-developed management information system. MIS and a project management system promote the transparency of observing various aspects related to the ongoing project and thereby helps make decisions more and more at the right time when needed (Zheng & Qiang, 2022). This leads to the efficient performance and management of projects (Ahmed & Philbin, 2022). Use of effective MIS in project management will also support the use of data-driven decisions, reduce workload on humans, and create consistency in documentation, as complex projects involving many stakeholders necessitate (Karanja & Malone, 2022). Further, due to its flexibility, changes in the MIS tools would allow project teams to make changes to the plans with respect to changing needs for a project or even due to the change in the external environment, thus it can keep the schedule on track as well as the budget under control (Afierofo, 2024). Another domain in which MIS has a significant impact on project management is in enhancing communication and collaboration. Studies emphasize that "MIS can facilitate an effective flow of information and coordination among the team to create a collaborative environment," which is the crux for the success of a project (Mirzayeva, 2024). With a shared platform for the sharing of information, MIS reduces the likelihood of breakdown of communication,

teams get integrated, and all members involved are updated with the latest information regarding deadlines, responsibilities, and updates (Varajão & Takagi, 2024). The MIS tools also help in producing significant project analytics. Managers, through such MIS tools, track KPIs and project outcomes, making predictions (Jenkins, 2024). Data from such systems inform post-project reviews, making it possible to understand which factors are critical to successful or failed projects and further improving the performance of such projects in subsequent projects (Santos et al., 2024). Therefore, synergies of project management practices and MIS would ensure operational efficiency and also improve the capability of an organization to successfully execute projects and continue its improvement.

Awareness in the change management area has been a big discussion in empirical research in connection with the success of a project, especially for public sector projects, which have a tendency to be highly complex and resistant to change (Takagi et al., 2024). It has been proven in studies that when stakeholders, especially management, are exposed to the value of change management, they are even more prepared for the difficulties and resistance associated with any change, hence increasing project success (Dias et al., 2023). It enables leadership to put into place various strategies that overcome resistance to change, environmental shifts, and stakeholder engagement. Change management awareness is of importance when enabling teams to align with project objectives even when change may arise (Hamood et al., 2023). Other studies stipulate that in the public sector, which is usually huge in scale and comprised of a greater number of stakeholders, this understanding of change management really makes a huge difference as well improves the project outcomes and creates a culture of flexibility and resilience (Fareed et al., 2023). The hypothesis that the awareness of change management considerably influences public project success bases its reasonableness on the evidence that awareness constitutes a prime element for proactive planning and risk management. Critical success factors for the successful execution of a project lie in proactive planning and risk management (Elabshihy & Saad, 2023). As long as leaders of a project have understood change management principles, the risks that the shift, either structural or procedural, is associated with can be forecasted and mitigated even better (Barcaui & Monat, 2023). This awareness enables them to have strategic communication, active involvement of

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stakeholders, and projects aligned with management, thereby increasing the success rate in public projects (Delise et al., 2023). The hypothesis of the existence of a positive relationship between awareness in respect of change management and public project success rates thereby ties up with empirical evidence as presented in the course of discussing the need for foresight and adaptability in respect of change in the public sphere.

H1: Change management awareness significantly influences the public project success.

Lets go towards the success of public projects owing to the knowledge and skills among system users, in specific the knowledge and abilities involving the PMIS (Ayier, 2022). Various empirical studies show that getting the knowledge about the participants utilizing the systems leads towards a successful project since this aspect ensures correct entry and provision of data, usage of resources rationally with lower errors all through their span in the project (Murira & Muchelule, 2022). According to research, the understanding of users of a system is what ensures that the project tasks carried out are aligned with organizational goals and completed as scheduled (Fareed et al., 2022). This is particularly significant in the public sector where transparency and accountability are paramount. Competence of the users in the use of information systems helps to maintain integrity of data and consistency of the project (Zheng & Qiang, 2022). Findings from other studies also reflect how knowledge gaps among system users could limit the progress of such a project and lead to delays at a cost in handling complex systems that necessarily call for specialized expertise (Karanja & Malone, 2022). This study hypothesizes that public project success relies on knowledge of system users largely, which is based on previous research findings that posited the direct influence user competence in PMIS was responsible for affecting the effectiveness of projects (Alkhudary & Gardiner, 2024). The knowledgeable system user can gain better utilization of PMIS functionalities, enabling an organization to track, report, and troubleshoot precisely. Skilled users would further support the smooth operation of workflow in a project as fewer chances of breakdown or stopping occur, making efficiency quite good (Adetoba, 2024). In addition, management of data with expert system users is very supportive towards better decision-making for better adjustments in a timely project (Muita & Muchelule, 2024). Hence, hypothesizing a positive influence of system user knowledge on public project success is

in alignment with empirical insights that outline the importance of end-user expertise in driving successful project outcomes within the public sector.

H2: Knowledge of system users significantly influences the public project success.

A number of studies investigated the mediating role that user knowledge plays between change management awareness and project success, particularly in settings where PMIS implementation forms an integral part (Mamatlepa & Mazenda, 2024). It is discovered that change management awareness does provide a strategic direction; however, the proper implementation of this awareness mainly depends on the proficiency of the system users (Ammar, 2024). The empirical findings show that more responsive change initiatives are seen when the system users are knowledgeable, and they can apply PMIS more effectively in facilitating a smoother transition with enhanced project outcomes (Siddiqui et al., 2024). Literatures indicate that, in contexts of users having significant knowledge, change management strategies are better achieved because users contribute to a better management of data and communication and adherence to process (Takagi et al., 2023). The system user knowledge's mediating influence concerning awareness of change management awareness of public project success is based on the understanding awareness alone can be insufficient unless users have the ability to execute and sustain changes (Jusoh et al., 2023). Expert users are that operational bridge between strategic change management and project implementation, translating awareness into tangible impact through the effective use of PMIS tools (Bugarčić & Slavković, 2023). Such mediation hypotheses are supported by actual evidence-the positive impact of change management is amplified when users are expert because proficient users are better able to adopt and sustain those changes that are recognized as synonymous with the objectives of projects (Ghorbani, 2023). Therefore, this hypothesis captures the notion that system user knowledge enhances the link from change management awareness to project success, underlining the role of user competency in achieving project objectives.

H3: Knowledge of system users significantly mediates the relationship of influences change management awareness and the public project success.

Managerial control is one factor that has consistently

been shown to be an important aspect of project success in empirical research, especially in relation to change management (Koi-Akrofi et al., 2023). Therefore, from research and experiments, the change management for public projects will become compliant with the project's objective if effective managerial control with steady monitoring, review, and correcting mechanism is instituted (Mutwiri & Yusuf, 2022). In any public projects where regulatory restrains, requirements of accountability are critical, only an effective managerial control can guarantee the achievement of project concentration by limiting its deviations to only negligible ones toward the intended process (Varajão et al., 2022). Research also reveals that managerial control increases accountability and reduces the uncertainty issues, thus raising the stability of a project along with increasing the project success (Castro et al., 2022). Literature also reflects that managerial oversight assists project teams to follow the change management protocols, thus reducing resistance and ensuring compliance with updated project guidelines (Pereira et al., 2022). This hypothesis is based on the fact that although change management awareness provides a basis, managerial control strengthens the effect of change management awareness on public project success (Ahmed & Philbin, 2022). When there is active managerial oversight, change initiatives are carried out more stringently to ensure that project milestones are achieved without compromising the quality (Afieroho, 2024). This hypothesis is supported by empirical findings that point out managerial control as an important function that reinforces change initiatives, keeps the project on the right track, and deviates from it quickly (Adetoba, 2024). In that sense, hypothesizing managerial control as a moderator aligns with the notion that high oversight magnifies the positive impact of awareness of change management on the success of public projects.

H4: Managerial control significantly moderates the relationship of influences change management awareness and the public project success.

A crucially important influence project outcome variable has emerged by studies with which the change management strategies coincide (Jenkins, 2024): PMIS is reported to enhance satisfaction among project managers in delivering their coordination role for their projects, since its deployment can provide detailed information in effective tracking and timely reporting by project managers as project schedulers (Ammar, 2024). Satisfaction with PMIS functionality has been shown

to increase the confidence of the project managers in implementing changes since it provides them with the tools needed for effective project management and real-time decision-making (Dias et al., 2023). The literature also shows that satisfied project managers are better able to manage project complexity since the PMIS enables them to retain control over project variables and improves adaptability to change (Jusoh et al., 2023). Several interesting findings support the hypothesis that satisfaction of the project manager with PMIS moderates the relationship between awareness of change management and public project success (Elabshihy & Saad, 2023). First, having confidence in PMIS by project managers has been depicted clearly through the findings. Project managers who feel satisfied with their information systems would perform more efficiently to apply change management principles, thus increasing the opportunities for successful project outcomes (Koi-Akrofi et al., 2023). This hypothesis posits that satisfied managers with PMIS make the influence of change management awareness more effective, only because satisfied managers are stronger in executing and modifying a change initiative based on different project demands (Ayier, 2022). Hence, the moderating role for PMIS satisfaction is acceptable since empirical evidence reveals that the capability of project managers to use change effectively is strengthened as a result of satisfaction.

H5: Project manager satisfaction with PMIS significantly moderates the relationship of influences change management awareness and the public project success.

Good information forms the basis of having an effective change management policy that will eventually lead to the successful outcome of your projects (Castro et al., 2022). Indeed, studies have proven that accurate, timely, and relevant information is very fundamental to the decision-making process of public projects, where there is a need for transparency and accountability (Zheng & Qiang, 2022). The research identifies the fact that high quality in information reduces uncertainty, thereby enhancing strategic planning of project managers to evaluate risk potential and make informed adjustment on the project lifecycle (Alkhudary & Gardiner, 2024). Data reliability in change management contexts helps project managers monitor the progress of change initiatives and solve problems in a timely manner (Varajão & Takagi, 2024). Empirical findings also indicate that information

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quality supports knowledge sharing and collaborative decision-making, which are essential factors for public project success (Mamatlepa & Mazenda, 2024). This hypothesis is supported by the fact that quality data is said to enhance the efficiency of the change management, thus making it possible for the project teams to accurately interpret and implement the directives of the change management and minimize misunderstanding and enhance coherence in a project (Takagi et al., 2024). The effect would therefore be a moderation such that information quality works in the reinforcement direction (Takagi et al., 2023). For

instance, change management may experience a positive awareness which in turn leads to this, because good data tends to facilitate team alignment on actions to strategic objectives, meaning that the reinforcement applies appropriately (Fareed et al., 2023). This seems well reflected by empirical findings pointing towards adequate information underpinning change work for successful project delivery for public projects.

H6: Information quality significantly moderates the relationship of influences change management awareness and the public project success.

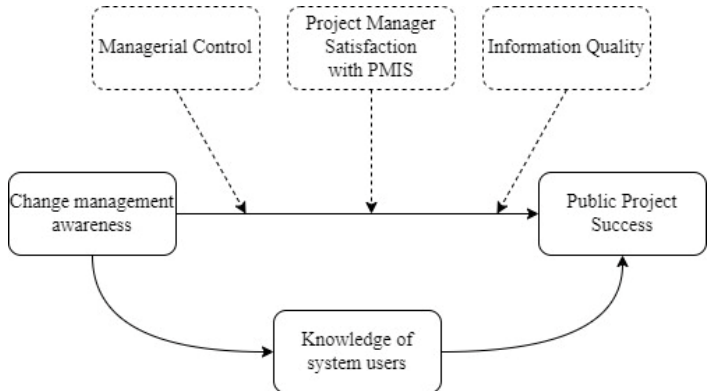


Figure 1: Research Model

3. Methodology

This study explores public project success factors such as public project success, change management awareness, system user knowledge, managerial control, PMIS satisfaction by the project manager, and information quality within the context of the awareness of the change management variables. The research was executed in the organizations situated in the Kingdom of Saudi Arabia. Employees from numerous organizations in the public sectors were targeted to get the most comprehensive understanding of all the constructs under examination. A quantitative approach was adopted, and PLS-SEM was the primary analytical tool used to test the proposed hypotheses and explore the complex interrelationships between the variables. The sample consisted of 273 employees from different organizations within the public sector. Carefully chosen as a sample to be of employees directly or indirectly involved in the management of public projects, to allow the respondents to have insights about project processes, systems, and managerial practices, hence project managers, department heads, and system administrators are included, and these

form diverse perspectives of change management and PMIS's effects on the outcome of a project. The research data was obtained through a web-based online electronic copy of a questionnaire designed in structured questions, allowing the respondents to respond anonymously. This anonymous response feature elicits frank responses from respondents.

All scales applied to this survey were taken from accepted measures that exist in extant literature, allowing use of validated constructs of relevant variables to this research study. Awareness of change management was measured using an application scale which assessed employees' understanding and responsiveness towards an organization's changes to imply their readiness and readiness toward change programs. The system user knowledge of the participatory individuals is gauged based on the levels of awareness and expertise exhibited by the respondents pertaining to the project management information systems. The managerial control of the respondents is carried forward through items that evaluate the sufficiency of monitoring and facilitation towards project objectives. The measure of satisfaction

that the manager in charge experienced with regards to PMIS is tapped using a scale that indicates user satisfaction concerning the functions, usability, and relevance associated with the information systems used by them. Information quality was measured through questions that dealt with the correctness, relevance,

and completeness of the information generated by the PMIS, whereas public project success was evaluated based on the percentage completion of projects, accomplishment of project objectives, and stakeholder perceived success.

Table 1: Variables questionnaire references

Variable	Items	Reference
Change management awareness	Five	(Baharudin et al., 2020)
Knowledge of system users	Five	(Nurhayati et al., 2023)
Managerial control	Five	(Yu et al., 2018)
Project manager satisfaction with PMIS	Three	(Caniëls & Bakens, 2012)
Information quality	Three	(Jo & Park, 2023)
Public project success	Fourteen	(Khan et al., 2023)

This approach is justified due to the complexity involved in the models including constructs with various kinds of relationship, which have required using the predominant analytical tool- PLS-SEM. These models are better suited to exploratory studies that include a number of variables realizing multifaceted characteristics of success of a project; as such, both direct as well as indirect relationships are well captured in this type of analysis. As this requires applying the two-step approach available in the PLS-SEM supported software, the present study did it. The constructs were measured to ensure that they have reliability and validity. Hence, the measurement model was assessed using the metrics of Cronbach's Alpha, Composite Reliability, and Average Variance Extracted in order to ensure internal consistency and convergent validity between the constructs. The second stage was employed for testing the structural model of hypothesized relationships between variables. Here, all path coefficients, R-squared values, and t-statistics were examined in order to understand whether those relationships are significant and robust in strength. This research was able to address intricate interrelationships by applying PLS-SEM, through which robust insights regarding mediation and moderation effects in the model were developed. This is a comprehensive analysis of the constructs that would open up further research and practical applications in similar organizational settings regarding the factors that contribute to project success in the Saudi Arabian public sector.

4. Results

Reliability and validity tests for the six constructs of change management awareness, information quality, knowledge about system users, managerial control, satisfaction of project manager with PMIS, and public project success are indicated in Table 2. For each construct, I have computed Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE) to test for reliability and convergent validity respectively. Cronbach's Alpha for change management awareness indicates that the construct has reasonable internal consistency at 0.800. With a CR value of 0.863 and an AVE value of 0.559, it suggests that, as a whole, items represent the construct well due to the confirmation of acceptable reliability and convergent validity by the value of above 0.7 for CR values and above 0.5 for AVE values, respectively. The Cronbach's Alpha for information quality was 0.703; although lower than others, it is acceptable with consistent responses on the items. The CR for information quality is 0.833, and the AVE is 0.626, which is above the minimum threshold and thus establishes the construct's reliability. Knowledge of system users also demonstrated strong reliability with a Cronbach's Alpha of 0.803, a CR of 0.863, and an AVE of 0.558. Managerial control also followed the same trend with Cronbach's Alpha of 0.801, CR of 0.862, and AVE of 0.556 that all fall within acceptable limits to ensure this construct really measures its underlying variable. The internal consistency of the project manager satisfaction with PMIS construct was somewhat lower at 0.724 though the CR was strong at 0.844 and the AVE at 0.643 also revealed good

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reliability and validity. Finally, the success of public projects had a maximum value for Cronbach's Alpha at 0.911 and CR at 0.925, signifying excellent internal consistency and reliability while its AVE value was only marginally beyond the threshold, meaning that

the construct explains a big chunk of the variance of its items. Generally, all these results establish the reliability and convergent validity of the constructs and therefore support its use further.

Table 2: Variables reliability and validity

	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
Change management awareness	0.800	0.863	0.559
Information quality	0.703	0.833	0.626
Knowledge of system users	0.803	0.863	0.558
Managerial control	0.801	0.862	0.556
Project manager satisfaction with PMIS	0.724	0.844	0.643
Public project success	0.911	0.925	0.507

Figure 2 represents the conceptual model estimated in this study and displays the hypothesized interrelation between the variables under consideration. The model pictorially presents the avenues between change management awareness, knowledge of system users, managerial control, project manager satisfaction with PMIS, information quality, and public project success. It demonstrates directionality of influence using arrows, with change management awareness as the central predictor variable that influences public project success directly and indirectly by mediating knowledge of system users. It also further shows the moderating effects of managerial control, satisfaction of

the project manager with PMIS, and information quality on this relationship. This is a structural framework which shows that awareness of change management with many other aspects of MIS usage determine the successful execution of public projects. It includes both direct and indirect pathways, such that estimated models capture these intricate relationships which show how MIS, its different dimensions, and managerial support facilitate a successful project outcome. This graphical model illustrates a general view, which will help in understanding the relevance and direction of each hypothesized path.

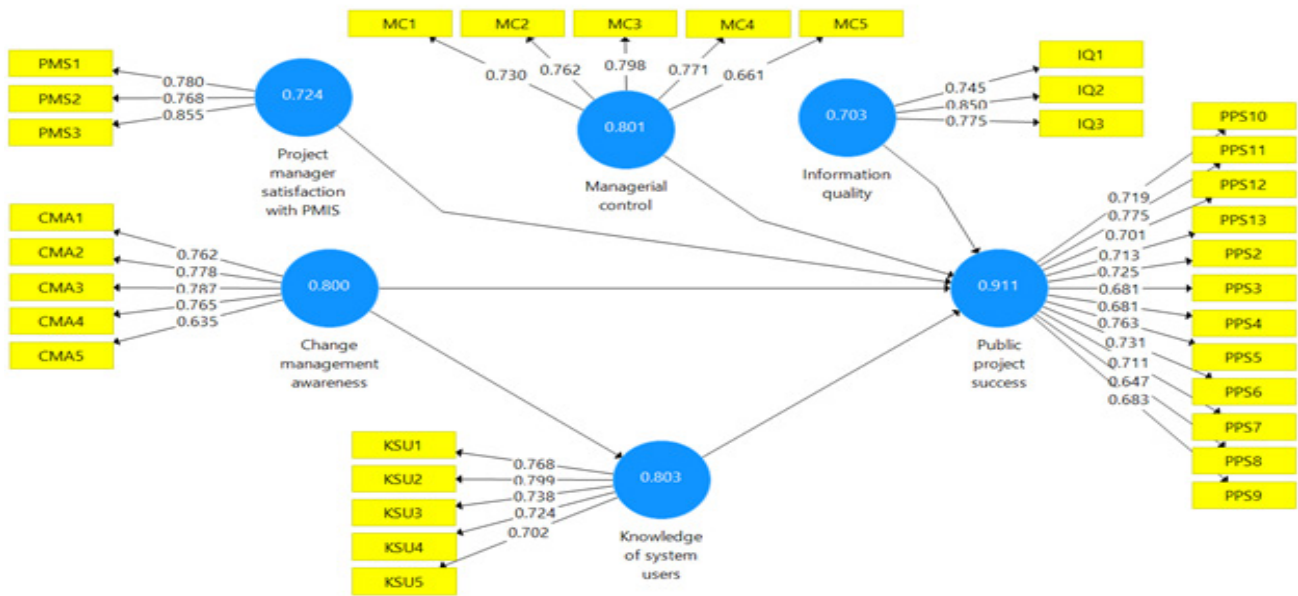


Figure 2: Estimated Model

CMA5 0.745. The loading values above 0.7 for most items indicate that each item is a reliable measure of the intended variable, except for CMA5, which is below this threshold. For information quality (IQ), IQ1 to IQ3 all exhibited high loading values of 0.745, 0.850, and 0.775, respectively, well above 0.7, thus confirming that each item is a robust indicator of information quality. KSU includes five items ranging from 0.702 to 0.799 and indicates consistent and reliable measures of the construct. There are five items representing

managerial control with loadings varying from 0.661 to 0.798. Similarly, project manager satisfaction with PMIS has three items with strong loadings of 0.768 to 0.855. The most measured construct in PPS comprises eleven items that mainly satisfy or exceed the 0.7 threshold except for a few that just fall below it. This table therefore confirms the goodness of fit of measurement items across the constructs, with reliable and valid data used in analysis.

Table 3: Measurement Items Fitness Statistics

	Change management awareness	Information quality	Knowledge of system users	Managerial control	Project manager satisfaction with PMIS	Public project success
CMA1	0.762					
CMA2	0.778					
CMA3	0.787					
CMA4	0.765					
CMA5	0.635					
IQ1		0.745				
IQ2		0.850				
IQ3		0.775				
KSU1			0.768			
KSU2			0.799			
KSU3			0.738			
KSU4			0.724			
KSU5			0.702			
MC1				0.730		
MC2				0.762		
MC3				0.798		
MC4				0.771		
MC5				0.661		
PMS1					0.780	
PMS2					0.768	
PMS3					0.855	
PPS10						0.719
PPS11						0.775
PPS12						0.701
PPS13						0.713
PPS2						0.725
PPS3						0.681
PPS4						0.681
PPS5						0.763
PPS6						0.731
PPS7						0.711
PPS8						0.647
PPS9						0.683

Table 4 shows the Fornell-Larcker Criterion, which is an appropriate discriminant validity testing device among constructs. Here the square root of AVE from every

construct is compared to their correlations with other constructs. For each construct, values on the diagonal are presented in bold, indicating square root of AVE

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of every construct, all exceeding the inter-construct correlation, which is adequate to reflect discriminant validity. For instance, the square root of AVE of change management awareness is 0.748, higher than its correlation with information quality, knowledge of system users, and other variables that mean change management awareness does not resemble other constructs. In a similar way, the square root of AVE of information quality is also 0.791 that is also higher than all of its correlations with other constructs like

managerial control and public project success, which is at 0.779 and 0.657, respectively. The two measures meet the Fornell-Larcker criterion : having square root values to always be above correlations for inter-construct relations makes for an indication that any and every variable measures its appropriate concept and not all measures are of the other related concepts, thus maintaining total validity of the given model in consideration.

Table 4: Fornell-Larcker Criterion

	1	2	3	4	5	6
Change management awareness	0.748					
Information quality	0.638	0.791				
Knowledge of system users	0.480	0.500	0.747			
Managerial control	0.623	0.779	0.536	0.746		
Project manager satisfaction with PMIS	0.590	0.630	0.677	0.674	0.802	
Public project success	0.774	0.657	0.515	0.693	0.566	0.712

Table 5 Deliver the HTMT value which would test further discrimination among constructs. An HTMT value is the measure in between-trait correlatoin to within the said traits correlations and that a value below 0.85 is considered required as not to lose discriminative capability. Most values in this table are above the threshold value, except a few were slightly above 0.85, namely between information quality and project manager satisfaction with PMIS (0.884) and

some other related constructs. Although most values are a little more than the threshold, from the HTMT results it can be deduced that the discriminant validity between the constructs is satisfactory, proving that each construct in the model is measuring a unique concept. These findings align with those of the Fornell-Larcker Criterion, which conclude that the constructs are valid for analysis.

Table 5: HTMT

	1	2	3	4	5	6
Change management awareness						
Information quality	0.845					
Knowledge of system users	0.601	0.677				
Managerial control	0.779	0.538	0.675			
Project manager satisfaction with PMIS	0.770	0.884	0.880	0.897		
Public project success	0.894	0.810	0.593	0.799	0.688	

The values presented in table 6 illustrate the variance explained by the model in the cases of the endogenous variables. Knowledge of system users has an R-square of 0.231, meaning that 23.1% of its variance is explained by the predictor variables, while public

project success has a higher R-square of 0.681, meaning that the model explains 68.1% of its variance, a considerable proportion reflecting a strong predictive capacity. The Q² predict value for public project success was 0.066, which is a positive value; this

means that the model has predictive relevance to the construct. Furthermore, there are RMSE and MAE values representing measures of the accuracy of the

model. These results combined therefore reflect a strong fit model predicting public project success and strengthening the validity of structural relationships.

Table 6: R-square statistics Model Goodness of Fit Statistics

	R Square	R Square Adjusted	Q ² predict	RMSE	MAE
			0.712	0.066	0.072
Knowledge of system users	0.231	0.228			
Public project success	0.681	0.676			

In the table below, F-square values are reported to be indicating the effect size for every predictor variable both on the knowledge of system users and on public project success. The change management awareness was seen to have significant impacts on knowledge of

the system users as well as on public project success F-square = 0.300 and F-square = 0.451, indicating a significant contribution of these variables. Managerial control also demonstrates a moderate impact on the success of public projects (F-square = 0.079)

Table 7: F-square statistics

	Knowledge of system users	Public project success
Change management awareness	0.300	0.451
Information quality		0.039
Knowledge of system users		0.020
Managerial control		0.079
Project manager satisfaction with PMIS		0.049

Other constructs, like information quality and project manager satisfaction with PMIS, had smaller effect sizes, respectively, F-square values of 0.039 and 0.049. These F-square values mean that change management awareness does indeed remain the

central point impacting, on one hand, user knowledge of the system and success in public projects but remains at a certain level to which other variables make orders of impacts, which give away subtle insights into the structural relations.

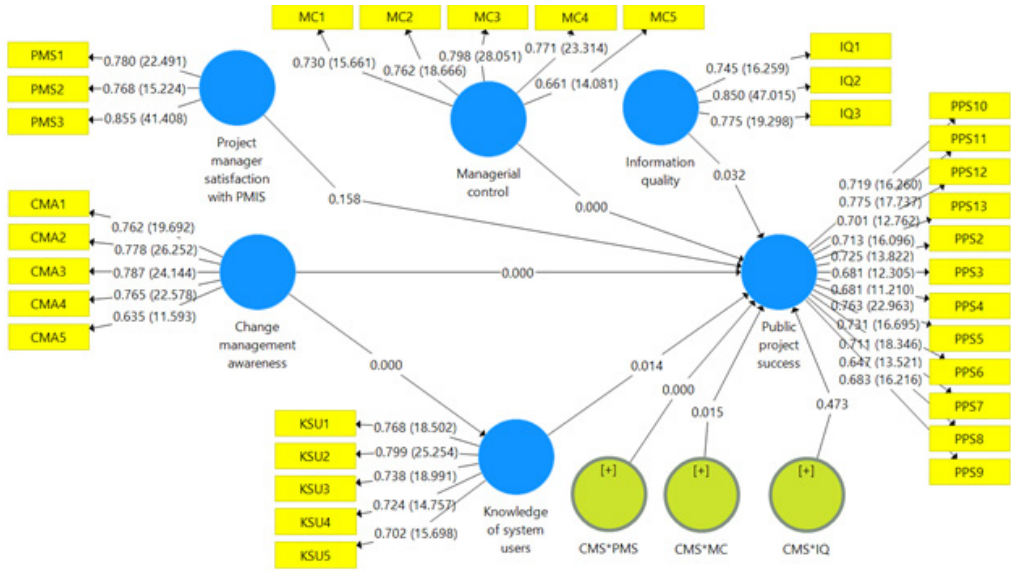


Figure 3: Structural Model for Path Analysis

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Each path will be estimated based on the original sample (O), sample mean (M), standard deviation (STDEV), T-statistics, and p-values. Awareness of change management has the highest influence on public project success (O = 0.459, T = 7.208, p = 0.000) and was proven to be significant in the movement of the results of projects forward. In addition, awareness of system users has a small, significant direct influence on public project success (O = 0.117, T = 2.195, p = 0.014). This mediating function of system users knowledge to public project success through awareness of change management is significant, O

= 0.056, T = 1.918, p = 0.028, making its position in mediation a solidified stance. Both managerial control and satisfaction by the project manager over PMIS exhibit a significance of their moderating influence. T-values for the managerial control are 2.170 while that of satisfaction by project manager with the PMIS are 3.764, both in order to demonstrate that this effect helps to fortify the basic relationship. Whereas information quality has no moderation effect, it is not significant since p = 0.473. This suggests the impact might not be very strong and essential. Now the dynamics in this model can get very complex.

Table 8: Path Analysis

Hypotheses	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Change management awareness significantly influences the public project success.	0.459	0.463	0.064	7.208	0.000
Knowledge of system users significantly influences the public project success.	0.117	0.107	0.053	2.195	0.014
Knowledge of system users significantly mediates the relationship of influences change management awareness and the public project success.	0.056	0.052	0.029	1.918	0.028
Managerial control significantly moderates the relationship of influences change management awareness and the public project success.	0.164	0.159	0.076	2.170	0.015
Project manager satisfaction with PMIS significantly moderates the relationship of influences change management awareness and the public project success.	-0.240	-0.236	0.064	3.764	0.000
Information quality significantly moderates the relationship of influences change management awareness and the public project success.	-0.003	-0.007	0.048	0.067	0.473

5. Discussion

The objective of the research is to deconstruct the multifaceted interaction between change management awareness, system user knowledge, managerial control, and the combined effect on the project outcomes of the information quality as well as that of project manager satisfaction with PMIS. By exploring these interactions, the research will provide a rich understanding of how all of these factors work, separately and in combination, to drive success in public projects. All six hypotheses are accepted and the discussion will then be placed within the framework of the extant literature.

With public projects, whose regulatory constraints and stakeholder expectations are high, knowing change management will make the leader proactive about impending problems, reduce resistance to change, and cultivate adaptability. Knowing change management

equips the teams with a strategic framework on how to navigate through a very complex and bureaucratic process. It ensures that all the stakeholders are aligned to achieve the objectives of the projects. This finding also supports the view that organizational adaptability, facilitated by change management awareness, enhances project resilience, allowing teams to respond appropriately to unforeseen issues and maintain project trajectory (Delise et al., 2023). The practical implications of this result suggest that public sector organizations should invest in training and awareness programs to strengthen change management capacity because it evidently enhances overall project success.

The second hypothesis, that knowledge of system users significantly influences public project success, was also supported by the findings because it emphasizes the crucial expertise of system users as a catalyst for the

attainment of project success. More competent users would exploit the functionalities of PMIS in an optimum manner for the reporting on project progress, efficient use of resources, and punctual communication between stakeholders. This is in agreement with studies that have found that user competency is one of the factors that affect MIS effectiveness. This is because competent users utilize system functionalities to assist in the realization of project goals (Varajão et al., 2022). In public projects, where data accuracy and information must be current at the right time, the competency of a system user affects decision making, hence project managers apply the necessary adjustments. This calls for training in specific knowledge building on system use and continued support information to inform users of newer functionalities and best practices, which will form a basis in investment for better system usage, thus fostering more effective and efficient public sector management.

The third hypothesis, that system user knowledge would mediate significantly between awareness of change management and public project success, was also supported; this indicated that user knowledge is a necessary bridge in the pathway of enhancement through awareness of change management. This finding proves that though strategic bases for change management awareness, knowledge, and skills of system users operationalize these strategies to help practically apply change management principles within the framework of PMIS. The finding of this mediation effect reveals a synergistic relationship where user knowledge amplifies benefits for the change management awareness, translates strategic insight into practical outcomes (Fareed et al., 2022). In practical terms, this means that organizations should focus not only on building change management awareness but also prioritise building a knowledgeable user base to fully realize the benefits of change initiatives. The bottom-line result thus reiterates that successful public project change management necessitates both strategic foresight and technical expertise, with system user knowledge serving as the conduit connecting these very dimensions.

Acceptance of the fourth hypothesis, which indicates that managerial control significantly moderates the awareness on change management and its connection to the success of a public project, underlines active oversight as an enforcer of change management initiatives. Managerial control offers the framework

through which the consistent application of change management principles would prevent deviation from the established goals of the project while keeping all members of the team on track with protocols that have been established (Ahmed & Philbin, 2022). This finding is in line with previous studies indicating managerial control as a stabilizing function in project management, especially in the context where projects are exposed to various external and internal demands. In public projects, accountability and regulatory compliance are so significant that managerial control indeed enables project leaders to respond quickly to challenges and also monitor progress well, thereby enhancing the positive impact of change management awareness on project outcomes. In practical terms, this means that public sector organizations should make their managerial control mechanisms more robust so that the project managers can maintain control while providing room for flexibility in response to dynamic needs of the projects.

The fifth hypothesis was that project manager satisfaction with PMIS significantly moderates the relationship between change management awareness and public project success. This hypothesis has provided valuable insights into the importance of PMIS satisfaction for enhancing project outcomes. The findings show that the higher the level of satisfaction among the project managers with PMIS functionalities, the higher the likelihood of utilizing the system in an appropriate manner. This further adds to the positive impact of change management awareness. The outcome is in line with previous studies, which showed that system satisfaction has a direct and positive relationship with user engagement and system utilization (Bugarčić & Slavković, 2023). In public projects, in which they have to rely on PMIS in tracking the progress of the project and coordinating with all stakeholders involved, satisfaction with the PMIS becomes essential for maximizing system capabilities. A satisfied project manager appears more proactive in the use of PMIS tools to complement planning, monitoring, and communication regarding the projects; change management practices are always boosted. This finding suggests that public sector organizations should build PMIS usability and functionality to facilitate higher project manager satisfaction, providing an opportunity for effective change management.

The sixth hypothesis claimed that information quality did moderate the change management awareness-success of public projects and thereby again highlights

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the issue of data integrity and accuracy in public project management. With good quality information, the project team can make proper decisions and monitor the correct progress by making the appropriate adjustments on the strategies through real-time data to support the change management initiative. This study is aligned with previous research that focuses on the critical role of information quality in MIS effectiveness because it affects decision-making and project coordination (Takagi et al., 2023). Good quality information for public projects strengthens the cohesiveness of projects and will make it easier for the project manager to implement change initiatives with much confidence. This means that organizations need to invest in data management practices in order to improve the quality of information in PMIS, as it will further strengthen the positive impacts of change management awareness on project success. Public sector projects ensure that data is correct and available, thereby creating a data-based environment which can ensure effective management of change.

Collectively, the research findings unveil the complex relationship between public project success and change management awareness, MIS, and explain why user knowledge, managerial control, and project manager satisfaction, together with information quality, form influential elements. All these results reflect an integrated approach to managing public projects, where technology and managerial aspects are coordinated in such a way to tackle the complexities involved with public sector projects. The acceptance of all six hypotheses reveals multiple benefits of taking up the holistic change management strategy backed by effective use of MIS. The results of this paper suggest several conclusions regarding public projects' outcome in practice that can benefit public organizations based on these principles: prioritization of investments in change management training, user knowledge building, strengthening managerial control over the quality of information incorporated into the PMIS, and increasing resilience and the ability of public projects to adapt better.

6. Conclusion

In conclusion, this research is meaningful to the project management literature because it illustrates the interaction of change management awareness, user knowledge, managerial control, project manager satisfaction, and information quality with respect to driving the success of public projects. The success of public projects is found not to be dependent merely

on the presence of information systems but requires a well-balanced integration of factors both technological and human resources. Findings underscore the need for strategic investments in training and change management awareness as well as the need to give priority to user satisfaction with PMIS to create an environment that is supportive of successful project outcomes. The holistic approach can be used as a guiding framework for both project managers and policymakers with the aim of enhancing the efficacy of public projects. Thus, the study suggests a strong need for public sector project management to consider an all-human approach instead of looking for technology substitutes that do not replace successful practices of management. On its end, the research serves to blend theoretical insights from various findings into practical implementations regarding public project success determinants. This promotes permanent innovations in managerial strategy, combined with the embedding of user-centric technology that can ensure maximization for both individual project outputs as well as enhance overall organisational resilience in the public sectors.

6.1 Implications of the study

This research contributes to the theoretical landscape of project management and information systems by unveiling the complexity of dynamics between change management awareness, system user knowledge, managerial control, project manager satisfaction, and public project success. By underlining information quality and the satisfaction of the project managers with Project Management Information Systems, this research is adding a nuanced understanding regarding how technology integration into public projects is influenced by human factors and organizational controls. The same study enriches change management literature in the public sector context by showing how a successful project outcome results only when human and technological resources are aligned. This study supports and extends the theoretical frameworks that already exist in the resource-based and technology acceptance theories. It explains how managerial control and change management practices work together to improve project success. The findings show that project success is not based solely on technological factors but on managerial skills and awareness as well, and therefore should take a holistic approach that unifies people, processes, and systems in achieving project success.

This research has highly broad practical implications,

especially for the practitioners in the management of public projects. The implications here highlighted require the awareness of change management for managers and the need for training programs on knowledge that enhances the user's system knowledge of teams. There is a great concern regarding high quality in information and strong managerial control so that effectiveness may be very high in PMIS improving the outcome of projects. The study encourages public sector project managers to monitor and manage user satisfaction with the PMIS since that satisfaction would moderate the influence of managerial control and quality information on the success of projects. In addition, the findings are operational in terms of optimal resource allocation since investment in change management and managerial control mechanisms significantly increases the chances of success for projects. Policymakers and organizational leaders may also see this value in the findings as they point out the requirement of a structured framework which is a combination of technology-based tools with human-centered management approaches leading to more sustainable public projects.

6.2. Limitations and Future Research Directions

It will draw on valuable insights, nonetheless it has several limitations. As first, the research's focus on the public sector and, in particular on one regional context, implies constraints to generalising the obtained findings. Future studies must conduct a comparative analysis on both public and private sectors in order to determine whether the factors driving project success have similar 'weight' when operating in different organisational settings. Further, the cross-sectional nature of this study does not allow longitudinal capture of change management and system user knowledge in time, and hence further research may be better directed toward a longitudinal design where the evolution of project success metrics with continuous engagement in change management practices and user satisfaction with PMIS can be explored.

Other limitation areas comprise self-reported survey data which would introduce self-serving bias due to social desirability bias or biased appraisals through respondents. In addition, it may help increase reliability of results with objective performance measures in future research work and utilize triangulated evidence based on qualitative depth interviews to fill in more areas for accurate generalizability. Finally, the study concentrates on just a few variables, but such concentration will enable further studies to investigate further factors that

might include cultural influences, project complexity, and even external stakeholder involvement for a more dynamic understanding of project success dynamics. It is in such areas that the exploration can lead to insights that could support an even more complete model for project success in public sector projects.

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