

EMPIRICAL EVIDENCE ON THE IMPACT OF PROJECT MANAGEMENT CAPABILITIES ON PROJECTS SUCCESS OF CONSTRUCTION IN IRAQ: A PLS-SEM APPROACH

Abstract: The objective of this study is to determine the relationship between project management skills (PRMC) and project success (PRS) in the Iraqi construction industry. Collecting information from project managers through accessible sampling. Utilized a cross-sectional design, quantitative research methodology, and Partial Least Square (PLS)-Structural Equation Modeling (SEM). According to the PLS-SEM data, all PRMC have a significant and favorable effect on PRS. On the basis of the aforementioned findings, the research contributed to a body of literature in the context of Iraq that may be called a pioneering study with the substantial PRMS findings on PRS. Consequently, the extended model in the context of Iraq could assist future scholars in understanding the significance of the project management factor. The research could also advise construction industry business owners on the importance of PRMC to the success of their projects.

Keywords: Project management capabilities, project success, Iraq.

Introduction

Companies have frequently been unable to complete their tasks satisfactorily over the past fifty years (Vlahov, Omazic, & Tipuric, 2015). Businesses were continuously enhancing their project management techniques in order to increase their success rates. The emphasis of research and practice has switched to project success (PRS) during these economically challenging times, when organizations are increasingly implementing their strategies through projects (Görög, 2016). Numerous initiatives and organizations fail due to a lack of project management knowledge and expertise. Almost one-third of multibillion-dollar projects supported by the World Bank reportedly failed to meet their claimed objectives due to insufficiently qualified project management processes (Hussain et al., 2021). Moreover, this has been observed in Indonesia, where inefficient use of project management skills has led to inefficiencies and delays in projects (Hutabarat et al., 2021). A recent study found that poor planning and execution resulted in cost overruns ranging from 0.03% to 72.88 % for more than half of Malaysia's building projects (Shehu et al., 2014). Moreover, Kaimasu, Ao, and Taira (2017) examined a "hundred Asian Development Bank-sponsored projects" located in numerous "Asian countries (Bangladesh, India, China, and Thailand)" and found that the majority of projects were either postponed or rejected due to the absence of project management practices and a clearly defined project life cycle.

Despite the fact that it might be challenging to model programming techniques, a large number of businesses utilise them to do this (Hamadameen & Hassan, 2018; Hassan & Hamzah, 2013). To remove such obstacles

on projects, organizations use numerous techniques and invest in various activities, such as establishing a "PMO (Project Management Office)", giving project-specific training to staff, and implementing integrated "project management practices (PMP)" (Tahri & Drissi-Kaitouni, 2015). According to the study, "project management capabilities (PRMC) are the most crucial aspect in obtaining PRS. Organizations with more established PRMC are more likely to achieve their objectives (Simangunsong & Silva, 2013). In addition, Maceta and Berssaneti (2020) discovered that PRMC significantly linked with the success of a project. In addition, an organization's attention on its own PRMC can aid in the formulation of a long-term strategy for increasing its PRS (Vlahov et al., 2015). Yet, a number of studies (Loch & Sommer, 2019; Yazici, 2020) indicate that advanced project management is necessary for a project's success. Consequently, PRMC are regarded as a crucial component in boosting PRS.

In the past decade, as researchers have sought to determine the role of PRMC in boosting PRS, there have been numerous gaps in the literature. For example, earlier research has primarily focused on other developed economies (Alghail et al., 2022; Müller & Turner, 2007), while emerging economies have received little attention (Irfan, Hassan, & Hassan, 2019; Zuo et al., 2018). While Iraq is likewise a growing country, its building industry has received little attention, despite playing a vital role in Iraq's social and economic development. Hence, construction in Iraq could not be neglected. Additionally, prior research on PRMC focused mostly on project management software, project training, knowledge transfer, and process management (Irfan et al., 2019), while project

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quality management (PRQ) and project communication management have received minimal attention (Irfan et al., 2019). Earlier research suggested that these two PRMC played a significant impact in boosting PRS (Munir, Majeed, & Mahmood, 2022). Hence, these two abilities were not readily dismissed. In light of these deficiencies, the purpose of the present study is to determine how seven PRMC have affected the PRS of the Iraqi construction industry. To achieve this objective, the inquiry was divided into five sections: introduction, literature review, research methodology, data analysis and discussion, conclusion, and future directions.

**Literature Review
Project Success**

One of the most studied aspects of project management is the degree to which a project is successful (Jugdev & Moller, 2006; Müller, 2019). There are numerous reasons why the achievement of project objectives (Khan & Spang, 2011), the process of evaluating projects for cost, timing, and effectiveness (Zid, Kasim, & Soomro, 2020), the strategic articulation of initiatives in relation to corporate objectives (Joslin & Müller, 2016), and the creation of a positive reputation (Irfan et al., 2019) have received so much attention, primarily in research. Similarly, Turner (2018) believes that when projects are effectively finished, businesses' financial performance, market share, and return on investment for shareholders all improve. According to the traditional definition of project success (PRS), or project management success, a project is deemed a success if and only if the technical performance criteria (Ika & Pinto, 2023) are met; the project objectives (Zid et al., 2020) are met; and the project budget (Ika & Pinto, 2023; Zid et al., 2020) are met. Because when a project is completed within the stipulated scope, on schedule, and within the budget, it is considered successful (Munns & Bjeirmi, 1996). Literature (Irfan et al., 2021) indicates, however, that a project's success today also requires ensuring the end user is satisfied with the finished result, in addition to finishing on time and within budget. In addition to time, cost, and effectiveness, Davis and Pinto (2022) introduced "client acceptability" as a fourth consideration because customer pleasure is the ultimate goal of any project. In the literature, however, new measures are emerging, such as "measuring success after delivery," which involves evaluating the project's impact and benefits from the perspective of its stakeholders. Successful project completion is defined as the achievement of the

objectives included in the success criteria established during the project's planning phase and evaluated upon completion (Demirkol, Bayram, & Canaran, 2021; Dinh et al., 2022; Rezvani et al., 2016). Since the 1970s, the idea of PRS has evolved, and its contributing components remain controversial (Ika, Diallo, & Thuillier, 2010). The primary focus of the literature "(the iron triangle of time, cost, and quality)" was the operational component (Ika & Pinto, 2023; Müller & Jugdev, 2012). The PRS was evaluated retroactively in succeeding years with the idea that diverse factors impacted the amount of accomplishment. Kerzner (1987) established the list of important success characteristics for initiatives that did not fall into any one category. His evaluation of the higher management and surrounding environment as crucial success elements for the project. A small number of factors, some of which have been recognized, contribute to PRS (Duong & Hai Thi Thanh, 2022; Khan et al., 2021; Sudhakar, 2012). They include a well-developed communication strategy, clearly stated objectives, a collaborative effort, and thorough planning. In a parallel analysis conducted in the United Kingdom, it was determined that the project environment, the experience of the project team, the availability of resources, and the technical skill of management were all significant determinants (Alzahrani & Emsley, 2013; Fahrurrozi, 2022). However, a recent study by Maceta and Berssaneti (2020) indicated that the PMM maturity level of an organization is a critical element in determining whether a certain project should be accepted or rejected. While this analysis did not demonstrate statistically significant results, it did indicate a theoretical link between the variables. The results of this investigation may shed light on this connection.

Project Management Capabilities

Usage of the term "project" is controversial in contemporary writing (Hutabarat et al., 2021; Tahri & Drissi-Kaitouni, 2015). The primary idea of this study is critical, thus it is essential that all participants have a common grasp of it. However, Turner (2018) argues that there is no universally agreed definition of a project, even if many of the same terms are used to describe them. Considerations also include the changing nature of projects, the uniqueness of the techniques employed to accomplish them, and the fact that no other projects have ever been or ever will be identical to the ones currently being worked on (Many projects get a starting and even an end date).

In addition to achieving organizational objectives and adjusting to potential risks, this framework emphasizes the importance of achieving these objectives.

Project difficulty is proportionate to the undertaking's scope and size. The incorporation of one-of-a-kind jobs into a project's procedures is a vital aspect of any project, as can be observed by reviewing the definition of projects and the basic project structure. Figure 1 depicts a straightforward project setup, illustrating the basic procedures required to execute a project. Thus, it is essential to understand the rules that govern the integrated processes, structures, and linkages of the project.

Based on what has been said so far, it should be evident that the project is an effort whose primary objective is to contribute to the success of the parent firm. We will discuss a range of project-born concepts in the near future. The next section will examine PMM, the most contentious and commonly utilized topic in the area. Several research have offered various dimensions for determining the idea of project management capabilities (PRMC) (Christoph Albrecht & Spang, 2014; Fathurohman, Purba, & Trimarjoko, 2021; Kwak & Ibbs, 2002). PRMC served as the foundation for the creation of these dimensions. Irfan et al. (2019) identify eight distinct facets of project management that lead to effective outcomes: "I) performance and results management; II. project responsibilities and duties; III) human resources; IV) project stakeholders; V. project resources; VI) project change management; VII) risk management; and VIII) organizational approaches as a whole." In another context, Fabbro and Tonchia (2021) contrasted this with their own results that PRMC comprises project management software, process management, retraining in project management-related themes, information interchange, managerial knowledge, and quality enhancement. According to them, PRMC appears to be a structure that is formed when variables converge. Although much prior research on PRMC has been on "process management, project training, knowledge transfer, the function of project management, and project management software" (Irfan et al., 2019), little emphasis has been paid to PRQ and project communication management (Febrianto, Ratnawati, & Riyadi, 2022; Irfan et al., 2019). Earlier research suggested that these two PRMC played a significant impact in boosting PRS (Munir et al., 2022). Thus, these two attributes could not be neglected.

Empirical relationship between project management capabilities and project success

Those with well-established infrastructure and procedures can achieve organizational success. Several instances from published works support this argument. In addition, research conducted by Young, Young, and Romero Zapata (2014) demonstrates that more advanced stages of development result in improved outcomes for both projects and organizations. Additionally, it has been discovered that higher levels of PMM result in cost savings throughout project delivery, better productivity, and a 400% return on investment (Unterkaalmssteiner et al., 2010). In addition, the PRMC framework permits the evaluation of an organization's expertise in the field of project management. According to Bento, Gomes, and Romão (2019), operational efficiency, customer intimacy, and reputation enhancement are among the potential results of organizational maturity in projects. Similarly, a rising corpus of research lends credence to the notion that an advanced company will have greater market success (Hassan et al., 2012). Moreover, Iannacci et al. (2019) suggested that PRMC are a popular strategy for boosting project success (PRS). Moreover, it has been discovered (Maier, Moultrie, & Clarkson, 2011) that more mature organizations are 25% more likely to have successful initiatives than less mature ones. In a separate study, de Souza and Gomes (2015) found that the idea of PRMC was substantially connected with the chance of a project's success or failure. A more developed approach to project management appears to be associated with a higher probability of PRS (Forestier-Peyrat, 2021; Karim et al., 2022). The most prevalent argument for strengthening an organization's PRMC is the notion that doing so will raise the probability that its projects will be successfully completed.

Of the different PRMC, continuous improvement is one in which any project-focused firm must be dedicated to a culture of continuous development. According to the research conducted by Crawford (2021), both project teams and organizations gain a great deal from periodically upgrading and enhancing their project management skills. In addition, constant improvement allows firms to identify ways to increase production and reduce waste. In addition, knowledge management transfer, which is defined as the portion of an organization that learns from another's experience, is known as knowledge management and transfer (Gnangnon, 2021; Saleh et al., 2021). Knowledge transfer in the context of project management is

more crucial than ever. In addition, the objective of knowledge management transfer on projects is not simply to share information, but to construct and disseminate a coherent body of information that can be used to successfully complete the projects. According to published data, however, initiatives are more likely to be successful if their methods are clearly outlined. Standardizing project processes, identifying critical processes, and regulating project processes with performance indicators appear to be examples of process management aspects (Albrecht & Spang, 2016; Göral, 2021; Guntoro & Widiyanti, 2021).

Other project management capability that project management awareness which discussing within the organization’s “role and awareness of project management” (Albrecht & Spang, 2016) is used to indicate whether the organization recognizes the importance of project management and regards it as a core competency. A well-informed population also requires the formation of a project management culture and the formalization of project management. If organizations are serious about achieving their objectives, they must establish and maintain a productive project management environment. Training in project management that focuses on enhancing employees’ skills and competencies is essential for any firm. For the past two decades, training in project management has been widely viewed as important for project-based businesses (Fabbro & Tonchia, 2021). Moreover, it is suggested (Kealey et al., 2005) that project management education can aid in the completion of projects in a variety of settings.

In addition to other project management software, PRS is essential for growth because organizations are constantly seeking cost-effective and time-efficient ways to simplify their operations. Thus, the role of IT and the usage of software in projects have contributed to greater productivity and quality (Yang, Chen, & Wang, 2012). There is widespread agreement that employing specialized project management software to get things done is a good idea. In addition, PRQ is a key metric for increasing PRS (Munir et al., 2022). Moreover, project communication management is an essential determinant of PRS growth (Munir et al., 2022). This study provides a research hypothesis based on a comprehensive literature review and the aforementioned literature synthesis. Literature asserts that “process management, continuous improvement, training, knowledge management transfer, project management awareness, software

use, PRQ, and project communication management are all prerequisites for project success.” The following research framework and hypothesis are therefore formulated.

- H1: process management has significant effect on project success.
- H2: Continuous improvement has significant effect on project success.
- H3: Knowledge management transfer has significant effect on project success.
- H4: project management awareness has significant effect on project success.
- H5: process management trainings has significant effect on project success.
- H6: project quality management has significant effect on project success.
- H7: project communication management has significant effect on project success.

The above proposed hypothesis relationships are predicted in the following framework Figure.1 below.

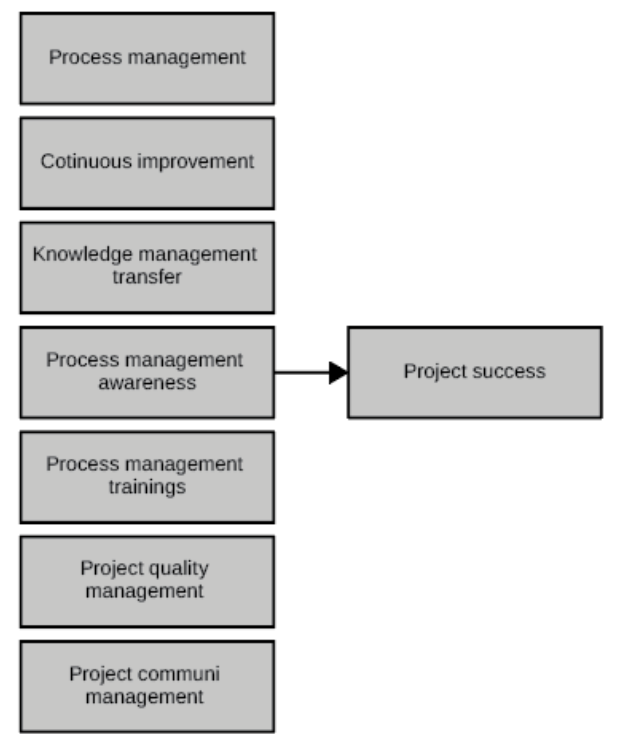


Figure.1: Conceptual Framework

Research Methodology

A survey questionnaire with predefined responses designed to elicit respondents’ informed opinions on the issue. Five factors are used to evaluate the project’s success (PRS). The independent variable of project management ability was measured across seven categories (PRMC). Continues improvement

is measured by four items, knowledge management transfer is measured by four items, process management is measured by four items, project management awareness is measured by three items, project management software is measured by four items, and project management trainings are measured by five items. These elements have been drawn from a study of Irfan et al. (2019); Sidenko (2006). The research instrument was graded on a five-point liker scale ranging from 1 (strongly disagree) to 5 (strongly agree). Employing a cross-sectional methodology, questionnaires were distributed to managers in the Iraqi construction industry to collect data. The data was collected over the course of four months (March 2022–June 2022). We emailed a link to an online poll to 1,500 construction companies in Iraq. A reminder was sent after the first round of data collection was completed. Just 400 of the completed surveys were usable, though. The number of participants in this study exceeded what the program G Power 3.0 had predicted.

Data Analysis and Findings

This study’s questionnaire data were examined using Partial Least Square (PLS)-structured equation modeling (SEM). The PLS-SEM family of contemporary statistical approaches can be used to investigate manifest or latent linked variables. PLS-SEM is a multivariate analytic technique that combines two more prevalent techniques: factor analysis and multiple regressions. Because PLS-SEM permits the analysis of nonnormal data and the incorporation of unobservable variables measured indirectly via indicator variables. In addition, improving explained variance in dependent variables is an important result of this method, which emphasizes developing predictions about a set of hypothesized relationships.

Reliability and validity

The consistency of an instrument’s results is considered proof of its reliability; hence, this is the first factor to consider when evaluating the quality of the measures (Hair & Alamer, 2022). Simply expressed, questionnaire reliability represents the consistency with which a concept is measured. Cronbach’s alpha is the most frequently used reliability test for multipoint scaled items (Hair et al., 2017). The coefficient indicates a convergence among the items. A gauge with higher coefficients is more precise and trustworthy. It is generally accepted that a scale’s dependability is strong if its alpha coefficient falls between 0.80 and 0.95. Although scores between 0.6 and 0.7

indicate moderate dependability, Cronbach’s alpha levels exceeding 0.7 and 0.8 indicate increased dependability. Cronbach’s alpha values below 0.6 imply unreliable scale construction. Lower order reflective constructions’ Cronbach’s Alpha scores indicate satisfactory reliability (Table 1). With a minimum Cronbach’s Alpha of 0.784 and a maximum of 0.893, the results of the measurements are consistent and reliable. Cronbach’s Alpha ensures that all indications have the same level of reliability. Nevertheless, PLS-SEM emphasizes the consistency of each indication. Therefore, it is advised that the CR (composite reliability) of the instrument be computed (Basco et al., 2022). According to the criteria, if the CR value is greater than 0.95, it indicates that each item reflects the same occurrences and is therefore inappropriate. Numbers above 0.7 are deemed acceptable. Yet, as indicated in Table 1, all of the CR values in this investigation fall within the authorized range.

After establishing the dependability of the questionnaire, it is suggested to analyze the validity of the instrument’s indications (Ahmad, Bin Mohammad, & Nordin, 2019). In addition, Sekaran and Bougie (2016) suggested that a research instrument’s measurement of constructs should be both reliable and valid. Validity in this context refers to the precision with which the indicators measure the idea. Several validity criteria may be used to assess the precision of a questionnaire. As mentioned, the validity of measures can be determined using convergent and discriminant validity testing (Hair et al., 2017). A good correlation between the indicator and other measures of the same construct is a measure of convergent validity. Indicators of a construct should therefore demonstrate strong convergence or share a substantial amount of variance. The outer/factor loadings and the extracted average variance (AVE) can also be utilized to assess convergent validity (Ahmad et al., 2020; Hair et al., 2017). Noting that eliminating indications with outside loadings greater than 0.5 could compromise the content validity is essential. You may eliminate them, but only if doing so will compromise the composite’s dependability or social cohesion (i.e. average variance extracted). Table 1 demonstrates that factor loadings for the majority of constructs exceed the 0.70 threshold value. All of this suggests that the constructs’ lower-order markers had a great deal of similarities in this experiment. The anticipated values in Table.1 indicate that all constructs have values larger than 0.5, which is consistent with the recommended value for the AVE, which is also greater than 0.5. All of the aforementioned values are anticipated in Table.1 below.

Table.1: Reliability and convergent validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted
CONI	0.891	0.898	0.914	0.576
KMT	0.884	0.892	0.928	0.812
PRM	0.923	0.905	0.917	0.503
PRMA	0.817	0.814	0.873	0.533
PRQ	0.814	0.823	0.873	0.585
PC	0.763	0.791	0.842	0.521
PRMT	0.856	0.868	0.883	0.756
PRS	0.755	0.771	0.837	0.651

Note: CONI-continuous improvement, KMT-knowledge management transfer, PRM-process management, PRMS-process management awareness, PRQ- project quality management, PC-project communication management, PRMT-project management trainings, PRS-project success

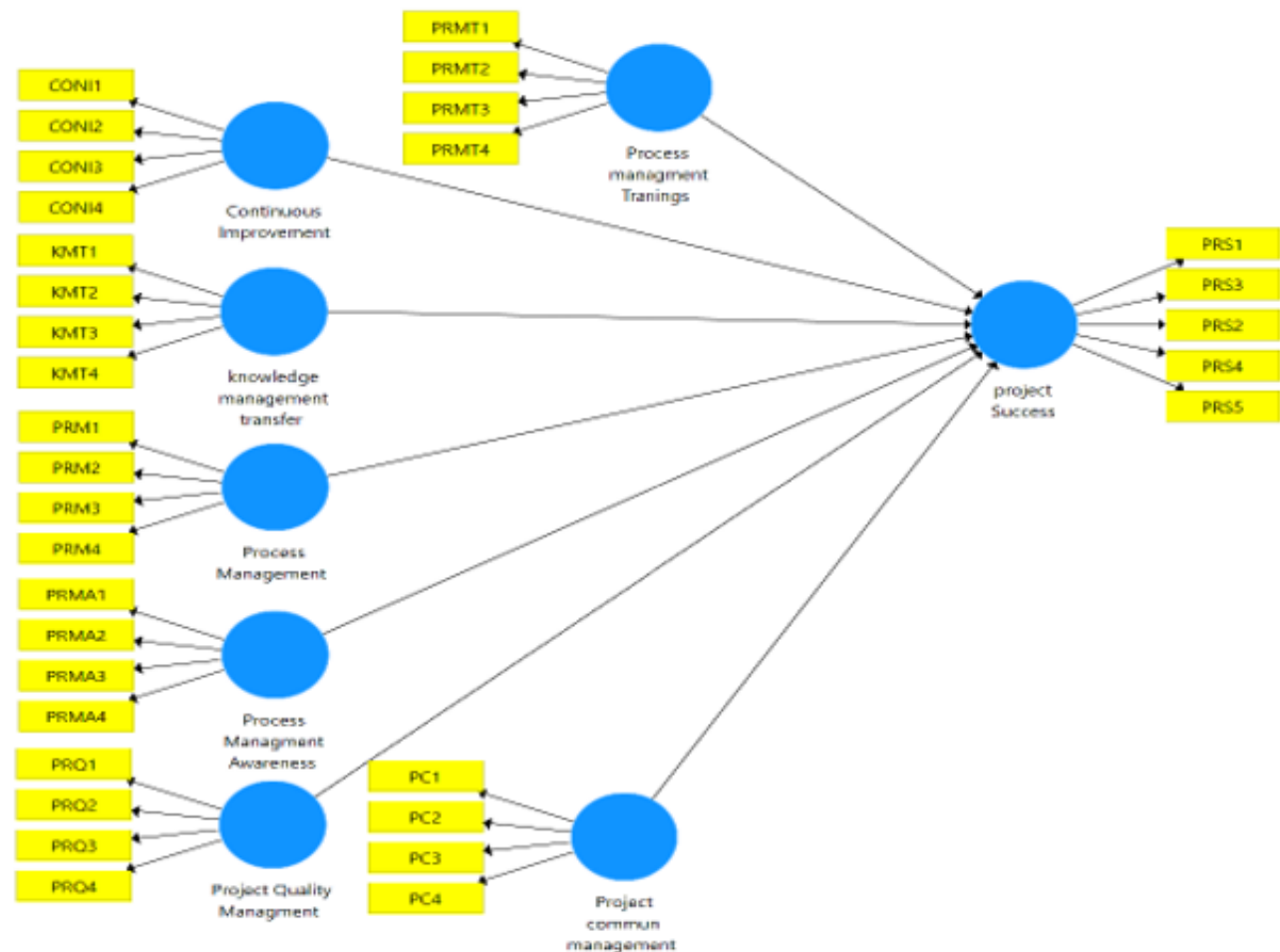


Figure.2: PLS-SEM model

Once convergent validity has been proven for constructs, it is advised (Basco et al., 2022; Hair et al., 2017) that they be subjected to the test for discriminant validity. Discriminant validity refers to the extent to which one of the constructs differs from the other constructs in terms of empirical criteria. Thus, if the study fits the criteria for discriminant validity, the compared constructs are different and distinct from one another. Fornell & Larcker's criterion is one of the

most widely used criteria for assessing discriminant validity (Hair & Alamer, 2022). It is assumed that the comparison between the correlations of the constructs and the square root of the AVE is valid. The construct correlations must be considerably less than the square root of AVE (Fornell & Larcker, 1981). This criterion is based on the premise that a construct will have a higher correlation with its indicators than any other construct. The results of using the Fornell

and Larcker criterion are shown in Table 2. According to the data, there are more correlations between constructions than can be computed by taking the square root of the AVE. The results suggest that the discriminant validity of the inquiry was not impacted. The following table predicts the validity of discrimination.

Table.2: Discriminant Validity

	CONI	KMT	PRM	PRMA	PRQ	PC	PRMT	PRS
CONI	0.759							
KMT	0.522	0.901						
PRM	0.945	0.772	0.709					
PRMA	0.246	0.15	0.24	0.73				
PRQ	0.416	0.457	0.486	0.388	0.765			
PC	0.299	0.339	0.353	0.254	0.599	0.722		
PRMT	0.339	0.346	0.385	0.336	0.629	0.811	0.597	
PRS	0.384	0.341	0.417	0.312	0.494	0.531	0.84	0.714

Note: CONI-continuous improvement, KMT-knowledge management transfer, PRM-process management, PRMS-process management awareness, PRQ-project quality management, PRMT-project management trainings, PRS-project success.

Table.3: Hypothesis Results

	Original Sample	Sample Mean	Standard Deviation	T Statistics	P Values	Decision
CONI->PRS	0.772	0.771	0.027	28.19	0.000	P<0.05
KMT->PRS	0.268	0.274	0.046	5.777	0.000	P<0.05
PRM->PRS	0.094	-0.091	0.046	2.048	0.041	P<0.05
PRMA->PRS	0.146	0.146	0.043	3.398	0.001	P<0.05
PRQ->PRS	0.493	0.489	0.047	10.391	0.000	P<0.05
PC->PRS	0.761	0.765	0.028	27.26	0.000	P<0.05
PRMT->PRS	0.157	0.151	0.039	3.992	0.000	P<0.05

Note: CONI-continuous improvement, KMT-knowledge management transfer, PRM-process management, PRMS-process management awareness, PRQ- project quality management, PC-project communication management, PRMT-project management trainings, PRS-project success

Discussion

This study expands upon prior research that explored the relationship between mature project management and effective project outcomes. While much has been written about both notions, there have been few actual investigations evaluating their links. Unlike the previous two studies in the series, this one examined the link empirically (Christoph Albrecht & Spang, 2014; Guangshe et al., 2008). The major objective of the study was to determine how different features of PMM influence project outcomes in Iraq. This work contributes to the existing body of knowledge by recommending and testing a measuring model with six components (Process management, project management awareness, continuous improvement, Training, Knowledge management transfer, project management quality, and project communication

Hypothesis Development

After evaluating the measurement model, the next stage is to evaluate the study's hypothesis. The results of the regression analysis reveal that process management has a favorable and substantial effect on PRS. The constant improvement has a big and favorable impact on PRS. The project management awareness has a large and favorable effect on PRS. Moreover, project management training has a good and substantial effect on PRS. Moreover, project management software has a large and favorable impact on PRS. PRS is also considerably and positively affected by knowledge transmission. PRQ has a large and favorable effect on PRS. The management of project communication has good and substantial effects on PRS as well. The subsequent Table.4 presents forecasts for each of these outcomes.

management) and their effect on PRS. This study offered empirical evidence that a more mature approach to project management enhances the probability that a project would be successful. The primary findings of this study indicated that project management factors had a positive and large effect on PRS. This finding demonstrates that all project management dimensions played a substantial impact in PRS. The study's findings are consistent with previous research on the topic (Irfan et al., 2019; Munir et al., 2022). Furthermore, this study's results offer empirical weight to the theoretical arguments presented by other researchers (Guangshe et al., 2008; Karim et al., 2022).

Conclusion and Future Directions

To ensure national development, the success of the project is essential for all project partners, including the local community. The project's success or failure is

contingent on a variety of variables, including “Process management, project management awareness, continuous improvement, Training, Knowledge management transfer, project management quality, and project communication management.” Thus, the fundamental objective of this article is to investigate the relationships between PMM dimensions and effective project completion. It has been discovered that PMM dimensions have positive and significant effects on PRS of organizations. This study also suggests that project management dimensions contributed significantly to the success of the initiatives.

Based on the aforementioned findings, the research contributed to a body of literature in the context of Iraq that may be regarded as a pioneering study with major findings of project management dimensions on PRS. Yet, there is still no global consensus on a single PMM model that is generally adopted (Ika, 2009). For this reason, it is debatable which model is superior for determining an organization's level of project management skill. Consequently, the extended model in the context of Iraq could assist future scholars in understanding the significance of the project management factor. In addition, this research could assist other project managers in understanding the significance of this study's project management model for enhancing their PRS and getting a competitive advantage for their projects. In addition, the findings of this study contribute to our understanding of how project-based businesses might improve their chances of completing their project management journey and attaining overall success by employing PMM. Also, it is suggested that firms utilize maturity models to increase efficiency. In the context of Iraq, we conclude that the adoption of PMMMs leads to an increase in PRS.

Together with noteworthy findings, the research has a number of restrictions that could help expand the research's scope in the future by introducing new research fields. Several moderating and mediating variables, such as the cost control system, may influence the association between the project management approach and the PRS. In order to boost the predictive value of future research, moderating or mediating effects could be incorporated in future studies. In addition, the research done on Iraq, a developing nation with a different work environment than other developed economies, limited the scope of the research; therefore, future research might be undertaken on other developed

nations to expand the scope of the research.

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