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ORIGINAL

Interlinkage between Integration Management, Risk Factors, and Project Management Performance in the Construction Industry of UAE

Interrelación entre la Gestión de la Integración, los Factores de Riesgo y el Desempeño de la Gestión de Proyectos en la Industria de la Construcción de los EAU

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ABSTRACT

Introduction: the key purpose of the present study was to investigate the role of integration management, technical risk, social risk, and project management risk in determining the performance of United Arab Emirates' (UAE) construction sector, grounded in the theoretical foundations of agency theory and resource-based view (RBV).
Method: data was collected through a survey questionnaire from various respondents linked with the UAE construction industry. A final valid sample of 288 respondents was utilized for both descriptive and inferential statistics. Measurement model and structural model assessments were conducted using Smart PLS.
Results: the study findings showed a significant positive impact of integration management on project management performance within the construction sector. Conversely, technical risk and project management risk were found to be adversely and significantly linked with project performance.
Conclusions: for achieving peak performance in the construction industry, project managers and related individuals need to mitigate the adverse impacts of the identified risk factors. Additionally, promoting integration across different functional departments and project-related activities can enhance project management performance. The study also discusses meaningful policy implications, future research directions, and limitations.

Keywords: Integration Management; Risk Factors; Project Performance; Construction Industry; UAE.

RESUMEN

Introducción: el propósito principal del presente estudio fue investigar el papel de la gestión de la integración, el riesgo técnico, el riesgo social y el riesgo de gestión de proyectos en la determinación del desempeño del sector de la construcción de los Emiratos Árabes Unidos (EAU), basándose en las teorías de agencia y de recursos y capacidades (RBV).
Método: se recopiló información mediante un cuestionario de encuesta a varios encuestados vinculados con la industria de la construcción en los EAU. Se utilizó una muestra válida final de 288 encuestados para realizar análisis tanto descriptivos como inferenciales. Las evaluaciones del modelo de medición y del modelo estructural se realizaron utilizando Smart PLS.
Resultados: los resultados del estudio mostraron un impacto positivo significativo de la gestión de la integración en el desempeño de la gestión de proyectos dentro del sector de la construcción. Por el contrario, se encontró que el riesgo técnico y el riesgo de gestión de proyectos están negativamente y significativamente

vinculados con el desempeño del proyecto.
Conclusiones: para lograr un rendimiento óptimo en la industria de la construcción, los gerentes de proyectos y las personas relacionadas deben mitigar los impactos adversos de los factores de riesgo identificados. Además, promover la integración entre los diferentes departamentos funcionales y las actividades relacionadas con el proyecto puede mejorar el desempeño de la gestión de proyectos. El estudio también discute implicaciones políticas significativas, direcciones futuras de investigación y limitaciones.

Palabras clave: Gestión de la Integración; Factores de Riesgo; Desempeño del Proyecto; Industria de la Construcción; EAU.

INTRODUCTION

The word project management (PM) emerged during the time of 1950 and evolved through some development and specific PM tools and techniques. In this regard, PM in recent years is regarded as a completely new function as managed by the business groups or sub-business units to achieve the stated objectives. Meanwhile, under different business units, the role of managers specifically for the successful implementation of PM is significant. [1] In this regard, several multidisciplinary definitions for PM have emerged over time. For example, during the mid of last decade, Project Management Institute (2004) has defined the term PM in the following words:

"Project management involves strategically utilizing skills, techniques, tools, and knowledge, to coordinate various project activities and meet set requirements. The accomplishments of project management are done by undertaking and integrating processes which include initiating, planning, executing, monitoring, and controlling, and closing. The responsible person for meeting set project objectives is referred as project manager."

However, the word PM indicates that it can be divided into five different activities entitled initiating, planning, executing, monitoring and controlling and costing. Meanwhile, PM knowledge can be drawn with the help of varied elements that includes time, human resources, cost, integration, scope, procurement, communication, stakeholder management, quality and risk management.[2]

A growing recognition is observed while claiming there exist an obvious distinction among the success of project and PM success level as both have some separate objectives to achieve.[3,4,5] This is because existing literature has shown some significant stress as narrating that project success is measured while keeping in mind the project objectives over the project's life cycle, which cannot be measured through some time, cost, and quality constraints.[3] On the other side, PM success is more specific as it is linked with a specific project based on the time, cost and various other humans as well as financial constraints.[4,5,6,7,8]

Furthermore, the word risk is also stated within the context of uncertainty concerning the occurrence of a loss and is called risk. More specifically, the risk is an uncertain situation with an occurrence rate between the probability of 0 and 1. However, for the project components like scope, cost, quality or schedule, risk factors can affect any one or all of these. This is because construction projects are complex and initiated under some dynamic and multifaceted environment, resulting in high uncertainty and risk.[9] Meanwhile, uncertain risk and events are inherent in the nature of construction work irrespective of the size as expressed by [10].

Likewise, construction projects involve various stakeholders, project contributors, and partners. For this reason, the interaction between various parties and both internal and external environment in any project entails significant collaboration.[11,12] However, risk assessment is controversial because organizational and technological complexities create remarkable risk.[11] For this reason, managers in construction projects mainly rely on subjective probabilities to rank the risk factors.[13] However, it is stated that quantifying the risk factors mainly through probabilistic approach is not sufficient, but the factors like experience, specific knowledge, judgement, and rules of thumb must be aligned in a structural way for the assessment of risk.[14] In addition, risk management is to be considered among the important requirements for construction projects, which covers identifying the hazard, assessing risk and controlling the same. Project risk would have both positive and negative effects and various uncertainties associated with it. These are entitled as performance of the construction parties, environmental conditions, availability of the resources, contractual relations, time, and cost as well.[15] Based upon above background, this study develops the below research objectives:

1. To review the effect of integration management on the performance of construction projects through a structural equation modelling approach in UAE.
2. To study the influence of social Risk, technical risk, and project management risk factors on the performance of construction projects through a structural equation modelling approach in UAE.
3. To highlight some practical policy implications and strategic guidelines for the project managers, industry experts, and other stakeholders as associated with the construction projects in UAE.

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Literature review

Integration Management and Performance

Researchers investigate the association between integration management and performance. However, this concept has gotten very little attention from the construction and project management context. One meaningful contribution is provided by [1], who claim that performance in construction projects depends upon various dimensions of project management where the role of integration management (IM) is permanent in nature.[15] Effective PM starts with the proper integration of people and processes in any construction project. Their study examined the effects of varied elements of IM on the performance of construction PM. Various components like project charter, project cost, quality, safety, client satisfaction, staff integration, process integration, and knowledge integration were considered. By undertaking the questionnaire approach, data was collected from different professionals working on different construction projects and analyzed through the structural equation modelling technique through SPSS-AMOS. The study findings indicate a significant and positive effect of integration management on the performance of construction projects. Furthermore, their study aids the literature, specifically in integration management and performance. Besides, industry experts and practitioners may benefit from the study framework and stated findings.

Another significant work in IM and performance is provided by Sicotte and Langley. They claimed that information processing theory states that there is a need for various integration mechanisms in research and development project management under the shadow of uncertainty. Based on this argument, their study investigates the link of different integrations with project performance while taking a sample of 121 research and development projects. It is observed that some positive results can be generated with the help of planning and process specification, communication, and information leadership.[16]

Technical Risk (TNR) and Performance

The word risk can be categorized into several components and subfactors where the role of technical risk is not something new in the present body of literature. Researchers have also investigated the association between technical risk and performance. For instance, De Almeida et al. expressed that the construction industry is observing some changes in approaches like risk, quality, and performance outlook. Therefore, their study examined the management trends for the technical risk of the performance-based building structure. Their findings suggest that technical risk linked with the performance-based building can be managed reasonably.[17] In this regard, the structural performance of the buildings can be improved reasonably.

Lewis expressed that risk in a project or a specific program can be examined through time, scope, and cost factors. The Monte Carlo method is a widely used process to examine the risk based on time, cost, and schedule factors. However, the word technical risk is not widely explored in the literature. His study considers the statistical versus deterministic methods independently as linked with technical performance. Additionally, Monte Carlo simulation, technical performance measurement, and system software investigate the technical risk index distribution.[18]

Chen et al. focused on the technical risk factors, environmental turbulence, and functioning for the new product development project. Data was collected from 17 public telecommunication firms working in the Taiwan region. Their study found a negative relationship between risk factors and performance outlook.[19]

Social Risk and Performance

The relationship among social risk dynamics and the performance of different firms is also investigated and tested by researchers. For instance, Joynt Maddox et al. adjusted for the social risk factors impacting the hospital industry's performance. Data were collected from different patients and observed that different factors of social risk have their linkage with the hospital's performance in terms of high admission rates.[20] Kamran et al. considered the social performance of the construction project with the help of empirical analysis.[21]

One of the most significant impacts of social risk on organizational performance is the damage to the organization's reputation. Studies have highlighted that negative publicity, social media backlash, and stakeholder criticism can significantly harm an organization's reputation and result in reduced customer loyalty and decreased market share.[22] Therefore, effective management of social risk is critical to protect an organization's reputation and maintain customer trust and loyalty. Social risk can also affect an organization's financial performance. For instance, research has shown that social risk can lead to increased costs, such as fines, legal fees, and increased insurance premiums.[23] Moreover, social risk can affect an organization's ability to attract investors, leading to decreased access to capital and decreased shareholder value.[24]

Project Management Risk and Performance

The term project management risk covers a range of risk factors having their adverse influence on the performance of construction projects. In contrast, the existing literature body related to project management risk factors has been widely investigated in both developed and developing economies. For example, Rabechini

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Junior and Monteiro de Carvalho examined the effect of project risk management on the performance factor from the context of Brazilian companies. Data was collected from 415 projects having different levels of complexities. The study findings show that the presence of project risk managers is clearly linked with project performance. Moreover, authors further suggest that paying attention to the management of different risk factors and uncertainties, along with critical success factors is significantly needed in the projects.[25]

Wallace et al. claim that to reduce the failure of software projects, there is a significant need for managers to use different tools and techniques. However, lack of project software risk assessment has its influence on the performance of the project.[26] Khameneh et al. claim management of risk is among the primary functions of project-based organizations with its key motive to develop the worth of the organization. Within the latest time period, there is a wide range of implementation of risk management practice among project-based institutions with a motive of evaluating and examining the nature of risk aspects. Moreover, project risk management and key performance indicators are closely connected to each other.[27]

Raz and Michael also show that risk management is among the significant steps in project management. Moreover, several tools and techniques have been discussed by the authors having their influence on the success of the projects. Therefore, it is inferred that project management risk and performance outlook are closely connected to each other.[28] The developed conceptual framework as follows:

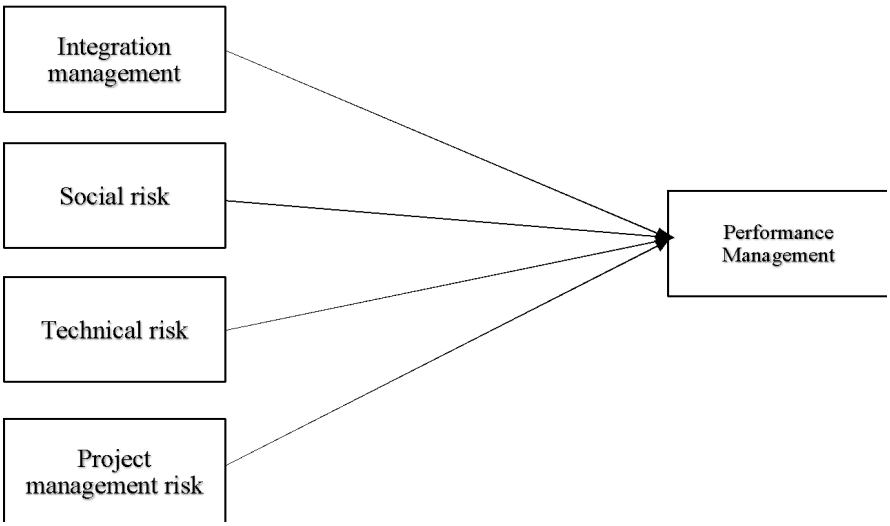

Figure 1. Research Framework

H_1: There is a significant impact of integration management on the performance of construction projects in UAE.

H0b: There is no significant impact of social risk on performance of construction projects in UAE.

H_2: There is a significant impact of social risk on the performance of construction projects in UAE.

H0c: There is no significant impact of technical risk on performance of construction projects in UAE.

H_3: There is a significant impact of technical risk on the performance of construction projects in UAE.

H0d: There is no significant impact of project management risk on performance of construction projects in UAE.

H_4: There is a significant impact of project management risk on the performance of construction projects in UAE.

H0e: There is no significant impact of knowledge management on performance of construction projects in UAE.

Theoretical Foundation

Agency Theory

The title of agency theory has got much significance in the literature related to the behaviours, duties, and obligations of the managers in the field of management and many others. It examines the problems and solutions related to the delegation of the task from the principals (business owners) to the agents where the conflict of interest might arise between the parties. The historical background of agency theory reveals that it deals with the issues of agency and works towards its solution.[29] The old review of agency theory makes it clear that it is associated with the era where business practice and relevant activities are being done by human civilization with a motive to maximize their interest.[30] However, the term agency problem has emerged when the joint-stock companies initiate evolving and it can never be neglected as almost all business institutions

suffer such issues but in different forms.[30]

With the passage of time, agency problems have evolved into different shapes based on the evidence from the provided literature. More specifically, the existence of issues related to agency has been observed in different disciplines such as accounting, finance, political science, marketing, and organizational behaviour.[35] Considering the agent-principal relationship, it is assumed that agents (managers and employees) have their prime obligation to work for the well interest of their owners/principals. However, conflict arises when the managers and employees place their personal interest ahead of the corporate interest and are unable to work for the best interest of their owners too.[36] However, if the managers and related individuals do not take care of different risk factors, ultimately, they will have an adverse impact on the performance of the organization. Hence, a conflict arises between the both. In this regard, the elements of agency theory have widely been supported under the conceptual framework of risk management.[37,38] Due to conflict of interest between the stated parties, organizations have to suffer agency costs which are regarded as an internal cost associated from agent and arises because of conflict of interest among the linked parties.

METHOD

This study considers the questionnaire survey approach as part of data collection. Table 1 provides the description related to study variables, their measurement, and literature source. Moreover, the data was collected through probability random sampling technique from different individuals as linked with the construction sector. As per the outcome from the official portal of the Government of UAE, it is found that currently, there are approximately 7,38 million people who are employed in different public and private organizations. Out of these individuals, 8 percent are currently employed in the construction industry of UAE (Government of UAE, 2021). In this regard, the total number of populations under present study will be 587000 (8 % of total workforce in UAE). Therefore, the sample under present study will be selected out of this 8 percent workforce. Based upon the suggestion of Krejcie and Morgan (1970), considering the population of 1 million and above, the sample size will be 384. A sample of 288 valid responses have been analyzed through measurement model and structural model under Smart PLS. Besides, the descriptive statistics have been conducted through SPSS-22.

DEVELOPMENT

Survey questions have been adopted from previous studies as shown of the following table 1.

Table 1. Measurement of the Variables and Source

Measurement of Integration Management (ITM)		
Description of Items	**Literature Source**	**Measurement**
Extent it is realized by the company:	(Demirkesen & Ozorhon, 2017b)	Very low=1, very high=5
Preparing project charter timely.		
Knowledge integration effectiveness.		
Effectiveness of process integration.		
Employee integration effectively.		
Integrating supply chain properly.		
Integrating change effectively.		
Project Management Risk (PMR)		
Improper organizational structure.	(A Kassem, Khoiry, & Hamzah, 2021b)	Very low=1, very high=5
Poor management.		
Issues in planning and controlling of scheduling.		
Improper communication and coordination.		
Poor management of quality control.		
Social Risk (SCR)		
Demolishing houses and land requisition through unfair settlement	(Miao, Huang, & He, 2019)	Very low=1, very high=5
Poor credibility of government.		
Quality issues related to engineering		
Law violation		
Environment pollution (water, land, Noise, etc.)		
Contrasting attitudes of locals for project		
Unavailability of information related to stakeholders' interests		
Unreasonable project design.		
Technical Risk (TNR)		

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Change in design Lack or wrong information associated with sustainable design Improper or incomplete green specification. Poor scope definition of sustainable construction Failure to attain green code or certification. Project delay due to repeated discussions with green specialist. Improper construction techniques selection in sustainable construction.	(El-Sayegh, Manjikian, Ibrahim, Abouelyousr, & Jabbour, 2021)	Very low=1, very high=5
Project Management Performance (PMP) Extent it is realized by the company:		
Completion of project in determined timeframe	(Demirkesen & Ozorhon, 2017b)	Very low=1, very high=5

RESULTS

Descriptive Analysis

Descriptive analysis helps in exploring the nature and trend of the data using both measures of central tendency and dispersion, this is shown in table 2 below.[37,38,39]

Technical Risk: The results show that for the items under the category of technical risk, the relative mean values are 3,16, 3,84, 3,83, 4,00, 6,16, 3,99, and 2,96 for TNR1 to TNR7. All the items, except for TNR7, have a mean value above 3, indicating that respondents perceive the level of technical risk to be high in construction projects. The relative standard deviation is maximum for TNR1 (1,008), while the rest of the items have a standard deviation lower than 1.

Social Risk: For social risk, eight items ranging from SCR1 to SCR8 were measured. All items have mean values above 3, with SCR3 having the highest mean score and a standard deviation of 0,8197. The highest deviations in the mean are associated with SCR7 and SCR8, with scores of 1,30 and 1,31, respectively.

Project Management Risk: For project management risk, the mean values for PMR1 to PMR5 are all above 3, indicating a high level on the Likert scale.

Project Performance: Three items (PMP1 to PMP3) were assessed, with mean values of 3,84, 4,69, and 3,84, respectively. These scores indicate that respondents believe their projects are almost always completed within schedule, budget, and required quality.

Integration Management: The mean scores for ITM1 to ITM6 are 4,71, 3,86, 4,72, 3,86, 3,82, and 4,02, respectively. These scores suggest a high level of agreement among respondents regarding various aspects of integration management.

Table 2. Descriptive Statistics

Items	Minimum	Maximum	Mean	Std. Deviation
TNR1	1,00	5,00	3,1667	1,00867
TNR2	2,00	5,00	3,8438	0,51449
TNR3	1,00	5,00	3,8368	0,49150
TNR4	2,00	5,00	4,0069	0,42560
TNR5	1,00	5,00	3,1667	0,94813
TNR6	2,00	5,00	3,9931	0,45718
TNR7	1,00	5,00	2,9688	1,08637
SCR1	2,00	5,00	3,8438	0,51449
SCR2	1,00	5,00	3,8542	0,46432
SCR3	1,00	5,00	4,6042	0,81978
SCR4	1,00	5,00	3,8958	0,49694
SCR5	1,00	5,00	3,8576	0,58781
SCR6	1,00	5,00	3,8924	0,54633
SCR7	1,00	5,00	3,4514	1,30039
SCR8	1,00	5,00	3,5382	1,31141
PMR1	1,00	5,00	3,5347	1,48119
PMR2	1,00	5,00	3,6493	1,41370
PMR3	1,00	5,00	3,6076	1,46583
PMR4	1,00	5,00	3,9132	0,48255
PMR5	1,00	5,00	3,9132	0,42084
PMP1	1,00	5,00	3,8472	0,58815
PMP2	2,00	5,00	4,6944	0,70120

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PMP3	1,00	5,00	3,8924	0,53992
ITM1	2,00	5,00	4,7118	0,68095
ITM2	2,00	5,00	3,8646	0,45616
ITM3	1,00	5,00	4,7222	0,67245
ITM4	1,00	5,00	3,8646	0,67230
ITM5	2,00	5,00	3,8222	0,5191
ITM6	1,00	5,00	4,0855	0,1587

Note: ITM; integration management, PMP; project management performance, PMR; project management risk, SCR; social risk, TNR; technical risk.

Measurement Model Assessment

Reliability and validity of the latent constructs and their relative items are essential for testing the hypothesized relationships between the variables.[40,41] Cronbach's Alpha (CBA) values are above 0,70, indicating reliable constructs. Composite reliability (CR) values are also above 0,70, and the Average Variance Extracted (AVE) for all constructs is above 0,50, confirming convergent validity as the following table 3, and the below figure.

Table 3. Construct Reliability and Validity

	Cronbach's Alpha	CR	AVE
ITM	0,861	0,906	0,707
PMP	0,893	0,934	0,825
PMR	0,925	0,951	0,865
SCR	0,904	0,926	0,677
TNR	0,789	0,860	0,606

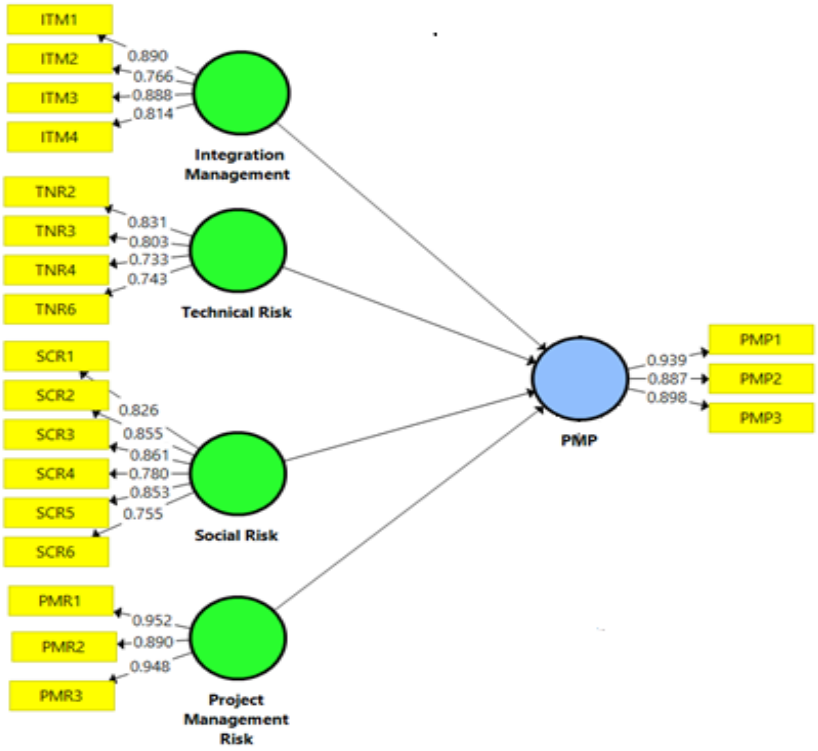

Figure 2. Measurement Model (Items' Loadings)

Discriminant Validity

The Fornell-Larcker criterion was used to assess discriminant validity. The square root of the AVE for each construct is greater than the correlations with other constructs, indicating discriminant validity as the following table.

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Table 4. Fornell-Larcker Criterion

	ITM	KNS	PMP	PMR	SCR	TNR
ITM	0,841					
PMP	0,870	0,023	0,908			
PMR	0,044	0,046	0,033	0,930		
SCR	0,848	0,048	0,834	0,011	0,823	
TNR	0,649	0,020	0,734	0,016	0,543	0,779

DISCUSSION

Impact of Integration Management on Project Management Performance

The findings indicate a significant and positive impact of integration management (ITM) on project management performance (PMP) with a coefficient of 0,163 and a t-statistic of 4,444 (p-value=0,000). This suggests that effective integration management contributes positively to project performance. This aligns with existing literature where integration management is shown to enhance project success.[15,16]

Impact of Technical Risk on Project Management Performance

Technical risk (TNR) has a significant negative impact on PMP, with a coefficient of -0,240 and a t-value of -2,088 (p-value=0,037). This indicates that higher technical risks are associated with poorer project performance. Similar findings are reported in studies by AlDhaheri et al. (2023) and Chen et al. (2017a), emphasizing the challenge of managing technical risks in construction.[17,19]

Impact of Project Management Risk on Project Management Performance

Project management risk (PMR) significantly negatively impacts project management performance (PMP), with a coefficient of -0,353 and a t-score of -3,949 (p-value=0,000). This indicates that higher PMR is associated with lower project performance, reflecting poor management and inefficiencies.[25] Haq et al.[26] similarly found that effective risk management is crucial for improving project performance in their study of Pakistani software firms.

Impact of Social Risk on Project Management Performance

Social risk (SR) has a positive but insignificant effect on PMP, with a coefficient of 0,121 and a t-value of 0,633. This suggests that while social risk may have some impact, it is not statistically significant in the UAE construction sector. This contrasts with the broader literature that often highlights the importance of social risk in project performance.[27] However, no strong empirical support for social risk in agency theory was found in the UAE context.

CONCLUSION

This study investigates the impact of technical, social, and project management risks on project management performance (PMP) in the UAE construction sector, and the role of integration management (IM) in enhancing PMP. Descriptive statistics were used to explore data trends, while measurement models were assessed for reliability and validity. The results confirm that all latent constructs achieved the threshold values for construct reliability and convergent validity. Discriminant validity was verified using the Fornell-Larcker criterion, showing that the square root of the average variance extracted (AVE) exceeds correlations with other constructs.

Key findings indicate a significant positive impact of IM on PMP, whereas technical and project management risks negatively affect performance. Based on these findings, the following policy recommendations are made:

- Integration Management: Construction industry stakeholders should continue to focus on integrating various processes, departments, and functional areas. Effective coordination by project managers among processes and stakeholders is crucial for improving project performance.
- Risk Management: Project officials should conduct comprehensive risk assessments to identify potential risks related to design, construction methods, equipment, and materials. Implementing appropriate design and construction techniques and ensuring regular quality assurance and control can mitigate technical risks. Regular testing and monitoring of electrical and mechanical systems are also recommended.

The study acknowledges its limitations, such as excluding other risk factors like financial, political, legal, environmental, technological, reputation, and safety risks. Future research should address these factors for more comprehensive policy implications.

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