THE INTERRELATIONSHIP BETWEEN PROJECT COST CONTROL SYSTEM AND ENABLERS: A STUDY ON IRAQ CONSTRUCTION INDUSTRY

Shahad Ibrahem Ahmed[1], Ahmed Hasoon[2], Husam Abdulkadhim Raheema[3], Noor Qusai[4], Barzan Munshed Salih[5], Mostafa Hsan Elwan[6], Nidhal Raheem Mardood[7], Mohammed Yousif Oudah Al-Muttar[8], Mohammed Hakki[9]

[1]Department of Nursing, Al-Zahrawi University College, Karbala, Iraq
Email: Shahadalbayati1993@gmail.com
[2]Engineering technical college/Al-Farahidi University, Baghdad, Iraq
[3]Islamic university in Najaf, Iraq
[4]Department of management/Al-Nisour University College/Iraq
[5]Accounting and Economics college/Al-Kitab University/Iraq
[6]Department of pharmacy/Ashur University College/Baghdad/Iraq
[7]Accounting and Economics department/Al-Esraa University College, Baghdad, Iraq
[8]Scientific Research Center, Al-Ayen University, Thi-Qar, Iraq
Email: mohd.yousif@alayen.edu.iq
[9]Damascus University, Damascus, Syrian Arab Republic

Abstract: With the development of a robust project cost control system during the construction phase, the study aimed to improve cost management in building projects. Contemporary research also examines the impact of facilitators on the system to provide suitable reform strategies. Information was collected from 325 project managers using a convenient sampling technique for this goal. Using SPSS and AMOS, descriptive and inferential statistics were used to examine the data. Structural Equation Modeling (SEM) results reveal that pre-control has a considerable and favorable effect on the in-control and post-control systems. Moreover, in-control has a beneficial and considerable impact on the post-control system. Also, the enablers positively and significantly impact the pre-control system, the control system itself, and the post-control system. The significance of these findings suggests that this research could aid other scholars and regulatory agencies in understanding the significance of enablers for cost control system improvement. The extended model, particularly in the context of Iraq, is seen as a pioneering study that could assist future academics in advancing their work.

Keywords: Cost control system, enablers, Iraq, construction industry.

Background of the Study

The building industry makes a substantial contribution to the economy in development. The construction business is one of the world's largest industries in terms of social and economic contributions (Darlow, Rotimi, & Shahzad, 2022). Globally, the construction industry has faced grave concerns, including enormous losses, rising construction costs, and a high project failure rate (Oliver, 2018; Sippel, 2021). The Department of Commerce, Economic Development, and Employment states that as of 2022, the maximum number of construction industry enterprises have filed for bankruptcy. The Federal Reserve warned about further corporate collapse (Visweswaran et al., 2022). One western builder with 16 large construction projects lost NZD 800 million in 2019. (Noble et al., 2019). Inadequate cost management systems are one of the primary causes of the failure of a construction project, along with cost overruns (Sridarran, Keraminiyage, & Herszon, 2017). According to previous studies, the probability of a budget overrun occurring worldwide is approximately 86%; these negative costs are the reason for project failure. Nine out of ten ventures fail due to adverse costs (Flyvbjerg, 2021). Following the global perspective, the Iraqi construction industry has cost control system issues. Hence, efficient cost control strategies tend to improve the overall performance of construction projects in Iraq and lower the likelihood of project failure. A project control system's primary objective is to measure a project's performance by establishing performance criteria, monitoring and comparing those standards to actual performance, and then making remedial arrangements (Olawale & Sun, 2013). Project control also provides historical data that aids in future decision-making, estimation, and project scheduling (Del Pico, 2013). Current research has focused exclusively on the project control sector, including models for project control controllers, techniques of project control mechanisms, the significance and efficacy of project control, as well as project control barrier elements (Durdyev, 2021; Jawad, Ledwith, & Khan, 2022; Olawale & Sun, 2015). According to the study's findings, project control systems (PCS) are currently in use, and these characteristics are the most influential on the system. In the past, researchers constructed various cost control systems (CCS), identified novel cost control methods and techniques, and established successful cost control process (CCP) success factors (Bryde, Unterhitzenberger, & Joby, 2018; Jawad & Ledwith, 2022; Jayaraman, 2016). Thus, a limited number of research identifies the CCS performance and the internal relationship between the various parts of PCS to improve the system.

In the interim, the conceptual framework "maturity model" was predominantly used to analyze software engineering performance for certain tasks and services so that organizations might modify their activities to achieve higher performance (Project Management Institute, 2013). Maturity models are intended to guide firms in evaluating themselves by comparing their quality standards and best practices to those of other firms (Albliwi, Antony, & Arshed, 2014). In

addition, maturity evaluations can assist businesses in identifying inefficiencies that may impede them from achieving their objectives (Jayanetti, Perera, & Waidyasekara, 2022). The core principle of the conceptual maturity framework is that numerous organizational aspects, such as people, functional areas, processes, and others, can mature and stabilize through a development process (Vásquez et al., 2021). Within the construction industry, numerous maturity models have been developed and implemented over time, with an emphasis on the evaluation of certain processes (including risk management, facility management, and project execution) and the actions that can be taken to improve them (such as strategic collaboration), resulting in increased maturity or optimization of the existing organization (Hoseini, Hertogh, & Bosch-Rekveldt, 2021; Rana et al., 2020). Thus, current research establishes a dependable "project cost control system (PCCS)" in which enabling are linked. In addition, previous research had a strong bias towards established economies and paid less attention to new economies, notably Iraqi nations and underdeveloped countries. Consequently, research was done to improve cost management in building projects by developing a strong project cost control system during the construction phase. To provide relevant reform measures for the Iraqi construction industry, this article examines how system facilitators influence the system.

The study resulted in a substantial body of writing that has now been incorporated into the literature since the overall conclusions of this research provide a comprehensive PCCS to improve the cost-effectiveness of construction projects. In addition, this research contributes to the literature on construction project management by providing empirical validation of the functions of enablers in enhancing the "project cost control system (PCCS)" maturity level. These results have real-world consequences since they give a framework for evaluating existing procedures by decision-makers. For example, PCCS can be used to improve its users' project cost control practices. Moreover, the study could aid regulatory agencies and other policymakers in understanding the significance of enablers for boosting PCCS, particularly in Iraq. Introduction, literature review, study methodology, data evaluation and discussion, study limitations, and future directions constituted the organization of the study.

Literature Review and Hypothesis Development

A project cost control system (PCCS) might be defined as the application process for tracing the performance of project cost against the budget of the project cost to determine the actual variances in costs to determine whether the project's objectives have been met or not (Boyd et al., 2010; Del Pico, 2013). This aids organizations in determining the state of a project and provides initial warnings concerning cost overruns; these alerts prompt managers and decision-makers to take appropriate corrective action (Adjei, Aigbavboa, & Thwala, 2018). Del Pico (2013) outlined four critical aspects of cost management for a project: establishing a cost budget baseline; evaluating actual costs; predicting changes; and, last, implementing corrective steps to remove and minimize the differences.

This technique begins with assessing associated costs to produce a budget for the project-scheduled work. Typically, the project cost evaluation is established by obtaining bids from suppliers and subcontractors for each work package and adjusting them (Aşkın, 2022; Olawale & Sun, 2015). The estimation must be fully comprehended by the project control board, its underlying assumptions and justifications, and the direct and subcontractor activities (Komurlu & Er, 2018). Cost Breakdown Structure (CBS) would then be built utilizing the financial model and Structure of Work Breakdown parameters to track cost and progress performance. The tasks or groupings of work in WBS at the site may not necessarily match the actual expenses inside the CBS, prompting the need to split expenditures when a joint task is performed by many teams (Aziz & Haryani, 2022; De Marco et al., 2017; Kyurova & Athanasios, 2018). By developing comprehensive project control models, other academics exceeded the simple methods of PCCS. Olawale and Sun (2015) proposed a strategy cycle-based technique to characterize PCCS's procedures and activities and to determine how tasks should be executed. Their model consists of best practice recommendations for planning, monitoring, reporting, and analyzing cost and schedule management operations.

Researchers in this field are also interested in applying project CCS methodologies and aspects based on well-established project management systems. Many strategies for project cost control have been found in the literature, including earned value analysis (EVA), unit pricing, standard costing, total profit or loss, and reconciling labor/plant/actual material cost against the anticipated cost (DE CARVALHO, MELBARDIS, SANTANA, & SOARES). EVA is the most extensively used and effective strategy for reducing the cost of a project (Basheer et al., 2022; Cho et al., 2020; Zahoor et al., 2022). EVA is a technique used in project management for controlling and monitoring purposes that extends beyond the simple evaluation of cost and schedule summaries. Using EVA, a project manager can measure the work accomplished (Scott, 2021). The typical EVA comprises three metrics: "earned value or anticipated cost of work completed, the actual cost of tasks performed, and planned value, or expected cost of the project scheduled (EV)." The "cost variance (CV 5 EV-AC)" and "cost performance index (CPI 5 EV/AC)" are assessed to notify project management of any deviations from the plan.

The calculated "cost overruns (CV 5 EV-AC)" and "standard cost performance (CPI 5 EV/AC)" alert the project management to any deviations from the design. As information and communication technologies advanced, many models have been created to enhance the EVA structure's application (ICT). Fulford and Standing (2014) developed an innovative yet simple-to-understand ICT-based cost control system based on EVA to enhance communication between Participants from the offices and project sites of "small and medium-sized contractors." Pajares and Lopez-Paredes (2011) suggested updating the "Cost Control Index" and including the monitoring of cost control performance in the EVA concept. Several empirical studies have proved the effectiveness of EVA in cost tracking and management (Kamal et al., 2022). Building information modeling (BIM) is a modern breakthrough increasingly used to improve PCC for construction projects (Abdel-Hamid & Abdelhaleem, 2021; Benson & Fortune, 2022; Elghaish et al., 2019; Li, Wang, & Alashwal, 2021a), for instance, presented a ground-breaking model that combines "earned value management (EVM)" and BIM concepts to create "EVM-Grid" that generates automatically statistical data for "Cost Performance Fraction and Schedule Performance Percentage." This method allows decision-makers to monitor and limit smartphone and computer-related expenditures to operate more quickly and with greater insight. Finally, the analysis of PCCS enablers is the essential research topic for this current discussion. The project team discovered that several crucial factors, including market conditions, government regulations, the chosen method of acquisition, a lack of innovation, and technical progress, could not be "managed" in a controlled manner (Bhatti et al., 2022; Kirun & Varghese, 2015). To identify changes under the project team's control, only factors within the project management and leadership limits were chosen as the core focus of this research.

According to a prior study, the project control team was not the only factor determining the PCCS's effectiveness; additional requirements included tactics for project risk management, historical data management, and design quality (De Carvalho et al., 2016; Kirun & Varghese, 2015; Orgut et al., 2020). Further studies demonstrated that the involvement of senior leadership, such as staff training, adequate finances and resources, and the incorporation of length and cost considerations throughout project management, may influence the achievement of project control (Bridi & Al Hosani, 2022; Fortune et al., 2011). According to Jung and Woo (2004) and Ling (2004), the performance of suppliers and subcontractors is vital in determining how well a project is managed. Regarding internal factors, research from prior studies revealed that the overall success of the project control process could be ensured by the abilities of the project working committee and the detailed classification of jobs and responsibilities (Jawad, Ledwith, & Panahifar, 2018; Olawale, 2020). Further research found that systematic and detailed financial analysis reports are necessary for project control, resulting in the absence of systematic corrective measures (Cherian, Munuswamy, & Jasim, 2021; Olawale & Sun, 2015). It supported the findings of Jawad et al. (2018), who discovered that a lack of a uniform approach for collecting and analyzing data and a weak reporting system are the primary hurdles to the ability of construction projects to control costs and schedules. So, these concerns must be addressed. Because it is crucial to the success of numerous project components, clear communication between project partners can contribute to additional enhancements (Bouchlaghem, 2012; Culver, 2022).

Additionally, superior communication would likely enhance the confidence of project participants, thereby increasing the process' transparency (Olawale, 2020). Even though past Models are the result of research that considers various programs engaged in multiple procedures and sub-processes and has uncovered a vast array of system factors, the literature review results indicate that several aspects of PCCS require further investigation (De La Hoz, 2021; Willems & Vanhoucke, 2015). The efficiency of PCCS has not been investigated as of yet. To improve the efficiency of such a system, the relationships between PCCS processes and sub-processes must be precisely specified. Empirically, it has been determined that the

pre-control system and the post-control system are interconnected, and additional research indicates that enablers have an impact on the project control system (Charoenngam & Sriprasert, 2001; Hwang et al., 2020; Le & Sutrisna, 2023; Taylor, 2008). So, based on prior debate, the following hypotheses are presented:

H1: Pre control system has a significant and positive impact on In control system of the construction industry in Iraq.
H2: Pre control system has a significant and positive impact on the post-control system of the construction industry in Iraq.
H3: In control system has a significant and positive impact on the In control system of Iraq's construction industry.
H4: Enablers have a significant and positive effect on the pre-control system of the construction industry in Iraq.
H5: Enablers have a significant and positive significant effect on the control system of Iraq's construction industry.
H6: Enablers have a significant and positive significant effect on the post-control system of the construction industry in Iraq.

Research Design and Sampling Technique

With the development of a robust project cost management system during the construction phase, this study sought to enhance the ability of building projects to control costs. This research also examines the impact of facilitators on the system to recommend suitable reform solutions. Researchers utilized the quantitative research methodology and cross-sectional research design for this objective. The nature of the research was explanatory. For data collection, the self-administered survey questionnaire was employed. The data was gathered from project managers using a technique of convenient sampling. The research instrument was dispersed to 500 project managers, and 325 returned it. The questionnaire utilized a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). In the questionnaire, the in-control system was measured on five questions, pre-control on five, post-control on five, and enablers on eleven questions. These items were taken from the research (Le & Sutrisna, 2023).

Data analysis and Findings

The data was analyzed from both descriptive and inferential perspectives. Descriptive analysis was conducted using SPSS, and inferential analysis was conducted using Amos software.

Descriptive Statistics

The descriptive analysis was performed with SPSS. In descriptive statistics, the mean value for control is 3.45, and the standard deviation is 0.95. The mean value before control is 3.85, and the standard deviation is 0.84. The mean value after control is 3.90, and the standard deviation is 0.93. These scores show that respondents rank the constructs used to examine the interdependence of variables at a moderate level. Moreover, the values of Skewness and Kurtosis vary from 2 to -2, indicating that the data is regularly distributed. The values mentioned above are projected in Table 1 below.

Table.1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
INCS	325	1	5	4.14	.952	-1.312	.125	1.971	.250
PRECS	325	1	5	4.15	.920	-1.200	.125	1.625	.250
PSTCS	325	1	5	4.15	.910	-1.175	.125	1.636	.250
ENAB	325	1	5	4.18	.893	-1.230	.125	1.942	.250

Source: Author's estimations

Inferential Statistics

The study included AMOS software and structural equation modeling (SEM). Latent variables must be directly measured; several visible variables can reflect latent variables (Byrne, 2012). CB-SEM and PLS-SEM are the two SEM techniques used to study structural relationships (Dash & Paul, 2021). Often, the purpose of the research drives the method selection. CB-SEM is often used in theory testing and theory confirmation research.

On the other hand, PLS-SEM is deemed appropriate for research aimed at theory prediction and development (Hair & Alamer, 2022). Due to the requirement to test the current theory, Li et al. (2021b) utilized CB-SEM to study the significant relationships between project complexity and cost. Hence, CB-SEM using AMOS software was utilized for this study.

The model evaluation focuses initially on measurement models to evaluate the validity and reliability of construct measures. The examination includes "Composite Reliability (CR)" to assess "internal consistency, individual indicator reliability, and Average Variance Extracted (AVE)" to validate convergent validity. Table 2 presents the validity and reliability results and the factor loadings for the indications. All factor loadings appear to be more than 0.60, as evidenced by the fact that all indicators must be eliminated from the recommended observed variables (Gefen & Straub, 2005). Each CR exceeded the recommended minimum value of 0.700. (Wasko & Faraj, 2005). Generally, convergence validity is deemed satisfactory when all constructs have an AVE of at least 0.50 (Hair et al., 2017). Cronbach's alpha scores and composite reliability values exceed the 0.70 threshold, indicating that all structures possess high internal consistency dependability (Hair et al., 2017). The values mentioned above are projected in the Table below. 2

Table.2: Convergent Validity

Constructs and Items	Loadings	AVE	CR	Alpha
In control System		0.773	0.892	0.873
INCS1	0.783			
INCS2	0.893			
INCS3	0.912			
INCS4	0.893			
INCS5	0.783			
Pre Control System		0.784	0.894	0.846
PRECS1	0.893			
PRECS2	0.731			
PRECS3	0.854			
PRECS4	0.823			
PRECS5	0.785			
Post Control System		0.706	0.906	0.861
PSTCS1	0.850			
PSTCS2	0.789			
PSTCS3	0.888			
PSTCS4	0.832			
PSTCS5	0.934			
Enablers		0.776	0.893	0.840
ENA1	0.758			
ENA2	0.825			
ENA3	0.865			
ENA4	0.837			
ENA5	0.831			
ENA6	0.865			
ENA7	0.831			
ENA8	0.791			

In conclusion, discriminant validity was confirmed because, as shown in Table 3, the square roots of the AVE of the constructs are greater than their correlations with other Latent variables associated with the model, per Henseler, Ringle, and Sarstedt (2015) recommendation that all construct values should be greater than above diagonal values.

Table.3: Discriminant Validity

	INCS	PRECS	PSTCS	ENA
INCS	**0.783**			
PRECS	0.321	**0.894**		
PSTCS	0.450	0.352	**0.783**	
ENA	0.452	0.732	0.562	**0.894**

Using a structural model to test the hypothesis, the model was further validated based on the effect magnitude, R square (Hair et al., 2017). Acceptable and suggested values for multicollinearity, as assessed by a variance inflation factor (VIF), should be fewer than 5. These VIF values were more than 5, so there are no multicollinearity issues. In addition, the recommended value for R squares exceeds 0.10, the minimum acceptable value. These results indicate that the constructs have a coefficient of variation that indicates a strong link. The experiment results reveal that pre-control has a considerable and beneficial effect on the in-control system. This result suggests that when the pre-control system is enhanced, the in-control system also improves. These findings are consistent with prior research (Le & Sutrisna, 2023; Love, Zhou, & Matthews, 2019). In addition, the in-control system has a considerable and favorable impact on the post-control system. This conclusion also suggests that the in-control system is a crucial indicator for enhancing or expanding the post-control system. This outcome is consistent with earlier research (Love et al., 2019). In addition, the pre-control system has a favorable and significant effect on the post-control system, indicating that pre-control is an essential signal that contributes to the improvement of the post-control system. These results are consistent with earlier research (Sogaxa & Simpeh, 2023).

In contrast, the enablers have a favorable and significant impact on the in-control system, pre-control system, and post-control system. This demonstrates that enablers are essential for the in-control, pre-control, and post-control systems. These results are consistent with earlier research (Dimes & de Villiers, 2021; Sogaxa & Simpeh, 2023). The projected results of the preceding discussion are shown in Table 4.

Table.4: Hypothesis Results

Hypothesis	Relationship	VIF	Parameter Estimator	T-value	p-value
H1	PRECS->INCS	1.782	0.805	4.162	0.000
H2	PRECS->PSTCS	1.673	0.289	4.833	0.000
H3	INCS->PSTCS	1.833	0.232	3.424	0.001
H4	ENA->INCS	1.903	0.311	4.746	0.000
H5	ENA->PSTCS	2.343	0.253	2.963	0.002
H6	ENA->PRECS	2.784	0.892	4.123	0.000

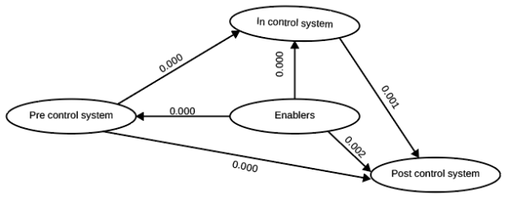

Figure.1: T Statistics

Conclusion and Recommendations

Due to market swings and pricing rivalry, construction firms in Iraq incur significant losses. Significant project management enablers have been identified, and their effects on project management have been proven. To improve system performance, there has been an insufficient exploration of the links between system constructions and the systems with their enablers. This study used a questionnaire to create and validate a model. The model draws links between the system's numerous components and offers stakeholders a quantitative method for ranking the various factors at play. The research demonstrates that there are important linkages between each component of the system. This study contributes to the literature on construction project management by providing empirical confirmation of the roles of enablers in increasing the level of maturity of the "project cost control system" (PCCS). These results have real-world consequences since they give a framework for evaluating existing procedures by decision-makers. For example, PCCS can be used to improve its users' project cost control practices. In addition, the study could aid regulatory agencies and other policymakers in understanding the significance of PCCS enablers, particularly in Iraq.

In addition to creating a solid platform for future research, this paper's findings do the same. First, we limited our non-probabilistic sample to members of one of three Iraqi building trade associations. Even though this study was conducted in Iraq and its construction sector, it can be extrapolated to other populations and locations by comparing their similarities and differences. Having proven the validity and reliability of the constructs and data utilized in this study, the results can be extended to evaluate the usefulness of the prioritized improvement areas and gauge the real performance of project cost control. In addition, research was limited on direct effects, while indirect mediating or moderating effects received little attention; therefore, further study might be conducted on other mediating or moderating effects to examine the variances in the findings. In addition, the study was conducted on developing economies. Still, future research might be undertaken on established economies to compare results, as the culture of developed nations differs from that of developing economies.

References

Abdel-Hamid, M., & Abdelhaleem, H. M. (2021). Project cost control using five dimensions building information modelling. *International Journal of Construction Management*, 1-10. https://doi.org/10.1080/15623599.2021.1880313

Adjei, K., Aigbavboa, C., & Thwala, W. (2018). The challenges of cost control practice in the construction industry: a literature review. *International Conference on Applied Science and Technology Conference Proceedings, 4*(1), 14-24. http://102.223.173.31/icast/index.php/proceedings/article/view/97

Albliwi, S. A., Antony, J., & Arshed, N. (2014). Critical literature review on maturity models for business process excellence. In *2014 IEEE International Conference on Industrial Engineering and Engineering Management* (pp. 79-83). IEEE. https://doi.org/10.1109/IEEM.2014.7058604

Aşkın, A. C. (2022). Categories of Otherness in the Discursive Construction of National Identity During an Internal Conflict: Turks and Politically Organized Kurds in the Print Media. *Kurdish Studies, 10*(2), 85-102. https://kurdishstudies.net/menu-script/index.php/KS/article/view/182

Aziz, A., & Haryani, E. (2022). Education psychology and learning performance: does mental skills and mental techniques influences learning performance? A survey study on Indonesian educational institutions. *Revista de Psicología Del Deporte (Journal of Sport Psychology), 31*(1), 26-39. https://www.rpd-online.com/index.php/rpd/article/view/632

Basheer, Z. M., Althahabi, A. M., Ali, M. H., Wafqan, H. M., Abd Al Mahdi, R., Al-Muttar, M. Y. O., & Bkhebukh, A. S. (2022). Determinants of Financial Performance: A Case from Oil and Gas Companies listed in the Iraq Stock Exchange. *Cuadernos de Economía, 45*(128), 34-44. https://cude.es/submit-a-manuscript/index.php/CUDE/article/view/258

Benson, A. K., & Fortune, G. (2022). Impact of economic indicators on company sustainability and corporate performance for sustainable development: comparability analysis between Nigerian and South African listed companies. *International Journal of Economics and Finance Studies, 14*(1), 176-201. https://sobiad.org/menuscript/index.php/ijefs/article/view/986/139

Bhatti, M. A., Alyahya, M., Alshiha, A. A., Aldossary, M., Juhari, A. S., & Saat, S. A. M. (2022). SME's Sustainability and Success Performance: The Role of Green Management Practices, Technology Innovation, Human Capital and Value Proposition. *International Journal of eBusiness and eGovernment Studies, 14*(2), 112-125. https://sobiad.org/menuscript/index.php/ijebeg/article/view/1160/185

Bouchlaghem, D. (2012). *Collaborative Working in Construction*. Routledge. https://doi.org/10.4324/9780203840511

Boyd, K., Mason, B., Kendall, M., Barclay, S., Chinn, D., Thomas, K., Sheikh, A., & Murray, S. A. (2010). Advance care planning for cancer patients in primary care: a feasibility study. *British Journal of General Practice, 60*(581), e449-e458. https://bjgp.org/content/60/581/e449.short

Bridi, R. M., & Al Hosani, N. (2022). An Examination of the Status of Higher Education in the United Arab Emirates: From Humble Beginnings to Future Challenges. *Eurasian Journal of Educational Research (EJER), 99*, 26-44. https://ejer.com.tr/manuscript/index.php/journal/article/view/756/110

Bryde, D., Unterhitzenberger, C., & Joby, R. (2018). Conditions of success for earned value analysis in projects. *International Journal of Project Management, 36*(3), 474-484. https://doi.org/10.1016/j.ijproman.2017.12.002

Byrne, B. M. (2012). *Structural equation modeling with Mplus: Basic concepts, applications, and programming*. Routledge/Taylor & Francis Group. https://doi.org/10.4324/9780203807644

Charoenngam, C., & Sriprasert, E. (2001). Assessment of cost control systems: a case study of Thai construction organizations. *Engineering, Construction and Architectural Management, 8*(5/6), 368-380. https://doi.org/10.1108/eb021197

Cherian, T. M., Munuswamy, S., & Jasim, K. M. (2021). Strategic sourcing: An empirical study among Indian construction retailers. *International Journal of Construction Supply Chain Management, 11*(1), 34-48. https://ijcscm.com/menu-script/index.php/ijcscm/article/view/63/56

Cho, N., El Asmar, M., Gibson Jr, G. E., & Aramali, V. (2020). Earned value management system (EVMS) reliability: A review of existing EVMS literature. In *Construction Research Congress 2020: Project Management and Controls, Materials, and Contracts* (pp. 631-639). American Society of Civil Engineers Reston, VA. https://doi.org/10.1061/9780784482889.066

Culver, C. A. (2022). Manipulating Remittances: Strengthening Autocratic Regimes with Currency Overvaluation and Remittance Flows. *Remittances Review, 7*(1), 21-47. https://doi.org/10.33182/rr.v7i1.2153

Darlow, G., Rotimi, J. O., & Shahzad, W. M. (2022). Automation in New Zealand's offsite construction (OSC): a status update. *Built Environment Project and Asset Management, 12*(1), 38-52. https://doi.org/10.1108/BEPAM-11-2020-0174

Dash, G., & Paul, J. (2021). CB-SEM vs PLS-SEM methods for research in social sciences and technology forecasting. *Technological Forecasting and Social Change, 173*, 121092. https://doi.org/10.1016/j.techfore.2021.121092

De Carvalho, M. S., Melbardis, V. M. B. G., Santana, A. D. S., & Soares, R. A. (2016). Project management in infrastructure and construction. *International Symposium on Management, Projects, Innovation and Sustainability (SINGEP)*. http://singep.org.br/5singep/resultado/356.pdf

De La Hoz, G. T. (2021). New Trends in Online Crime Using Social Networking Sites and Apps against Children and Adolescents: Police-Based Longitudinal Research. *International Journal of Cyber Criminology, 15*(1), 31-49. https://www.cybercrimejournal.com/pdf/IJCC-3-2021.pdf

De Marco, A., Narbaev, T., Rafele, C., & Cagliano, A. (2017). Integrating risk in project cost forecasting. In *Proceedings of the Summer School Francesco Turco* (pp. 117-122). https://www.researchgate.net/publication/337312859

Del Pico, W. J. (2013). *Project control: Integrating cost and schedule in construction*. John Wiley & Sons. https://www.wiley.com/en-us/Project+Control%3A+Integrating+Cost+and+Schedule+in+Construction-p-9781118421062

Dimes, R., & de Villiers, C. (2021). How management control systems enable and constrain integrated thinking. *Meditari Accountancy Research, 29*(4), 851-872. https://doi.org/10.1108/MEDAR-05-2020-0880

Durdyev, S. (2021). Review of construction journals on causes of project cost overruns. *Engineering, Construction and Architectural Management, 28*(4), 1241-1260. https://doi.org/10.1108/ECAM-02-2020-0137

Elghaish, F., Abrishami, S., Hosseini, M. R., Abu-Samra, S., & Gaterell, M. (2019). Integrated project delivery with BIM: An automated EVM-based approach. *Automation in Construction, 106*, 102907. https://doi.org/10.1016/j.autcon.2019.102907

Flyvbjerg, B. (2021). Top ten behavioral biases in project management: An overview. *Project Management Journal, 52*(6), 531-546. https://doi.org/10.1177/87569728211049046

Fortune, J., White, D., Jugdev, K., & Walker, D. (2011). Looking again at current practice in project management. *International Journal of Managing Projects in Business, 4*(4), 553-572. https://doi.org/10.1108/17538371111164010

Fulford, R., & Standing, C. (2014). Construction industry productivity and the potential for collaborative practice. *International Journal of Project Management, 32*(2), 315-326. https://doi.org/10.1016/j.ijproman.2013.05.007

Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information systems, 16*(1), 5. https://doi.org/10.17705/1CAIS.01605

Hair, J., & Alamer, A. (2022). Partial Least Squares Structural Equation Modeling (PLS-SEM) in second language and education research: Guidelines using an applied example. *Research Methods in Applied Linguistics, 1*(3), 100027. https://doi.org/10.1016/j.rmal.2022.100027

Hair, J., Hollingsworth, C. L., Randolph, A. B., & Chong, A. Y. L. (2017). An updated and expanded assessment of PLS-SEM in information systems research. *Industrial management & data systems, 117*(3), 442-458. https://doi.org/10.1108/IMDS-04-2016-0130

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science, 43*, 115-135. https://doi.org/10.1007/s11747-014-0403-8

Hoseini, E., Hertogh, M., & Bosch-Rekveldt, M. (2021). Developing a generic risk maturity model (GRMM) for evaluating risk management in construction projects. *Journal of Risk Research, 24*(7), 889-908. https://doi.org/10.1080/13669877.2019.1646309

Hwang, B.-G., Shan, M., Zhu, L., & Lim, W.-C. (2020). Cost control in megaprojects: efficacy, tools and techniques, key knowledge areas and project comparisons. *International Journal of Construction Management, 20*(5), 437-449. https://doi.org/10.1080/15623599.2018.1484976

Jawad, S., & Ledwith, A. (2022). A measurement model of project control systems success for engineering and construction projects case study: contractor companies in Saudi's petroleum and chemical industry. *Engineering, Construction and Architectural Management, 29*(3), 1218-1240. https://doi.org/10.1108/ECAM-11-2020-0924

Jawad, S., Ledwith, A., & Khan, R. (2022). Project control system (PCS) implementation in engineering and construction projects: an empirical study in Saudi's petroleum and chemical industry. *Engineering, Construction and Architectural Management,* (ahead-of-print). https://doi.org/10.1108/ECAM-02-2022-0114

Jawad, S., Ledwith, A., & Panahifar, F. (2018). Enablers and barriers to the successful implementation of project control systems in the petroleum and chemical industry. *International Journal of Engineering Business Management, 10*. https://doi.org/10.1177/1847979017751834

Jayanetti, J., Perera, B., & Waidyasekara, K. (2022). Defining a 'Maturity Model' in the Construction Context: A Systematic Review. In *10th World Construction Symposium - 2022* (pp. 298-312). Sri Lanka. https://doi.org/10.31705/WCS.2022.25

Jayaraman, R. (2016). Project cost control: a new method to plan and control costs in large projects. *Business Process Management Journal, 22*(6), 1247-1268. https://doi.org/10.1108/BPMJ-10-2014-0102

Jung, Y., & Woo, S. (2004). Flexible work breakdown structure for integrated cost and schedule control. *Journal of construction engineering and management, 130*(5), 616-625. https://doi.org/10.1061/(ASCE)0733-9364(2004)130:5(616)

Kamal, A., Abas, M., Khan, D., & Azfar, R. W. (2022). Risk factors influencing the building projects in Pakistan: from perspective of contractors, clients and consultants. *International Journal of Construction Management, 22*(6), 1141-1157. https://doi.org/10.1080/15623599.2019.1683693

Kirun, S. S., & Varghese, S. (2015). A study on cost control using delphi techniques in construction projects. *International Journal of Science Technology & Engineering, 2*(5), 44-51. http://www.ijste.org/articles/IJSTEV2I5029.pdf

Komurlu, R., & Er, A. (2018). A Simplified Method for Physical Progress Measurement. In *Responsible Design and Delivery of the Constructed Project* (pp. 1-6). ISEC Press. https://web.archive.org/web/20200709103223id_/https://www.isec-society.org/ISEC_PRESS/EURO_MED_SEC_02/pdf/CPM-10.pdf

Kyurova, V., & Athanasios, P. (2018). Theoretical problems in control of construction projects. *e-Journal of Science & Technology, 13*(4), 21-42. http://ejst.uniwa.gr/issues/issue_57/Kyurova_57.pdf

Le, A. T. H., & Sutrisna, M. (2023). Project cost control system and enabling-factors model: PLS-SEM approach and importance-performance map analysis. *Engineering, Construction and Architectural Management,* (ahead-of-print). https://doi.org/10.1108/ECAM-07-2022-0619

Li, X., Wang, C., & Alashwal, A. (2021a). Case study on BIM and value engineering integration for construction cost control. *Advances in Civil Engineering, 2021*, 1-13. https://doi.org/10.1155/2021/8849303

Li, Y., Cao, L., Zhang, Z., Hou, L., Qin, Y., Hui, X., Li, J., Zhao, H., Cui, G., & Cui, X. (2021b). Reporting and methodological quality of COVID-19 systematic reviews needs to be improved: an evidence mapping. *Journal of clinical epidemiology, 135*, 17-28. https://doi.org/10.1016/j.jclinepi.2021.02.021

Ling, F. Y. Y. (2004). How project managers can better control the performance of design-build projects. *International Journal of Project Management, 22*(6), 477-488. https://doi.org/10.1016/j.ijproman.2003.09.003

Love, P. E., Zhou, J., & Matthews, J. (2019). Project controls for electrical, instrumentation and control systems: Enabling role of digital system information modelling. *Automation in Construction, 103*, 202-212. https://doi.org/10.1016/j.autcon.2019.03.010

Noble, S., McLennan, D., Noble, M., Plunkett, E., Gutacker, N., Silk, M., & Wright, G. (2019). *The English indices of deprivation 2019*. Ministry of Housing, Communities and Local Government. https://dera.ioe.ac.uk/34264/1/IoD2019_Research_Report.pdf

Olawale, Y., & Sun, M. (2013). PCIM: Project control and inhibiting-factors management model. *Journal of management in engineering, 29*(1), 60-70. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000125

Olawale, Y., & Sun, M. (2015). Construction project control in the UK: Current practice, existing problems and recommendations for future improvement. *International Journal of Project Management, 33*(3), 623-637. https://doi.org/10.1016/j.ijproman.2014.10.003

Olawale, Y. A. (2020). Challenges to prevent in practice for effective cost and time control of construction projects. *Journal of Construction Engineering and Project Management, 10*(1), 16-32. https://doi.org/10.6106/JCEPM.2020.10.1.016

Oliver, H. (2018). *How is a major contractor going bust in the middle of NZ's building boom?* The Spinoff. https://thespinoff.co.nz/business/01-08-2018/how-is-a-major-contractor-going-bust-in-the-middle-of-nzs-building-boom

Orgut, R. E., Batouli, M., Zhu, J., Mostafavi, A., & Jaselskis, E. J. (2020). Critical factors for improving reliability of project control metrics throughout project life cycle. *Journal of management in engineering, 36*(1), 04019033. https://doi.org/10.1061/(ASCE)ME.1943-5479.0000710

Pajares, J., & Lopez-Paredes, A. (2011). An extension of the EVM analysis for project monitoring: The Cost Control Index and the Schedule Control Index. *International Journal of Project Management, 29*(5), 615-621. https://doi.org/10.1016/j.ijproman.2010.04.005

Rana, M. Q., Arif, M., Goulding, J., Sawhney, A., & Bendi, D. (2020). An off-site construction readiness maturity model for the Indian construction sector. *Construction Innovation, 21*(1), 123-142. https://doi.org/10.1108/CI-07-2020-0121

Scott, N. B. (2021). Analysis of the Evolutaion of Scope Management and Needs Identification in Agile Methodologies. *Honors Theses*, 335. https://ecommons.udayton.edu/uhp_theses/335

Sippel, A. (2021). *A Matter of Taste: the Fate of the Archdeacon Smythe Collection of British Watercolours in New Zealand.* (Doctoral dissertation). Open Access Te Herenga Waka-Victoria University of Wellington. https://doi.org/10.26686/wgtn.15066360.v1

Sogaxa, A., & Simpeh, E. (2023). Effective Cost Management Practices for Enabling Sustainable Success Rate of Emerging Contractors in the Eastern Cape Province of South Africa. In *Sustainable Education and Development–Sustainable Industrialization and Innovation: Proceedings of the Applied Research Conference in Africa (ARCA), 2022* (pp. 339-357). Springer. https://doi.org/10.1007/978-3-031-25998-2_26

Sridarran, P., Keraminiyage, K., & Herszon, L. (2017). Improving the cost estimates of complex projects in the project-based industries. *Built Environment Project and Asset Management, 7*(2), 173-184. https://doi.org/10.1108/BEPAM-10-2016-0050

Taylor, J. (2008). *Project scheduling and cost control: planning, monitoring and controlling the baseline*. J. Ross Publishing. https://jrosspub.com/catalog/business-default-category/project-program-management/project-scheduling-and-cost-control/

Vásquez, J., Aguirre, S., Puertas, E., Bruno, G., Priarone, P. C., & Settineri, L. (2021). A sustainability maturity model for micro, small and medium-sized enterprises (MSMEs) based on a data analytics evaluation approach. *Journal of Cleaner Production, 311*, 127692. https://doi.org/10.1016/j.jclepro.2021.127692

Visweswaran, S., McLay, B., Cappella, N., Morris, M., Milnes, J. T., Reis, S. E., Silverstein, J. C., & Becich, M. J. (2022). An atomic approach to the design and implementation of a research data warehouse. *Journal of the American Medical Informatics Association, 29*(4), 601-608. https://doi.org/10.1093/jamia/ocab204

Wasko, M. M., & Faraj, S. (2005). Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS quarterly, 29*(1), 35-57. https://www.jstor.org/stable/25148667

Willems, L. L., & Vanhoucke, M. (2015). Classification of articles and journals on project control and earned value management. *International Journal of Project Management, 33*(7), 1610-1634. https://doi.org/10.1016/j.ijproman.2015.06.003

Zahoor, H., Khan, R. M., Nawaz, A., Ayaz, M., & Maqsoom, A. (2022). Project control and forecast assessment of building projects in Pakistan using earned value management. *Engineering, Construction and Architectural Management, 29*(2), 842-869. https://doi.org/10.1108/ECAM-11-2020-0989