



**THE IMPACT OF PROJECT MANAGEMENT WORK
EXPERIENCE AND PROJECT MANAGEMENT
KNOWLEDGE ON PROJECT PERFORMANCE AND
SUCCESS**

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Abstract

This development paper is based on a pilot study conducted in preparation for a full study. The aim of this research is to investigate the impact of project managers' work experience and project management knowledge on project performance and success within the context of Singapore's construction industry. Quantitative survey questionnaires were used to collect data from 61 participants, comprising personnel working in the construction and built environment industry of Singapore, particularly project managers, for this pilot study. The study focuses on the relationships between the number of years of participants' working experience, the seven different Project Management Knowledge Areas of the PMBOK® and Project Success phenomena. Data collected were analysed using the linear regression analysis technique and the Statistical Package for the Social Sciences (SPSS) statistical analysis software tool. The results from hypothesis tests showed that project scope management, project time management, and project quality management had no significant relationship with project success. This preliminary study's results contribute to the project management literature by showing that, within the context of the Singaporean construction industry, working experience is not a direct predictor of project success, whereas project scope management, project time management, and project risk management are direct predictors of project success. The full study is ongoing, and it is hoped that with a larger dataset, the outcome will either confirm or generate new knowledge that will benefit practitioners and policymakers in the construction and built environment industries.

Keywords: Construction industry, project management, project management knowledge area, PMBOK, work experience, project success, quantitative, Environment, Singapore.

1. Introduction

Manoharan *et al.* (2022) states that the construction industry is widely connected with other business sectors and thus generates more employment across various businesses and sectors due to its opportunities in investment. In Singapore, the construction sector has one of the highest growth in employment amongst the other industries (Ministry of Trade and Industry Singapore, 2023; Building and Construction Authority, 2022b).

The organisations and companies in the construction sector are project-based, and these companies depend on various construction projects to sustain growth and business continuity. As such, ensuring project success is of the utmost importance to them. Moradi, Kähkönen and Aaltonen (2020a) explained that project managers, with their competencies and PM knowledge and tools are largely responsible for project success. do Vale, Nunes and de Carvalho (2018) described the challenge of project manager selection and further elaborates that an organization's ability to appoint an appropriate project manager who can perform shows how mature an organization is with regards to its project management capabilities. While the selection of project managers remains as a challenge, project managers are being employed and promoted from within each company and such instances may be good examples of project managers being “accidentally” appointed (Darrel, Baccarini and Love, 2010). González, Casas and Coronado (2013) share the same sentiments that such “accidental” appointments are common within the construction industry or sector. It is thus crucial to understand if these “accidental” appointments are competent to perform the role of project managers within the construction industry.

The aim of this research is to investigate the impact of project managers' work experience and project management knowledge on project performance and success within the context of Singapore's construction industry.

The research objectives are:

- I. To investigate the relationship between project managers' work experience in the construction industry, PMBOK® knowledge areas and project success in Singapore.
- II. To identify which of the ten PMBOK® knowledge areas are critical and significant when discussing about project success in Singapore.

1.1 Definitions of Key Terms

- **Competency** – It refers to the “skills, knowledge, experience, attributes, and behaviour that an individual needs to perform a job effectively” as defined by Hirsch and Stabler in 1995 (Horton, 2000).

- **Construction** – For the purpose of this research, the term construction refers to the building construction industry which can include civil and other works e.g., the construction of bridges, sewerage, roads, buildings, houses, mechanical and electrical works within a building, etc.
- **Project** – The Project Management Institute elaborates a project as “A temporary endeavour undertaken to create a unique product, service or result” in their PMBOK® guide (Project Management Institute, 2013, p. 3).
- **Project manager (PM)** – A project manager is an individual is assigned or appointed by the company who applies “knowledge, skills, tools, and techniques to project activities to meet the project requirements” as defined in the PMBOK® guide (Project Management Institute, 2013, p. 5)
- **Project management knowledge** – It refers to what the “project manager knows about project management” (Project Management Institute, 2013, p. 17). For the purpose of this research, project management knowledge refers to the ten knowledge areas defined within the **Project Management Body of Knowledge (PMBOK®)**.
- **Project Management Body of Knowledge (PMBOK®)** – A widely recognized collection of the “best practice” of project management (Pant and Baroudi, 2007, p. 125) which consists of ten knowledge areas, project integration, scope, time, cost, quality, human resource, communications, risk, procurement and stakeholder management.
- **Work experience** – For the purpose of this research, work experience refers to the construction industry related work experience that individuals possess.

A brief literature review of project success, project management knowledge areas and work experience are provided in the next section.

2. Literature Review

In this section, literature review of project success, project management knowledge areas and work experience are conducted. The literature review is conducted using a narrative (traditional) strategy.

2.1 Project Success

Project success is defined as a project that meets time, cost, and quality criteria, however, this evaluation criteria has evolved in the 2000s to include stakeholder satisfaction and for the project to also achieve acceptance from the client (Muneer *et al.*, 2022). Some authors defined the same iron triangle with similar factors by describing them as schedule, budget, and quality (Mathar *et al.*, 2020). These terms are thus interchangeable as they mean the same and defined as “timely completion of the project, with

prescribed quality standards within the given cost” (Hussain *et al.*, 2021, p. 3). Slevin and Pinto (1986) developed a project implementation project (PIP) as an instrument to measure the statuses of ten critical success factors during the lifecycle of a project namely, (1) project mission, (2) top management support, (3) project schedule or plan, (4) client consultation, (5) personnel, (6) technical tasks, (7) client acceptance, (8) monitoring and feedback, (9) communication, and (10) troubleshooting. Slevin and Pinto (1986, p. 1) recognized that tools and techniques i.e., CPM, flow charts for activities, spreadsheets, etc. have been widely developed and thus found the need to address the “human and managerial” aspects leading to project management success. Pinto and Slevin (1988) subsequently enhanced their PIP instrument to measure project success and based on their model of project success, two key themes are considered, namely, the project aspect and the client aspect. From the project aspect, the usual iron triangle of project management are the areas considered, being time, cost, and performance (Pinto and Slevin, 1988). From the client aspect, Pinto and Slevin (1988) considered the use of the project, the satisfaction of the client and the effectiveness of the project.

2.2 Project Management Body of Knowledge

The Project Management Professional (PMP) certification initiated by Project Management Institute (PMI) is globally recognized and most companies are employing project managers who are PMP certified (Thomas and Mengel, 2008). Hubble and Spitulnik (2016, p. 19) states that when a person has obtained a PMP certification, he or she has thus “demonstrated mastery” of project management knowledge. The recognition of PMP certification is currently in more than 170 countries and various studies have shown that it has extended its recognition and acceptance in one of the biggest markets of construction, China (Bai *et al.*, 2020). The PM Body of Knowledge is widely recognized as the “best practice” of project management (Pant and Baroudi, 2007, p. 125).

The PMBOK® comprises of ten knowledge areas and they are (1) project integration management, (2) project scope management, (3) project time management, (4) project cost management, (5) project quality management, (6) project human resource management, (7) project communications management, (8) project risk management, (9) project procurement management and (1) project stakeholder management (Hornstein, 2015).

According to Palm and Lindahl (2015), Projects are temporary, in which their duration of existence is limited, and are unique from each other. Amoah and Marimon (2021, p. 3) wrote in their article that project managers are “individuals with very special skills and training” and that they are responsible and accountable for all the stages in a project. Their continuous involvement in projects would require them to manage and supervise the various processes within these stages. and PMBOK is widely recognized as the “best practice” of project management by Pant and Baroudi (2007, p. 125) and as a generic toolkit by Burger, Verster and Zulch (2015, p. 53).

2.3 Competency

Hirsch and Stabler (1995) defined competencies as “skills, knowledge, experience, attributes, and behaviour that an individual needs to perform a job effectively” (Horton, 2000, p. 307). Competencies have evolved since David McClelland first coined the term “competency” and proposing it be a replacement for “skills” due to demands of jobs requiring other psychological aspects in addition to technical abilities for superior performance (Horton, 2000). Birkhead, et al., (2000, p. 99) had the same sentiments by indicating that competency is made up two elements, “actual performance of a required skills” and the other, “personal attributes” that contributes to the performance. Boyatzis (2008, p.6) undertook a research commissioned by the American Management Association (AMA) to distinguish successful managers from the lesser, emphasized that the concept of competency is based on contingency theory and found that “maximum performance is believed to occur when the person’s capability or talent is consistent with the needs of the job demands”. Boyatzis (2008, p.6) defined capability or talent as “values, vision and personal philosophy; knowledge; competencies; life and career stage; interests; and style” and job demands as “role responsibilities and tasks needed to be performed”. The evolution of the competency has been focused on the psychological and behavioural aspects of job demands and of managers, but from these definitions by Boyatzis (2008), maximum performance can be achieved when knowledge, being one of the factors of capability or talent, is consistent with the needs of the job demands. Thus, a project manager without the knowledge required and experience to perform the role can be detrimental to the success of the project (Eftekhari *et al.*, 2022) as knowledge and skills to apply them are considered fundamental to a project manager (Wen and Qiang, 2019).

Currently, there are four standards of practice to address competencies of project managers, namely, (1) Individual Competence Baseline (ICB.4), (2) Project Manager Competency Development framework (PMCD.3), (3) Association of Project Management Body of Knowledge (APM-BOK) and (4) Project Management Body of Knowledge’s PMI Talent Triangle (PMBOK®-PMI Talent Triangle) (Moradi, et al. 2021; Ghorbani 2023). ICB.4 identifies a total of 28 competencies and classifies them into 3 broad categories, people, practice and perspective; PMCD.3 identifies 16 competencies and categorizes them into 2 groups, performance and personal; APM-BOK identifies 11 competencies and classifies them into 2 groups, interpersonal and professionalism while PMBOK®-PMI Talent Triangle identifies 3 broad categories of competencies, “technical project management skills”, leadership and “strategic and business management skills” (Moradi, et al., 2021, p. 6).

The above is detailed in the Table as follows.

Table: Summary of Competency for Project Managers based on Standard of Practices

Standard of Practice	Group / Category	Competency
Individual Competence Baseline (ICB.4)	People	Self-reflection & self-management; Personal integrity & reliability; Personal communication; Relationships & engagement; Leadership; Teamwork; Conflict & crisis; Resourcefulness; Negotiation; Result orientation.
	Practice	Project design; Requirements & objectives; Scope; Time; Organization & information; Quality; Finance; Resource; Procurement; Plan & control; Risk & opportunity; Stakeholders; Change & transformation.
	Perspective	Strategy; Governance, structure & processes; Compliance, standard & regulation; Power & interest; Culture & values.
Project Manager Competency Development Framework (PMCD.3)	Performance	Project integration management; project scope management; project time management; project cost management; project quality management; project human resource management; project communications management; project risk management; project procurement management; project stakeholder management.
	Personal	Communicating; Leading; Managing; Cognitive ability; Effectiveness; Professionalism.
Association of Project Management – Body of Knowledge (APM-BOK)	Interpersonal	Communication; Conflict management; Delegation; Influencing; Leadership; Negotiation; Teamwork.
	Professionalism	Communities of practice; Competence; Ethics framework; Leading and development.
Project Management Institute Talent Triangle (PMI)		Technical project management skills; Leadership; Strategic and business management skills.

Adapted from Moradi, Kähkönen and Aaltonen (2020b, p. 6).

Moradi & Kähkönen (2020) attempted to identify the which competencies across the various frameworks are more critical and weightier and discovered a large degree of consensus and little differences and focuses between the frameworks.

As what Boyatzis (2008) has identified, performance and knowledge is best represented by PCMD.3's competencies in the performance group, whereby the competencies are identical to PMBOK's 10 knowledge areas of project management (Moradi *et al.*, 2020)

2.4 Work Experience

According to Hirsch and Stabler (1995) definition of competency, experience is one of attributes for an individual perform a job effectively (Horton, 2000). Studies have shown that a project manager's experience will allow him/her to deal with critical situations and ensuring the quality of work (Enshassi, Hallaq and Arain, 2019). According to job advertisements, experience is the most sought-after competency and considered as a fundamental requirement with project management knowledge and skills seconding it (Wyskvarski, 2021). In another study, similar findings were presented with experience being the most important requirement for project managers and project management certifications as the least important requirements (Lundqvist, 2018). Experience remains as one of the key competence and requirement of employers even though construction has moved into the digital era which other skills are required i.e., digital skills (Liu *et al.*, 2022). One of the key reasons for this phenomenon is because project success and performance have been strongly linked to the experience of project managers in early and recent studies (Hashim, Chao and Wang, 2022; Zheng, Wen and Qiang, 2020), and these studies have recommended the focus on project managers' experience to increase the likelihood of project success (Irfan *et al.*, 2021). It is certain that experience brings about or presents unique perspectives to addressing problems that are not presented or taught through academic coursework (Damayanti, Hartono and Wijaya, 2021). This is prominent with a project manager's risk assessment and identification in which a study has shown that as project managers gain more work experience, the more comprehensive his or her risk analysis would be, which will ultimately address the triple constraints of any given project (Pang, Shavarebi and Ng, 2022).

However, work experience alone, does not improve project success as there are various other factors that have considerable impacts on project success (Hoxha and McMahan, 2018). Similar conclusions were drawn by Aranyossy, Blaskovics and Horváth (2018) in their research and recommended that companies' HR department should make necessary adjustments to the recruitment criteria and selection process. Burger, Verster and Zulch (2015) recommended that project managers require a set of knowledge consisting of project management knowledge, industry knowledge and knowledge gained through experience. A study by Rezk *et al.* (2019) found that exceptional project managers are not always experienced. Their study extended the study by Burger, Verster and Zulch (2015) by grouping industry knowledge with experience, and project management knowledge with experience, and found that the latter group was more significant in identifying and differentiating exceptional project managers from average ones (Rezk *et al.*, 2019).

The literature review has indicated the importance and criticality of project managers equipped with project management knowledge to perform their roles effectively. However, according to Wyskvarski (2021), employers seek experienced people for the role of project manager instead. According to

Burger, Verster and Zulch (2015) exceptional project managers are equipped with both project management knowledge and experience. Although project managers can develop their skills and knowledge through either education, training, or experience, in which experience is referred to as “action learning” (Dulaimi, 2005, p. 181), the question remains if a project manager can learn project management knowledge through experience as studies have shown that project management knowledge and experience are two different attributes and when combined, can be significant in various aspects (Burger, Verster and Zulch, 2015; Rezk *et al.*, 2019).

2.5 Conceptual Framework and Hypotheses

Currently, there are various Standards of Practice for competencies of project managers, i.e., ICB.4, PMCD.3, APM-BOK and literature evidence has shown that these are standards of practice form part of the competencies identified through data-based research conducted by various researchers (Zheng, Wen and Qiang, 2020). As literature has identified, another crucial competency of project managers would be work experience (Lundqvist, 2018). The current publications have shown that these are two distinct qualities that any project manager should and what they possess. The publications have also indicated the significance and impact of possessing the two competencies (Burger, Verster and Zulch, 2015). However, to the best of the researcher’s knowledge, there are no publications on how construction work experience would assist in gaining knowledge of the PMBOK® knowledge areas. This research attempts to deconstruct the currently available competency frameworks by investigating into two components, construction work experience and the required project management knowledge, which in their own rights, lead to project success and better project performance.

The following paragraphs draw the connection between the literature review conducted, research aim and research questions that subsequently lead to the hypotheses to be developed.

2.5.1 Project Performance and Success (PP) as a Dependent Variable

The goal for any given project is to achieve project success through the effective management of time, cost, scope, quality and to achieve stakeholder satisfaction (Muneer *et al.*, 2022). Studies have shown that there are various critical success factors towards achieving project success (Alvarenga *et al.*, 2018) and through literature, the heaviest weighted factors identified are work experience and project management knowledge, both of which are embodied within a project manager as competencies (Burger, Verster and Zulch, 2015).

2.5.2 Project Integration Management (IN)

Project management involves various processes and activities, stakeholders, project team members, considerations and aspects and it is key to unifying all those mentioned by integration (Project Management Institute, 2013). If a project manager loses control or sight of any process, it may prove to be critical to the success of the project (Demirkesen and Ozorhon, 2017). Liu *et al.* (2022) found that employers have included integrated project management as one of the key competences when hiring and a research conducted on Turkish construction companies found that project integration management has significant impact on project performance (Demirkesen and Ozorhon, 2017).

Hypothesis H₁: There is significant relationship between IN and PP

2.5.3 Project Scope Management (SC)

Scope is considered one of the measures of project performance and success and thus managing and controlling the scope of works are crucial aspects of project scope management (Project Management Institute, 2013). Literature has shown that failure in scope management will lead to various negative impacts on project performance while good management will instead lead to positive outcomes (Abdilahi, Fakunle and Fashina, 2020).

Hypothesis H₂: There is significant relationship between SC and PP

2.5.4 Project Time Management (TI)

Time is another measure of project performance and success (Project Management Institute, 2013). Studies have shown that time management is one of the most common requirements required of project managers by employers (Wyskvarski, 2021). Completing a project within the stipulated time defined in the contract is one of the key requirements of any given projects and ineffective time management would lead to time and cost overrun (Lok and Abdul Hamid, 2015).

Hypothesis H₃: There is significant relationship between TI and PP

2.5.5 Project Cost Management (CO)

With cost being another measure of project performance and success, performing and completing the project within the stipulated cost requires a project manager to manage the cost and budget in good manner (Sampaio *et al.*, 2022). While cost management is one of the key competencies required of a project manager as shown in research by Moradi, Kähkönen and Aaltonen (2020a), it has also evolved

from controlling cost to optimizing and reducing cost, which is evident in the research conducted by Sarihi, Shahhosseini and Banki (2020).

Hypothesis H₄: There is significant relationship between CO and PP

2.5.6 Project Quality Management (QU)

The three constraints of project management, time, cost, and scope, affects the quality of any given project (Ahmed, Philbin and Cheema, 2021). Studies have been conducted on quality management and revealed ten factors negatively impacting quality (Waters and Ahmed, 2020). Rauzana, Akbar and Dharma (2022) recommends in their study that quality management is a must-know and must-have knowledge given how quality impacts project performance and success.

Hypothesis H₅: There is significant relationship between QU and PP

2.5.7 Project Communication Management (CM)

In any given project, communication is key to ensuring the timely delivery and exchange of accurate information and project failure has been linked to ineffective communications (Richardson *et al.*, 2022). Literature has shown that employers are looking for project managers with good communication skills (Zheng, Wen and Qiang, 2020) and that communication management processes and techniques lead to project success (Muneer *et al.*, 2022).

Hypothesis H₆: There is significant relationship between CM and PP

2.5.8 Project Risk Management (RI)

Risks are inherent in every project endeavour, regardless of how one avoids. It is thus crucial to manage risks as a project manager (Rauzana, Akbar and Dharma, 2022). Risk management has been linked to project success in literature and remains as one of the top contributors (Moradi, Kähkönen and Aaltonen, 2020b). Risk management can be enhanced through increased knowledge resulting in better risk management processes (Cerezo-Narváez *et al.*, 2022).

Hypothesis H₇: There is significant relationship between RI and PP

2.5.9 Work Experience (EX)

The experience of project managers is a competency required by most employers (Wyskwarski, 2021) and studies have shown that project success and performance are dependent on it (Zheng, Wen and Qiang, 2020). The unique perspectives towards solving critical issues and problems resulting from industry experience is without a doubt an advantage (Damayanti, Hartono and Wijaya, 2021). However, studies have also shown that experience alone is insufficient, and it works in tandem with other competencies of the project manager (Hoxha and McMahan, 2018). To the best of the researcher's knowledge, there are currently no studies into whether work experience allows a project manager to gain knowledge of the PMBOK® Guide's knowledge areas.

Hypothesis H₈: There is significant relationship between EX and PP

Hypothesis H₉: There is significant relationship between EX and IN

Hypothesis H₁₀: There is significant relationship between EX and SC

Hypothesis H₁₁: There is significant relationship between EX and TI

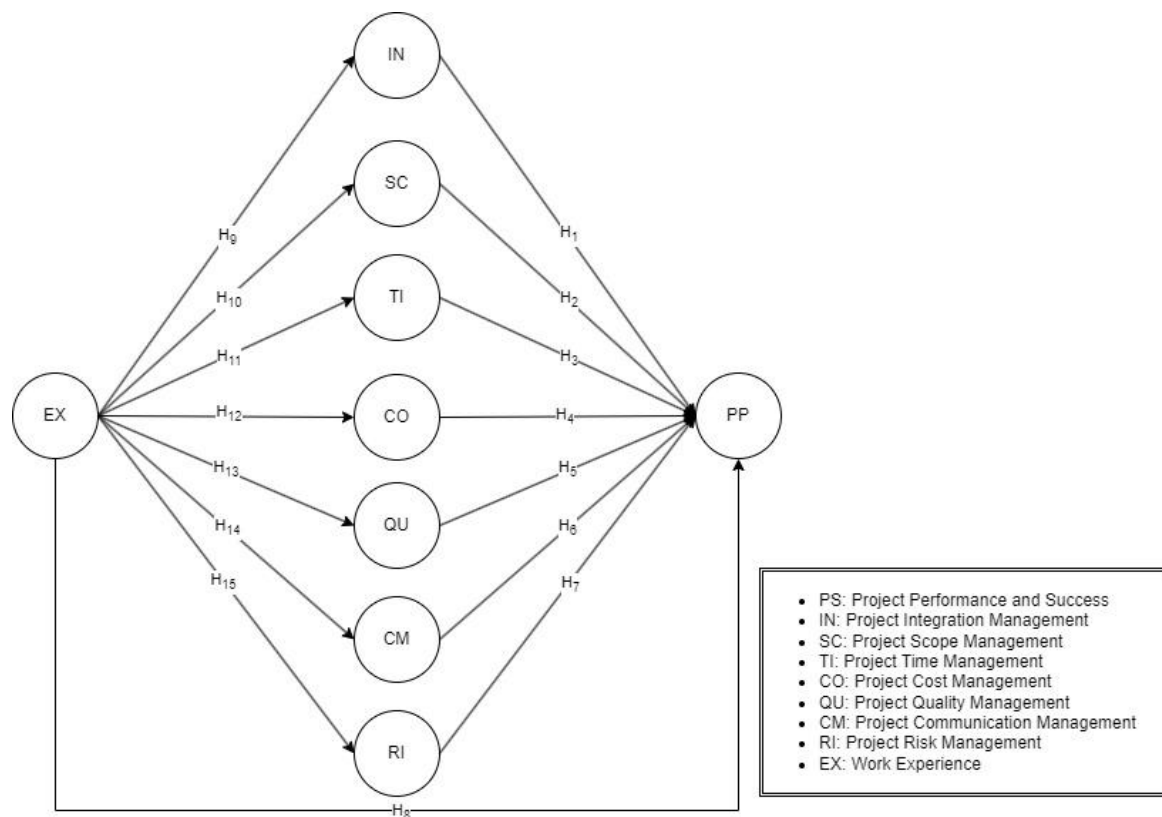
Hypothesis H₁₂: There is significant relationship between EX and CO

Hypothesis H₁₃: There is significant relationship between EX and QU

Hypothesis H₁₄: There is significant relationship between EX and CM

Hypothesis H₁₅: There is significant relationship between EX and RI

The conceptual framework of this research is based on the above hypotheses. The essence of this research attempts to deconstruct two major components of project managers' competencies, namely work experience and project management knowledge, to investigate the relationship between them.



3. Methodology

The main aim of the paper and the pilot study conduct is to provide insight into an ongoing doctoral thesis examining the impact of project management work experience and project management knowledge on project performance and success within the context of Singapore's construction industry.

As the research is explanatory in nature, a positivism philosophical stance is adopted. A deductive approach was thus adopted, consistent and aligned with the positivist philosophical stance.

A pilot study adopting quantitative research method was conducted in Singapore with the focus on the employees of construction firms which heavily rely on project management skillsets to perform their roles and responsibilities. The aim of pilot study was to evaluate the reliability and validity of the questionnaire based on a small sample size. The first section of the questionnaire consists of eight demographic questions to determine the participants' gender, age group, citizenship, highest level of education, education background, current work industry, years of work experience, and current position/appointment in their company. The second section consists of measurements items relating to PMBOK® knowledge areas and project performance and success which requires the participants to

respond based on a 5-Point Likert Scale with the following options, (1) strongly disagree, to (5) strongly agree. This section contains 32 statements to measure various PMBOK® knowledge areas i.e., project integration management, project scope management, project time management, project cost management, project risk management, project communication management and project quality management adapted from the research by Rezk *et al.* (2019) and 16 statements to measure project performance and success adapted from the research by Hoxha and McMahan (2018) and Rezk *et al.* (2019).

The following tests on the data collected are performed to draw inferences for discussions and subsequently conclusions using SPSS Ver. 29.

- Internal consistency and reliability: Cronbach Alpha
- Test of normality of data distribution: Skewness and Kurtosis, Kolmogorov-Smirnov, and Shapiro-Wilk tests, Mean and Median, Histogram, Q-Q and Box plots.
- Paired sample t-tests: Hypotheses testing.
- Correlation of variables: Pearson's correlation.
- Linear regression: Hypotheses testing and path analysis.

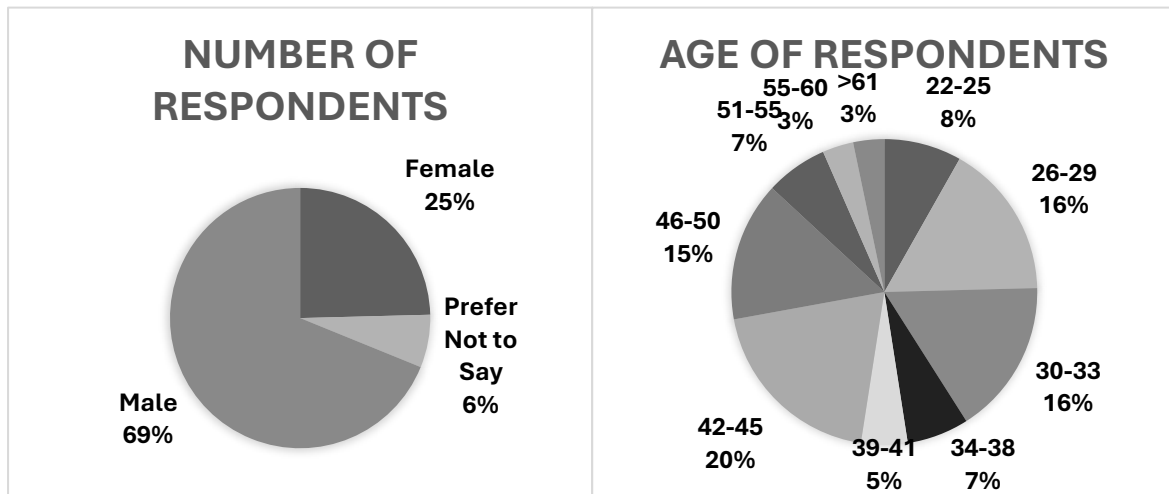
3.1 Research Ethics and Considerations

The following were some of the considerations taken, at this stage to address research ethical issues.

- (1) Participants were recruited on a voluntary basis.
- (2) Prior to conducting or attending the interview, participants were given information sheets to understand what the research is about.
- (3) Participants were free to decide on their withdrawal of participation in the research at any time.
- (4) There was no financial incentive for participants of the research.
- (5) Ethics approval was obtained prior to commencement of data collection (research interviews).

4. Results

61 valid responses were gathered via snowball technique with the researcher initially reaching out to 4 of his contacts. 42 respondents were male, 15 were female and 4 preferred not to say. Most of the respondents were between the ages of 26 to 33 and 42 to 45 years old making up about 52.5% of the respondents. At least half of the respondents had a bachelor's degree or equivalent.



The test results on internal consistency of the survey instrument was between satisfactory and excellent according to categorization by Sharma (2016). As such, the questionnaire can confidently be used for collecting data from a larger sample size for the full study.

Reliability Statistics				
Variables		Cronbach's a	No. of Items	Consistency
Project Performance and Success	PP	0.982	16	Excellent
Project Integration Management	IN	0.933	6	Excellent
Project Scope Management	SC	0.952	4	Excellent
Project Communication Management	CM	0.938	5	Excellent
Project Cost Management	CO	0.931	5	Excellent
Project Time Management	TI	0.957	5	Excellent
Project Risk Management	RI	0.936	4	Excellent
Project Quality Management	QU	0.892	2	Satisfactory

Internal Consistency Ratings

- > 0.9, Excellent
- $0.7 \geq 0.9$, Satisfactory
- $0.6 \geq 0.7$, Acceptable
- < 0.6, Unacceptable

Descriptive Statistics of Variables

Descriptive Statistics						
Variable	N	Skewness		Kurtosis		Normal Distributed
	Statistic	Statistic	Std. Error	Statistic	Std. Error	
Work Experience	61	0.764	0.306	-0.329	0.604	YES
IN	61	0.468	0.306	-0.749	0.604	YES
SC	61	0.048	0.306	-0.563	0.604	YES
CM	61	0.548	0.306	-0.823	0.604	NO
CO	61	0.576	0.306	-0.457	0.604	YES
TI	61	0.211	0.306	-0.594	0.604	YES
RI	61	0.198	0.306	-0.766	0.604	YES
QU	61	0.023	0.306	-0.558	0.604	YES
PP	61	0.060	0.306	-0.733	0.604	YES
Valid N (listwise)	61					

Mean and Median of Variables

Mean and Median					
Variable	N	Min / Max		Mean / Median	
	Statistic	Min	Max	Mean	Median
Work Experience	61	0.000	25.000	8.430	6.000
IN	61	2.330	5.000	3.549	3.500
SC	61	2.000	5.000	3.730	3.750
CM	61	2.600	5.000	3.643	3.400
CO	61	2.000	5.000	3.485	3.200
TI	61	1.800	5.000	3.721	3.600
RI	61	2.000	5.000	3.627	3.750
QU	61	2.000	5.000	3.853	4.000
PP	61	2.060	5.000	3.808	3.938
Valid N (listwise)	61				

The statistical value required for both Skewness and Kurtosis is to be within the range of $-0.8 \leq X \leq 0.8$; and in this case, the variable, CM, is not statistically distributed. One of the reasons is due to the small sample size. However, in this pilot study, it is assumed to be normally distributed given that the statistical value is very close to -0.8 , which may be corrected if a larger sample size or dataset was provided. The comparison of means and medians of the variables and the comparison shows that the values are very close with each other, indicating that the variables are normally distributed

Kolmogorov-Smirnov and Shapiro-Wilk Test of Variables

Tests of Normality						
Variable	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Work Experience	0.144	61	0.003	0.916	61	0.000
IN	0.152	61	0.001	0.927	61	0.001
SC	0.132	61	0.010	0.945	61	0.008
CM	0.186	61	0.000	0.896	61	0.000
CO	0.168	61	0.000	0.926	61	0.001
TI	0.140	61	0.005	0.918	61	0.001
RI	0.145	61	0.003	0.939	61	0.005
QU	0.173	61	0.000	0.906	61	0.000
PP	0.112	61	0.054	0.946	61	0.009

a. Lilliefors Significance Correction

For Kolmogorov-Smirnov and Shapiro-Wilk test, a variable is normally distributed when the *p-value* is more than 0.05. All the variables have *p-values* of less than 0.05. This may be caused by the small sample size and for the purpose of this pilot study, the results from this test are assumed to be normally distributed.

Paired Sample t-test for Hypotheses

Paired Sample t-test		Paired Differences					t	df	Significance	Hypothesis
		Mean	Std. Deviatio	Std. Error Mean	95% Confidence				Two-Sided p	
Hn	Hypotheses				Lower	Upper				
H1	IN - PP	-0.25922	0.43549	0.05576	-0.37075	-0.14769	-4.649	60	0.000	Accept
H2	SC - PP	-0.07889	0.32793	0.04199	-0.16288	0.00509	-1.879	60	0.065	Reject
H3	TI - PP	-0.08709	0.36181	0.04632	-0.17975	0.00557	-1.880	60	0.065	Reject
H4	CO - PP	-0.32316	0.48523	0.06213	-0.44743	-0.19888	-5.202	60	0.000	Accept
H5	QU - PP	0.04406	0.47150	0.06037	-0.07670	0.16481	0.730	60	0.468	Reject
H6	CM - PP	-0.16578	0.38353	0.04911	-0.26400	-0.06755	-3.376	60	0.001	Accept
H7	RI - PP	-0.18135	0.38353	0.04911	-0.27958	-0.08313	-3.693	60	0.000	Accept
H8	EX - PP	4.61783	6.79482	0.86999	2.87759	6.35806	5.308	60	0.000	Accept
H9	EX - IN	4.87705	6.87285	0.87998	3.11683	6.63727	5.542	60	0.000	Accept
H10	EX - SC	4.69672	6.81590	0.87269	2.95109	6.44235	5.382	60	0.000	Accept
H11	EX - TI	4.70492	6.81817	0.87298	2.95870	6.45113	5.390	60	0.000	Accept
H12	EX - CO	4.94098	6.87559	0.88033	3.18006	6.70190	5.613	60	0.000	Accept
H13	EX - QU	4.57377	6.81960	0.87316	2.82719	6.32035	5.238	60	0.000	Accept
H14	EX - CM	4.78361	6.82918	0.87439	3.03457	6.53264	5.471	60	0.000	Accept
H15	EX - RI	4.79918	6.88610	0.88167	3.03557	6.56279	5.443	60	0.000	Accept

Analysis using Paired Sample *t*-test rejected the following hypothesis.

Hypothesis H₂: There is significant relationship between Project Scope Management (SC) and Project Performance and Success (PP).

Hypothesis H₃: There is significant relationship between Project Time Management (TI) and Project Performance and Success (PP).

Hypothesis H₅: There is significant relationship between Project Quality Management (QU) and Project Performance and Success (PP).

When the significance is above 0.05, there is poor evidence presented for the alternative hypothesis, and so it is rejected, and the null hypothesis accepted. The *t*-test failed to reject the null hypothesis as $p \leq 0.05$. H₂, H₃ and H₅ are unable to establish significant differences.

Pearson's Correlation

		Correlations								
		PP	IN	SC	CM	CO	TI	RI	QU	Work Experience
PP	Pearson Correlation	1	.836**	.905**	.862**	.794**	.883**	.877**	.788**	.277*
	Sig. (2-tailed)		<.001	<.001	<.001	<.001	<.001	<.001	<.001	.031
	N	61	61	61	61	61	61	61	61	61
IN	Pearson Correlation	.836**	1	.904**	.895**	.865**	.852**	.873**	.683**	.168
	Sig. (2-tailed)	<.001		<.001	<.001	<.001	<.001	<.001	<.001	.197
	N	61	61	61	61	61	61	61	61	61
SC	Pearson Correlation	.905**	.904**	1	.884**	.853**	.876**	.886**	.736**	.242
	Sig. (2-tailed)	<.001	<.001		<.001	<.001	<.001	<.001	<.001	.060
	N	61	61	61	61	61	61	61	61	61
CM	Pearson Correlation	.862**	.895**	.884**	1	.834**	.853**	.883**	.749**	.230
	Sig. (2-tailed)	<.001	<.001	<.001		<.001	<.001	<.001	<.001	.075
	N	61	61	61	61	61	61	61	61	61
CO	Pearson Correlation	.794**	.865**	.853**	.834**	1	.833**	.855**	.671**	.164
	Sig. (2-tailed)	<.001	<.001	<.001	<.001		<.001	<.001	<.001	.206
	N	61	61	61	61	61	61	61	61	61
TI	Pearson Correlation	.883**	.852**	.876**	.853**	.833**	1	.849**	.786**	.240
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001		<.001	<.001	.063
	N	61	61	61	61	61	61	61	61	61
RI	Pearson Correlation	.877**	.873**	.886**	.883**	.855**	.849**	1	.730**	.150
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001		<.001	.248
	N	61	61	61	61	61	61	61	61	61
QU	Pearson Correlation	.788**	.683**	.736**	.749**	.671**	.786**	.730**	1	.245
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	<.001	<.001	<.001		.057
	N	61	61	61	61	61	61	61	61	61
Work Experience	Pearson Correlation	.277*	.168	.242	.230	.164	.240	.150	.245	1
	Sig. (2-tailed)	.031	.197	.060	.075	.206	.063	.248	.057	
	N	61	61	61	61	61	61	61	61	87

** . Correlation is significant at the 0.01 level (2-tailed).
* . Correlation is significant at the 0.05 level (2-tailed).

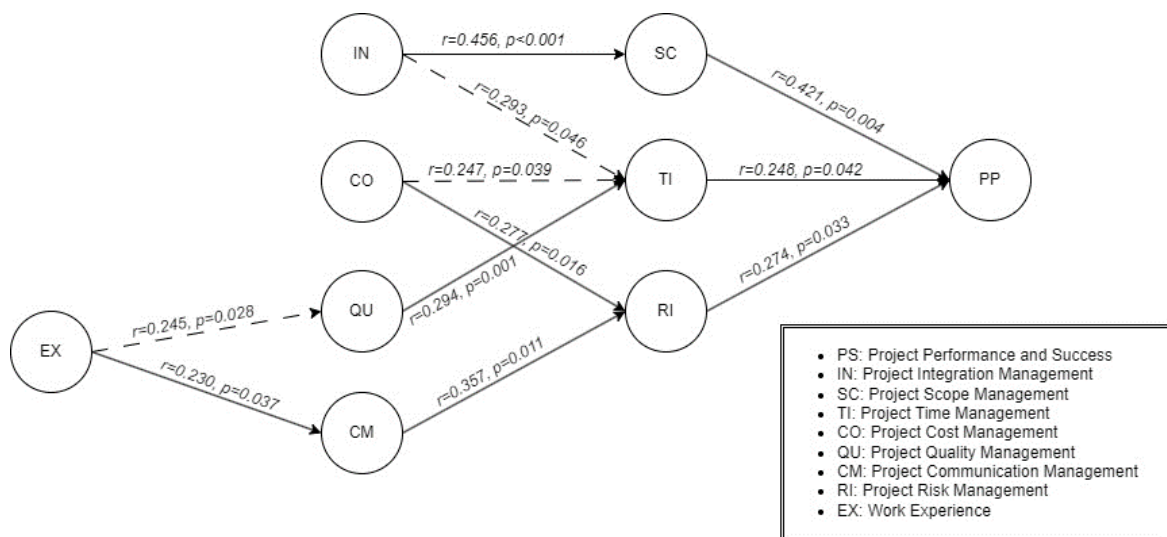
For Pearson's Correlation, all variables have very high or high positive correlation to PP other than Work Experience (EX), which has low correlation at 0.277 ($p \leq 0.05$). IN at 0.836 ($p \leq 0.05$); SC at 0.905 ($p \leq 0.05$); CM at 0.862 ($p \leq 0.05$); CO at 0.794 ($p \leq 0.05$); TI at 0.883 ($p \leq 0.05$); RI at 0.877 ($p \leq 0.05$); QU at 0.788 ($p \leq 0.05$). From the multivariate regression analysis performed, the strength of prediction for each path through the variables to PP can be derived as follows.

Due to the limited sample size of n=61, one-sided P-value is considered for this analysis.

<u>Path</u>	<u>Calculation</u>	<u>Rank</u>
• IN → SC → PP	: $0.456 \times 0.421 = 0.192$	(1)
• IN → TI → PP	: $0.293 \times 0.248 = 0.073$	(X)
• CO → TI → PP	: $0.247 \times 0.248 = 0.061$	(X)
• CO → RI → PP	: $0.277 \times 0.274 = 0.076$	(2)
• EX → QU → TI → PP	: $0.245 \times 0.294 \times 0.248 = 0.018$	(X)
• EX → CM → RI → PP	: $0.230 \times 0.357 \times 0.247 = 0.022$	(3)

Project Integration Management (IN) is the strongest predictor for Project Performance with $r=0.192$ followed by Project Cost Management (CO) with $r=0.076$. The results show that EX has the least predictability for PP.

Conceptual Model Derived from Linear Regression Analysis



Results from hypotheses testing indicated that project time management, quality management and scope management had no significant relationship with project success. However, given the small sample size obtained for analysis, the results cannot be generalized. Results from the linear regression analysis shows that project success is best predicted through project scope management, project time management and project risk management. Work experience in this case, has no direct influence on project success.

5. Discussion

The conceptual framework was developed based on the project manager competency development framework by PMBOK® Guide (PMCD.3) and years of working experience as highlighted in many studies after reviewing literature. The results for the bivariate analysis, or paired-sample t-test, presented that H2 (*SC-PP*), H3 (*TI-PP*) and H5 (*QU-PP*) are rejected while H1 (*IN-PP*), H4 (*CO-PP*), H6 (*CM-PP*) and H7 (*RI-PP*) are supported. Literature has shown that project management performance and success have been linked to the management of time, scope, cost, and quality in most studies (Muneer *et al.*, 2022) and the various areas of project management knowledge areas are essential for a project manager to perform his or her role efficiently and effectively (Hubble and Spitulnik, 2016).

From the paired sample t-test results, it is presented that not all the areas of project management knowledge directly affect project performance and success i.e., project scope management, project time management and project quality management. In contracts, there are avenues to remedy time overruns and scope creeps. For example, the commonly used standard conditions of contract in Singapore is the Public Sector Standard Conditions of Contract for Construction Works (PSSCOC) set out by the Building Construction Authority (BCA) of Singapore (Building and Construction Authority, 2022a). The PSSCOC is used commonly across all forms of public sector works, i.e., renovation of a hospital, improvements to military bases, upgrades to a public school, etc. Within the PSSCOC, there are clauses which address time and scope management issues. Clause 14.2 of the PSSCOC allows for the contractor to apply for an extension of time for completion of the works and Clause 19.1 allows for the contractor to be entitled to additional payments due to changes in the scope of the works (Building and Construction Authority, 2022a). Data collection was performed in Singapore, in which the participants should be aware of the basics of the PSSCOC which explains why the hypotheses (H2 and H3) are not supported given that the contractors are provided with an avenue to lower their guard on time and cost management. On the same note, BCA has stipulated that building works of various value levels will require site supervision by a resident technical officer or a resident engineer, otherwise known as RTO or RE respectively (Building and Construction Authority, 2020). The role of a RTO or RE is to provide full-time supervision on a construction site to supervise, inspect and verify that works performed by the contractors are being carried out properly, in compliance with the design and in good quality (The Institution of Engineers Singapore, 2017). Project managers, as such, need not focus as much on the quality of their work, given that an external supervision is available to vet the works performed and provide feedback for rectification when needed.

The supported hypotheses (H1, H4, H6, H7 and H8) are congruent with current research that project management knowledge and experience has significant influence on project performance and success (Burger, Verster and Zulch, 2015). Work experience has significant influence over project manager

knowledge (H9, H10, H11, H12, H13, H14 and H15) and is congruent with the conclusion of the study by Rauzana, Akbar and Dharma (2022) and amongst the variables, work experience has the highest t-scores with EX-PP ($t=5.308$, $p\leq 0.05$), EX-IN ($t=5.542$, $p\leq 0.05$), EX-SC ($t=5.382$, $p\leq 0.05$), EX-TI ($t=5.390$, $p\leq 0.05$), EX-CO ($t=5.613$, $p\leq 0.05$), EX-QU ($t=5.238$, $p\leq 0.05$), EX-CM ($t=5.471$, $p\leq 0.05$) and EX-RI ($t=5.443$, $p\leq 0.05$). on the overall, the results from the data analysis supports the conceptual model that project management knowledge and work experience has significant influence on project performance and success which are congruent with other research.

From the perspective of correlation, the results show that project management knowledge significantly influences project performance and success at the 0.01 level. IN-PP with 0.836, SC-PP with 0.905, CM-PP with 0.862, CO-PP with 0.794, TI-PP with 0.883, RI-PP with 0.877 and QU-PP with 0.788. Work experience, however, has a much weaker correlation with project performance and success at 0.277 and shows no correlation to project management knowledge on the overall with all variables having p-values of >0.05 , indicating that work experience does not increase or affect the level of project management knowledge of a project manager.

Based on the results, it is evident that work experience and project management knowledge are separate, independent qualities that a project manager should possess, in relation to promoting project performance and success. The results draw similarities with the derivation of competency from the paper by Boyatzis (2008). The results also presented that project management knowledge and experience are two different attributes and when combined, can be significant in various aspects (Burger, Verster and Zulch, 2015; Rezk *et al.*, 2019; Hoxha and McMahan, 2018).

Regression analysis was performed to examine the predictability of project performance and success through examining the strength of inter-variables relationships on the conceptual model. With the regression analysis performed, the PMBOK® knowledge areas were deconstructed and examined. The results show that only project scope management, project time management and project risk management have a direct influence on project performance and success and that the remaining PMBOK® knowledge areas have an indirect influence towards project performance through the former three areas. With the regression analysis, it becomes clear that work experience has no direct influence or predictability on project performance which is seen also seen in studies (Hoxha and McMahan, 2018), but however, has a direct influence on project communication management and project quality management. In that sense, an experienced project manager can manage communication and quality better than an inexperienced one. This pilot study is performed as a test-run to identify the strengths and weaknesses of the processes and analysis tools proposed or offered. The biggest limitation of this pilot study is the sample size ($n=61$) and thus, the output of the results is only representative to a certain degree of the main study as it is a means of testing for the main study.

6. Limitations and Future Directions

In the present pilot study, a small sample size of 61 was used. The results from this study cannot be used for generalization. In addition, only 7 project management knowledge areas were investigated against project success. For the main study, the following will be addressed and worked on.

- (1) To investigate all 10 knowledge areas from the PMBOK® in the research.
- (2) To explore the theoretical foundation behind project management and project success.
- (3) To explore the link between experiential learning and project management experience.
- (4) To determine a valid population size and a corresponding sample size.
- (5) To collect more data based off the determined sample size for a reliable analysis.
- (6) To identify practical implications based on the results after analysis.

7. Conclusion

This pilot study investigated the impact of project management work experience and project management knowledge on project performance and success. Data was collected using the quantitative survey method for this study. 61 respondents duly completed questionnaires were received and analysed using Statistical Package for the Social Sciences (SPSS) statistical analysis software tool. The results from the data analysis show that project performance and success are highly impacted by project management knowledge. Additionally, the pilot study results showed that work experience had no correlation with increasing one's project management knowledge even though PM knowledge has strong correlation with project performance and success. In the linear regression analysis performed, project performance is best predicted through project scope management, project time management and project risk management. Work experience has no direct influence on project performance and would only improve one's communication and quality management knowledge.

As the pilot study was performed with a small sample size ($n=61$), the results are not conclusive but only representative of the main study. For the main work, at least 250 responses will need to be collected for analysis based on the population of project managers in the construction industry of Singapore for generalisability of the results. Be that as it may, initial conclusion drawn from the pilot study suggests that employers of the construction industry in Singapore context of this research are asking of the incorrect requirements from potential employees for the project manager role. Thus, the expectation that in the construction sector/work, employees have mastered project management skills through more work experience is not supported in this study.

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