

Exploring the value of project management: Linking Project Management Performance and Project Success



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Abstract

The literature on Project Management (PM) shows that, in spite of advancement in PM processes, tools and systems, project success has not significantly improved. This problem raises questions about the value and effectiveness of PM and PM systems. This paper reports a research study which tests the relationship between PM performance and project success drawing from empirical data on PM professionals working in UAE project-based organisations.

Multi-dimensional frameworks are validated and used in this study to measure PM performance and project success. A total of 154 completed questionnaires were analysed. Bi-variate correlation and multiple regression tests found a positive influence of PM performance and its contributing variables on project success. Additionally, new variable relationships that have not previously been identified are explored between individual variables of PM performance and project success.

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1. Introduction

Project management (PM) has developed into a subject discipline alongside other management functions such as operations, information technology, or finance (Kenny, 2003) and the research literature in this discipline is growing (Besner and Hobbs, 2006; Thomas and Mullaly, 2007). Organisations are increasingly using PM as a tool to increase their productivity (Frame, 1995). The popularity of PM methodologies is confirmed by a partial longitudinal study conducted by Fortune et al. (2011) that reports a significant increase in 2011 from 2002 in the use of PM methodologies and tools within PM professionals. However, there is still limited research evidence that links PM performance with the value resulting from investment in PM. The literature suggests

that multiple benefits can be achieved from having a mature PM system in place (Bryde, 2003a; Kwak and Ibbs, 2000) and that PM is more effective than traditional functional management (Avots, 1969; Munns and Bjeirmi, 1996) but limited quantifiable evidence is available on these benefits (Thomas and Mullaly, 2007).

The Project Management Institute (PMI) conducted an in-depth study spanning 4 years and involving 65 case study organisations from 14 countries to find what value PM delivers to organisations (Thomas and Mullaly, 2009). The PMI study confirmed the value of PM but indicated that value is dependent on culture, implementation ‘fit’ with organisation needs and raised questions about the sustainability of value generation. This study concludes that PM creates tangible and intangible benefits (Thomas and Mullaly, 2008). This result is supported by many other researchers (Bryde, 2003a; Kwak and Ibbs, 2000; Phillips, 1998) but the value is defined differently from one study to another.

There is also some evidence that the value sought from a high performing PM system is associated with the success of projects

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(Cooke-Davies, 2004; Munns and Bjeirmi, 1996). The link between PM performance and project success (Cooke-Davies, 2004; Din et al., 2011; Stefanovic, 2007) is hard to model involving complex constructs often with insufficient accuracy and detail leading to findings that are fragmented and incomplete. The complexity of the issue is substantiated by the modelling effort made by Brown and Adams (2000) linking Building Project Management (BPM) to construction project success outputs of time, cost and quality, which surprisingly showed no beneficial effect of BPM upon cost and time delivery and indicated a negative relationship between BPM and the delivered quality. These findings raise questions about the value of PM as well as the appropriateness of the models used to measure the constructs of PM and Project Success. This lack of clarity on appropriate models and the need to comprehend more the value of PM forms the basis of our research study.

A number of studies investigate the nature of the term 'Project Success'. Some conceptualise it as a uni-dimensional construct concerned with meeting budget, time and quality (Brown and Adams, 2000; Bryde, 2008; Fortune et al., 2011; Müller and Turner, 2007; Turner, 2009; Wateridge, 1995) whereas others consider project success a complex, multi-dimensional concept encompassing many more attributes (Atkinson, 1999; Jugdev and Muller, 2005; Lim and Mohamed, 1999; Lipovetsky et al., 1997; Shenhar et al., 2001). Despite attempts in the PM literature to define project success and to assess it meaningfully many studies conclude that numerous projects do not meet their objectives and some fail altogether (Cicmil and Hodgson, 2006; Lee and Xia, 2005; Papke-Shields et al., 2010; Pich et al., 2002; The Standish Group, 2009). Therefore, there is a continuing need to identify the factors that positively influence project success. Some researchers have focused on identifying Critical Success Factors (CSFs) (Belassi and Tukel, 1996; Cooke-Davies, 2002; Fortune and White, 2006; Pinto and Slevin, 1987). Their research has provided a list of potential factors that assist with understanding the phenomenon of project success. However, a major limitation is that it is difficult to categorise and reduce the factors to a manageable number (Stefanovic, 2007). Though some CSF's do stand out in this long list of potential factors, there is only limited agreement among authors on critical factors and their individual influence on Project Success (Fortune et al., 2011). Hence, these studies have not yet identified a compelling model of the CSFs. Based on an extensive review of the project success literature, Muller and Jugdev (2012) concluded that a clear definition of project success does not exist and there is a need to develop meaningful and measurable constructs of project success. They indicated that the research theorising CSFs is not sufficient in meeting this objective.

Just like project success, researchers have modelled PM in many ways to determine how best to enhance PM performance. Interestingly, many of the CSFs that are identified in studies are actually the PM practices applied during project execution. However, the limitations of using CSFs for modelling, as discussed above, limit the applications of these models.

Other studies have focused on PM Maturity models based on a PM Body of Knowledge (PMBOKs) such as 'a Guide to the Project Management Body of Knowledge' (PMBOK® Guide, PMI, 2004). These models are criticised for being limited to

short-run gains and exclude intangible benefits (Jugdev and Thomas, 2002; Thomas and Mullaly, 2007).

Another approach uses established models from other fields, for example, Total Quality Management (TQM). The complementary nature of TQM and PM (Broetzmann et al., 1995; Bryde, 2003a; Choi and Eboch, 1998; Hides et al., 2000) provides some justification for adapting TQM-based models such as the European Foundation of Quality Management's Business Excellence Model (EFQM, 2011). The PM Performance Assessment Model proposed by Bryde (2003a) and the PM Excellence Model proposed by Westerveld (2003) are adaptations of the EFQM model to PM environments. However, these models have not been extensively researched.

Summarising the above review, there is an insufficient understanding of the relationships between PM Performance and Project Success. Relationships between these constructs are heavily dependent on the subjective and objective nature of how project success is perceived and defined. The inherent complexity of the constructs results in problems with modelling and in analysing their inter-relationships. Hence, this study focuses on finding empirical evidence for this relationship by selecting and validating appropriate models to measure these constructs and then analysing the relationship between these models.

2. Conceptual framework

2.1. Project Success

Projects differ in size, uniqueness and complexity, thus the criteria for measuring success vary from project to project (Müller and Turner, 2007) making it unlikely that a universal set of project success criteria will be agreed (Westerveld, 2003). Individuals and stakeholders often will interpret project success in different ways (Cleland and Ireland, 2006; Lim and Mohamed, 1999). Furthermore, viewpoints about performance also vary across industries (Chan and Chan, 2004). Muller and Jugdev's (2012) study which focuses on the evolution of the project success literature over the last decade neatly summarise this issue by asserting that it is a multi-dimensional and networked construct. They assert that perceptions of success and the relative importance of success dimensions differ 'by individual personality, nationality, project type, and contract type' (p. 768).

Consequently, a number of alternative frameworks are available for measuring project success. Pinto and Mantel (1990) recommend measuring: the success in the implementation process; the perceived value of the project; and client satisfaction with the result. In the context of the defence industry, Lipovetsky et al. (1997) propose measuring project success across four dimensions of: meeting design and planning goals; customer benefits; benefit to the developing organisation; and benefit to the defence and national infrastructure. Lim and Mohamed (1999) group project success by the use of micro and macro criteria. Whereas, Atkinson (1999) divides project success into three categories: doing the process right; getting the system right and getting the benefits right.

Informed by previous literature, Shenhar et al. (2001) advocated a comprehensive four dimensional framework for assessing project success which is cited in many PM studies (Bryde, 2008; Dvir et al., 2006; Jugdev and Muller, 2005). Shenhar et al. (2001) argue that projects are strategic and project success should be assessed according to short-term and long-term project objectives. Their framework links project success with competitive advantage and includes: Efficiency (meeting schedule and budget goals); Impact on customers (customer benefits in performance of end products and meeting customer needs); Business success (project benefits in commercial value and market share); and Preparing for the future (creating new technological and operational infrastructure and market opportunities). Shenhar et al. (2001) model these dimensions as dependent on time and the project's technological uncertainty.

Subsequently, Stefanovic (2007) argued that teamwork effectiveness should be included with these dimensions. Teamwork effectiveness is considered as a component of project success in many other studies (Bryde, 2008; El-Saboni et al., 2009; Lim and Mohamed, 1999; Muller and Jugdev, 2012; Müller and Turner, 2007; Pinto and Pinto, 1991; Wateridge, 1998 and Westerveld, 2003). The model presented by Shenhar et al. (2001) was selected for investigation in our study and was adapted to include teamwork effectiveness.

2.2. PM Performance

Traditional PM systems which exclusively pursue the success criteria of cost, time, quality and meeting technical requirements have become considered ineffective (Bourne et al., 2000; Walton and Dawson, 2001). A common approach is to focus on multiple stakeholders' expectations (Bryde, 2003b; Maylor, 2001; Tukul and Rom, 2001). This has led to a new set of difficulties in developing models for measuring performance because stakeholders' needs are often difficult to manage and measure (Boehm and Ross, 1989; Maylor, 2001) and there is sometimes resistance to going beyond the traditional criteria due to commercial pressures (Chan et al., 2003). These difficulties have resulted in limited literature on more holistic performance assessment frameworks for project environments.

It is evident in the literature that TQM and PM are two key management approaches implemented in organisations for achieving continuous improvement and organisational success (Bryde, 1997). A positive correlation has been found between TQM practices and organisational performance (Barad and Raz, 2000; Broetzmann et al., 1995; Choi and Eboch, 1998). Similarly PM is found to be an effective tool for achieving the strategic objectives of organisations (Kerzner, 2003), managing organisational change (Bryde, 2003b; Maylor, 2001) and systematic planning, execution and control of activities in a systematic manner (Meredith and Mantel, 2003).

The literature indicates that a two-way linkage exists between PM and TQM (Broetzmann et al., 1995; Choi and Eboch, 1998). PM is recognised as an effective methodology for implementing TQM practices in organisations. Similarly, TQM plays a role in providing an environment which facilitates

organisations to make use of PM (Bryde, 1997, 2003a, 2003b). These findings provide a basis for measuring PM practices using known TQM models. There is a degree of consensus amongst a group of researchers that the EFQM model, based on the TQM philosophy, is an effective performance assessment model (Neely et al., 2007; Sandbrook, 2001). Therefore, we argue that the EFQM model can usefully applied to the assessment of PM performance by adapting it to the PM environment. Westerveld's (2003) Project Excellence Model, for example, is an adaptation of the EFQM model and links the project success criteria with critical project success factors. His model consists of 12 key 'organisational areas' and is built on the assumption that the organisational areas containing critical success factors are the enablers which influence the results area comprising project success criteria.

Similarly, Bryde (2003a) linked TQM and PM practices proposing a model based on the EFQM model called the 'Project Management Performance Assessment (PMPA)'. Instead of the nine criteria used in the EFQM model the PMPA model consists of five enablers of high PM performance; PM leadership, PM staff, PM policy and strategy, PM partnerships and resources and project life cycle management process. The final area in the PMPA is PM Key Performance Indicators (KPIs), which are the practices by which actual achievement is measured. The PMPA model is presented in Fig. 1. Bryde (2003a) explains the integral parts of the PMPA model as follows:

1. PM Leadership: Focuses on
 - development and promulgation of awareness of the role of projects as a vehicle for managing all types of change
 - ensuring that PM system supports the development of open, two-way partnerships with customers and suppliers and a shared, common project language culture.
2. PM Staff: Emphasises
 - the planning and management relating to PM staff to increase its PM capability by maximising the potential of project-related human resources
 - the extent to which the management of PM staff incorporates methods for rewarding performance relating to PM.
3. PM Policy and Strategy: Focuses on how the development of PM, across an organisation, is introduced in a planned and systematic fashion ensuring the linkage between strategic, organisation level and the tactical, project level.
4. PM Partnerships and Resources: Emphasises:
 - The role and importance of win-win partnerships between all stakeholders
 - Effectiveness of such partnerships on project management strategy
5. Project Lifecycle Management Processes: Incorporates processes which are required to manage the whole project life cycle
6. PM Key Performance Indicators (KPIs): Focuses on
 - KPIs to indicate results achieved in relation to meeting the requirements of project stakeholders
 - The methods used within the PM system to improve performance against the KPIs.

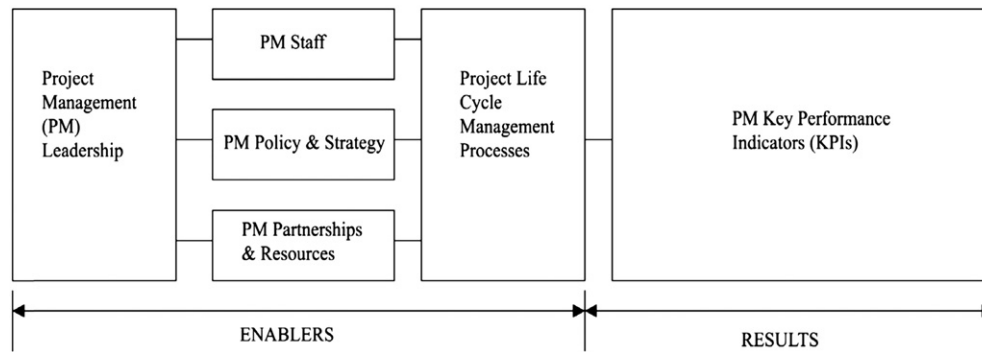


Fig. 1. The PMPA model (Bryde, 2003a, p. 233).

After detailed study of Westerveld's (2003) Project Excellence Model and Bryde's (2003a) PMPA model, the PMPA model was selected for this study as the preferred model for the performance assessment of PM. EFQM is a tried and tested model and PMPA has a closer resemblance to this model while being comprehensive enough to cover all of the aspects identified in the Project Excellence Model situated in the PM context. Furthermore, though Westerveld (2003) advocated the use of his model based on critical success factors and project success criteria, he did not present any statistical background to support his claim. In contrast, the PMPA model has been validated by Qureshi et al. (2009) and Din et al. (2011).

2.3. PM Performance and its relationship with Project Success

The PM literature argues that there is a positive relationship between PM Performance and Project Success (Bryde, 2008; Munns and Bjeirmi, 1996) and Munns and Bjeirmi (1996) claim that Project Success is dependent on appreciation of the importance of PM. They further emphasise that this role must be considered in terms of the wider organisational strategy and long-term expectations. From the above discussion it has been argued that Project Success and PM Performance are distinct yet inter-related concepts and a positive relationship between them is sought. So, it is proposed that:

Proposition 1. *There is a positive influence of Project Management Performance on Project Success* (Bryde, 2008; De Wit, 1988; Jugdev and Muller, 2005; Morris, 1998; Munns and Bjeirmi, 1996).

Hypothesis 1. H₁

There is a positive statistical relationship between PM Performance and Project Success.

Adopting the PMPA framework, the second proposition of this study explores the relationships of PM Performance variables with Project Success.

Proposition 2. The variables of the PM Performance construct have a positive influence on Project Success construct.

The following hypotheses will be tested to test the relevance of this proposition;

Hypothesis 2. H₂

There is a statistically significant positive relationship between PM Leadership and Project Success.

Hypothesis 3. H₃

There is a statistically significant positive relationship between PM Staff and Project Success.

Hypothesis 4. H₄

There is a statistically significant relationship positive between PM Policy and Strategy and Project Success.

Hypothesis 5. H₅

There is a statistically significant positive relationship between PM Partnerships and Resources and Project Success.

Hypothesis 6. H₆

There is a statistically significant positive relationship between PM Project Lifecycle Management Processes and Project Success.

Hypothesis 7. H₇

There is a statistically significant positive relationship between management of Key Performance Indicators (KPIs) and Project Success.

One school of thought argues that researchers should acknowledge the multi-dimensional nature of Project Success (Atkinson, 1999; Lim and Mohamed, 1999; Lipovetsky et al., 1997; Shenhar et al., 2001; Stefanovic, 2007), and based on Propositions 1 and 2, this study considers Proposition 3 which is:

Proposition 3. The individual Project Performance variables have a positive influence on individual Project Success elements.

A graphical representation of these hypotheses is presented in Fig. 2.

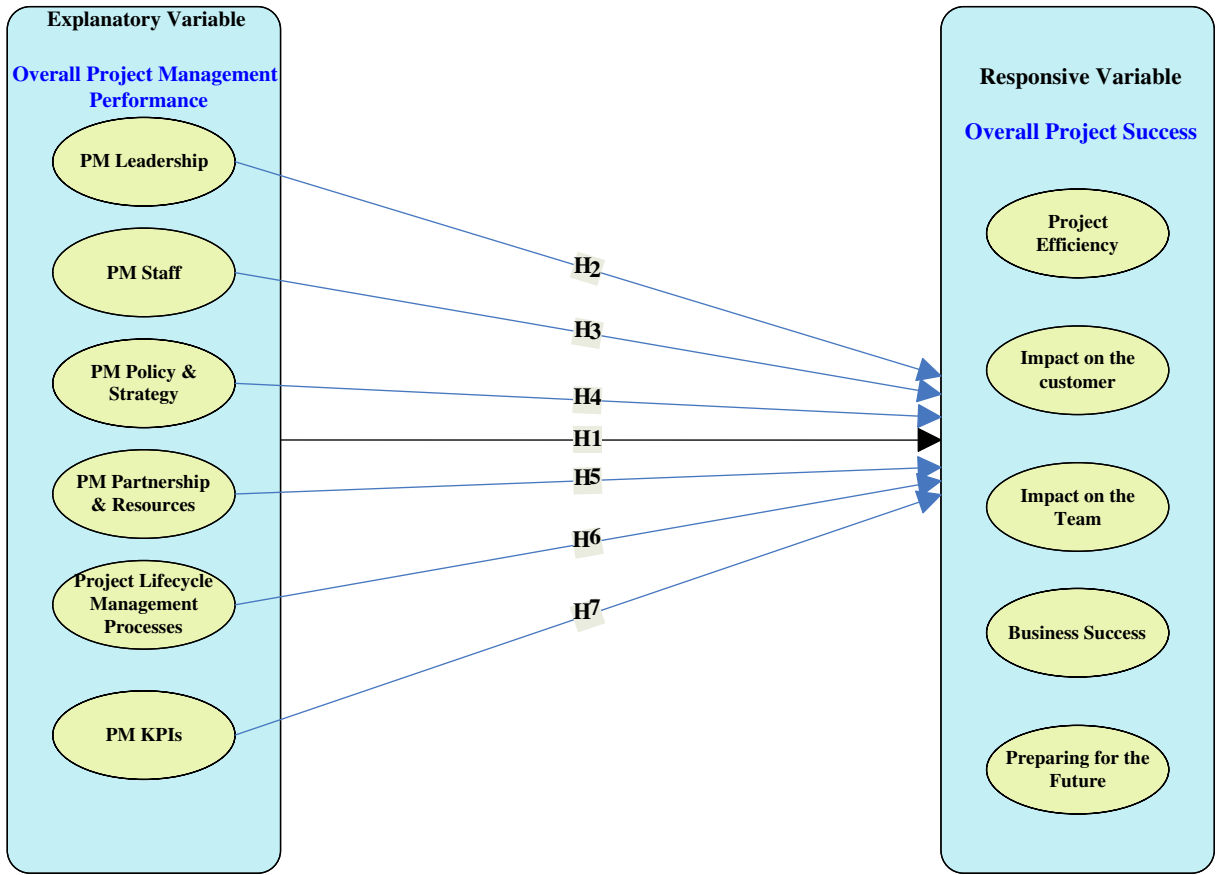


Fig. 2. Graphical representation of study hypotheses.

3. Method

3.1. Questionnaire design

A structured on-line questionnaire survey method was selected to assess relationships between Project Success and PM Performance. The items to measure Project Success and PM Performance were adapted from peer reviewed publications in the PM research area. The first section obtained descriptive data about respondents and their organisations. The next section dealt with PM Performance and asked respondents to agree or disagree with the given statements within the context of the PM practices in their organisations. In section three, data was elicited about Project Success in the context of a project recently completed within the organisation.

3.2. Internal and external validity

Both internal and external validity were considered. Since selection of the initial measurement items was based on a review of the theoretical and empirical literature, it is important to assess internal validity. A pilot questionnaire test was undertaken. Five potential participants were requested via email or face-to-face (at work) to complete a questionnaire and to present a critique of the questions. Some of the changes suggested by the participants in the pilot survey were incorporated in the final questionnaire. The

revised questionnaire comprised 48 items divided in 19 questions within 3 sections.

3.3. Study sample

A web-link for the on-line questionnaire was sent to PM professionals working in UAE organisations via email. The researcher requested the recipients to forward the web-link to other colleagues in their organisation working with projects. The theoretical sampling frame comprised approximately 1500 PM professionals. A total of 154 responses were received over a period of 4 weeks. The calculated traditional response rate in this case was 10.3% however, it should be considered as an understated representation since in the snowball approach to sampling, used in this survey, a traditional response rate cannot be accurately calculated (Müller and Turner, 2007). All of the returns were considered usable for the study.

4. Data analysis and results

4.1. Reliability

Reliability was investigated for each construct using Cronbach's alpha. Based on the results, Q7 and Q8 were removed from the PM Performance scale. After eliminating these questions, the alpha coefficient for all scales, except PM

Leadership and PM Policy and Strategy, was above the acceptable threshold level of 0.7 (Pallant, 2006). For PM Leadership (after excluding Q7 and Q8) and PM Policy and Strategy the alpha coefficient value was above 0.6 which is considered acceptable in social science research (Cronbach, 1951; Nunnally, 1978). All the alphas for variables within Project Success were above the acceptable value of 0.7.

The final results were: PM Performance construct (92.7%) and Project Success construct (93.2%). Cronbach alpha of the overall survey tool after excluding Q7 & Q8 was 95.4%. These results confirmed the appropriateness of further analysis of the data without any further deletion of items.

4.2. Inferential Statistics; Correlations and Regressions

The sample consisted of 154 responses. According to the central limit theorem, for such sample sizes, the sampling distribution will take the shape of a normal distribution (Field, 2009). This is reasonable justification for using parametric tests and therefore Pearson's correlation coefficient test was chosen to identify and analyse the main findings of the study.

4.2.1. Pearson's r correlation

The relationships between the dependent variables and independent variables were investigated using bi-variate correlation analysis. The parametric Pearson's correlation coefficient test results showed that Project Success construct was significantly correlated with the PM Performance construct and with each of its variables. Results are given in Table 1.

Reading the Pearson's correlation matrix in Table 1, it was observed that:

- a) All of the research hypotheses are supported. There is a statistically significant relationship ($p < 0.01$) between the independent variables and the Project Success construct. The final row of Table 1 shows the corresponding r values.
- b) The highest value is for PM Performance showing the strongest correlation between the independent and dependent constructs.
- c) Correlation associations for PM Leadership, PM Staff, PM Lifecycle Management Processes and PM KPIs have the highest co-efficient values (0.538, 0.570, 0.556 and 0.578 respectively) and hence are highly associated with the Project Success construct.
- d) The remaining two variables (PM Policy & Strategy and PM Partnerships & Resources also have statistically significant relationships ($p < 0.01$) though correlation coefficient values are between 0.4 and 0.5.
- e) Table 2 presents some interesting high correlation coefficients between the individual variables of PM Performance construct and the individual variables of Project Success construct. This table shows that:
 - i. PM Leadership, PM Staff, PM Lifecycle Management Processes and PM KPIs are showing correlation value of 0.5 and above with Impact on Project Teams. The

highest correlation value is observed for PM KPIs and Impact on Project Team (0.574).

- ii. PM KPIs show a slightly higher correlation coefficient values (all r values > 0.4) for all Project Success variables.

4.2.2. Linear regression of independent variables with Project Success construct

To further explore the collected data and validate earlier inferences about correlations, linear regression tests were conducted. Summarised results of linear regression are presented in Table 3 whereas the first column of this table gives the reference to corresponding Research Hypothesis.

Some key findings from Table 3 are as follows:

- a) PM Performance explained 44.9% of the variance in Project Success, with a very significant relationship explained by F values and Beta values ($F = 125.47$, $\beta = 0.672$, $p < 0.001$).
- b) PM KPIs, PM Staff, and PM Lifecycle Management Processes also explained at least 30% variances individually in Project Success (each with significant relationship having $p < 0.001$, high F values and Beta values of 0.578, 0.57 and 0.556 respectively).
- c) All other relationships, though are significant, explain less than 30% variance in the dependent variables.

To rule out the issue of multicollinearity in the regression analysis, a Variance Inflation Factor (VIF) test was performed. Table 3 shows the VIF test results for the independent variables with the Project Success construct as the dependent variable. Given that the VIF values are below 10 and tolerance levels are above 0.2, this confirms that multicollinearity is not a problem in this data set for regression modelling (Field, 2009). The Durbin–Watson test was also performed to detect the presence of autocorrelations in the residuals. The values of the Durbin–Watson statistics reported in Table 3 are close to '2' which are considered acceptable for this test (Field, 2009).

4.2.3. Findings—correlation and linear regression cross-validation

The findings from Sections 4.2.1 and 4.2.2 can be cross examined by cross-tabulating the results of both correlations and regression against each other as shown in Table 4. This table shows the F values from linear regression ranked in descending order along with the correlation values from the Pearson correlations. It is observed that the linear regression analysis supports the results of the correlation tests.

4.2.4. Linear regression results for independent variables with each dependent variable

To explore the validity of Proposition 3, linear regression models were run for Project Performance and each of its variables (Independent variables) against each variable of Project Success (Dependent Variables). To analyse the results, the summarised model results are given in the Table 5.

Table 1
Pearson’s correlation of independent and dependent variables.

	PM Leadership	PM Staff	PM Policy & Strategy	PM Partnerships & Resources	PM Lifecycle Management Processes	PM KPIs	PM Performance	Project Efficiency	Impact on Customer	Impact on Project Team	Business Success	Preparing for Future	Project Success
PM Leadership	1.000												
PM Staff	.483	1.000											
PM Policy & Strategy	.525	.573	1.000										
PM Partnerships & Resources	.493	.448	.514	1.000									
PM Lifecycle Management Processes	.593	.586	.530	.586	1.000								
PM KPIs	.524	.641	.584	.519	.712	1.000							
PM Performance	.753	.768	.752	.728	.871	.867	1.000						
Project Efficiency	.369	.365	.229	.254	.332	.417	.421	1.000					
Impact on Customer	.438	.492	.406	.443	.470	.444	.560	.584	1.000				
Impact on Project Team	.554	.546	.435	.449	.537	.574	.653	.508	.595	1.000			
Business Success	.359	.451	.405	.376	.401	.438	.506	.409	.655	.568	1.000		
Preparing for Future	.459	.431	.444	.395	.505	.478	.572	.380	.538	.596	.618	1.000	
Project Success	.538 ^a	.570 ^b	.477 ^c	.482 ^d	.556 ^e	.578 ^f	.672 ^g	.724	.885	.797	.811	.758	1.000

Notes: Correlation is significant at the 0.01 level (2-tailed) for all variable associations in the table given above.
Bi-variate association specific to study hypotheses.

^a H2.
^b H3.
^c H4.
^d H5.
^e H6.
^f H7.
^g H1.

Table 2

Correlation associations between individual Project Performance variables and individual variables of Project Success.

	PM Leadership	PM Staff	PM Policy & Strategy	PM Partnerships & Resources	PM Lifecycle Management Processes	PM KPIs
Project Efficiency	.369	.365	.229	.254	.332	.417
Impact on Customer	.438	.492	.406	.443	.470	.444
Impact on Project Team	.554	.546	.435	.449	.537	.574
Business Success	.359	.451	.405	.376	.401	.438
Preparing for Future	.459	.431	.444	.395	.505	.478

Notes: Correlation is significant at the 0.01 level (2-tailed) for all variable associations in the table given above.

Key findings are as follows:

- a) Table 5 lists 7 model summaries (first 6 models representing each variable of Project Performance and 7th model was made for Project Performance construct itself) for each variable of Project Success construct (dependent variables).
- b) Table 5 also highlights top 10 (solid shaded boxes) and bottom 10 (shaded with diagonal lines) model fit values (Adjusted R Square) to indicate which Independent Variables explain most in the corresponding Dependent Variables.
- c) The table with its legend mentioned above indicates that Project Performance construct itself is amongst the top 10 models hence explaining the most for each variable of Project success, except Project Efficiency. It explains the most in Impact on Project Team (42.3%) and the least for Project Efficiency (17.2%).
- d) Impact on Project Team is the single-most-variance-explained Project Success variable by the majority (4 out of 6) of Project Performance variables. PM KPIs explains the most variance (32.5%) after Project Performance explained above. The same result was earlier found during correlation of the Project Success variables with Project Performance variables indicating the fact the Impact on Project Team has the highest correlation with each variable of Project Performance.
- e) Impact on Project Team is followed by Preparing for Future and Impact on Customer each having 2 variables of Project Performance among top 10 model fit values. Similar results were earlier found during correlation of Project Success variables with Project Performance variables. The results show comparatively higher correlation of Preparing for Future and Impact on Customer with each Project Performance variables compared to Business Success and Project Efficiency.
- f) Project Efficiency is the least-variance-explained dependent variable with 5 out of 6 Project Performance variables among the bottom 10 model fit rates among all possible models. Maximum variance explained by any model for this variable was by PM Performance itself with 17.2% model fit and it was followed by PM KPI with model fit value of 16.8%. A similar result was found in the correlation test of Project Success with Project Performance variables indicating that Project Efficiency had lowest correlation with most of the Project Performance variables.
- g) Business Success was also found to be least explained by almost all variables of Project Performance with most variance being explained by the model with PM Performance itself (25%).

4.2.5. Multiple regressions

A stepwise approach using both forward and backward methods of regression was used. A best fit model was generated by backward stepwise method, explaining most variance in the dependent variable (Project Success). The results are given in Tables 6 and 7. These tables indicate that Model 3 was the best fit; PM Leadership, PM Staff, PM Partnerships & Resources and PM KPIs collectively define 45% variance in Project Success. Adding or removing any further independent variable decreases the model fit.

4.3. Construct validity

Principal Component factor Analysis (PCA) with varimax rotation was conducted to validate the underlying structure of the PM Performance and Project Success constructs.

4.3.1. PM performance construct validity

PCA was employed for factor extraction on the 20 items of PM Performance construct. Kaiser (1960 in Field, 2009) recommends retaining all factors with eigenvalues greater than 1. The results revealed the presence of four components with eigenvalues exceeding 1, explaining 42.9%, 7.3%, 5.8% and 5.6% of the variance respectively. After Varimax rotation the four-component solution explained a total of 61.5% of the variance, with component 1 contributing 27.5%, component 2 contributing 13.85%, component 3 contributing 11.09% and component 4 contributing 9.07%.

4.3.2. Project Success construct validity

PCA revealed the presence of four components with eigenvalues exceeding 1, explaining 44.6%, 8.96%, 6.76% and 5.12% of the variance respectively. To aid the interpretation of these four components, Varimax rotation was performed. The four-component solution explained a total of 65.4% of the variance, with component 1 contributing 22.78%, component 2 contributing 18.55%, component 3 contributing 12.82% and component 4 contributing 11.26%.

5. Discussion

5.1. The PM Performance–Project Success relationship

The statistically positive relationship found between PM Performance and Project Success is consistent with previous research (Din et al., 2011; Stefanovic, 2007; Stefanovic and

Table 3
Summarised results of hypotheses testing using linear regression.

Ref	Independent variables	Dependent variable	R	R Square	Adjusted R Square	Durbin-Watson	F	Sig.	t	Sig.	Unstandardised Coefficients		Standardised Coefficients		Tolerance	VIF
											Coefficients		Coefficients			
											B	SE	Beta	Beta		
H1	Constant	Project Success	0.672	0.452	0.449		125.47	0.000	5.356	0.000	15.044	2.809				
	PM Performance					2.043			11.201	0.000	.670	.060	0.672			
H2	Constant	Project Success	0.538	0.29	0.285		61.981	0.000	7.75	0.000	22.996	2.967				
	PM Leadership					1.859			7.873	0.000	2.709	.344	0.538	.568	1.759	
H3	Constant	Project Success	0.57	0.325	0.321		73.284	0.000	14.151	0.000	29.189	2.063				
	PM Staff					1.921			8.561	0.000	3.430	.401	0.570	.506	1.976	
H4	Constant	Project Success	0.477	0.227	0.222		44.703	0.000	8.035	0.000	25.235	3.141				
	PM Policy & Strategy					1.958			6.686	0.000	3.027	.453	0.477	.527	1.899	
H5	Constant	Project Success	0.482	0.232	0.227		46.005	0.000	9.228	0.000	26.694	2.893				
	PM Partnerships & Resources					2.073			6.783	0.000	2.855	.421	.482	.583	1.715	
H6	Constant	Project Success	0.556	0.31	0.305		68.182	0.000	10.789	0.000	26.392	2.446				
	PM Lifecycle Management Processes					2.234			8.257	0.000	2.036	.247	.556	.384	2.604	
H7	Constant	Project Success	0.578	0.334	0.329		76.178	0.000	10.627	0.000	25.604	2.409				
	PM KPIs					2.079			8.728	0.000	2.027	.232	.578	.391	2.556	

Table 4

Combined results for correlation test and linear regression tests.

Ref	Independent variables	Dependent variable	Pearson's Correlations	Linear regression results	
				F	Sig.
H1	PM Performance	Project Success	.672	125.47	0.000
H7	PM KPIs	Project Success	.578	76.178	0.000
H3	PM Staff	Project Success	.570	73.284	0.000
H6	PM Lifecycle Management Processes	Project Success	.556	68.182	0.000
H2	PM Leadership	Project Success	.538	61.981	0.000
H5	PM Partnerships & Resources	Project Success	.482	46.005	0.000
H4	PM Policy & Strategy	Project Success	.477	44.703	0.000

Shenhar, 2007). The linear regression results show that PM Performance explained 44.9% of the variance in Project Success, with a significant relationship explained by F values and Beta values ($F = 125.47$, $\beta = 0.672$, $p < 0.001$). This indicates that by managing PM Performance the chances of project success can be significantly increased. This lends support to confirm *Hypothesis 1* (H_1). However, there is still 55.1% of the variance unexplained which depends on factors other than PM Performance. Previous work suggests that perceptions of Project Success are influenced by other factors in the project environment, for example, the inherent risk (Din et al., 2011), or the choice of contract type (Sadeh et al., 2000). This unexplained variance should therefore be explored further but was not within the scope of this study.

5.2. Influence of individual PM Performance variables on Project Success construct

All the other hypotheses predicting statistical relationships between the independent variables (PM Performance variables) and the dependent variable (Project Success construct) were also confirmed. These findings clearly show that enhanced Project Success can be achieved by focusing on the individual variables of PM Performance.

The Pearson's correlation and linear regression results found that:

- [Management of] PM KPIs is the most significant individual variable contributing towards the success of any project. This suggests that if there is PM performance measurement in an organisation it can significantly impact on Project Success. The PM literature advocates defining the targets and using measures to achieve required results (Bourne et al., 2000; Bryde, 2005; Thomas and Fernandez, 2008). Therefore, methods should exist in an organisation to formally develop these KPIs. Organisations should have a system that ensures that KPIs are developed from the perspective of all stakeholders and encompass not only short-term benefits (for example, meeting cost, time, quality objectives of current projects), but also the long-term

Table 5

Linear regression results for independent variables with individual variables of Project Success.

Independent variable	R	R Square	Adjusted R square	Std. error of the estimate	Dependent variable
a PM Leadership	.438(a)	0.192	0.187	4.014	Impact on customer
c PM Staff	.492(c)	0.242	0.237	3.889	
d PM Policy and strategy	.406(d)	0.165	0.159	4.081	
e PM Partnerships and resources	.443(e)	0.197	0.191	4.003	
f PM Lifecycle management processes	.470(f)	0.221	0.216	3.943	
g PM KPIs	.444(g)	0.197	0.192	4.002	
h PM Performance	.560(h)	0.314	0.31	3.699	
a PM Leadership	.554(a)	0.307	0.302	2.127	Impact on project team
c PM Staff	.546(c)	0.298	0.294	2.141	
d PM Policy and strategy	.435(d)	0.189	0.184	2.301	
e PM Partnerships and resources	.449(e)	0.201	0.196	2.283	
f PM Lifecycle management processes	.537(f)	0.288	0.284	2.156	
g PM KPIs	.574(g)	0.33	0.325	2.092	
h PM Performance	.653(h)	0.426	0.423	1.935	
a PM Leadership	.359(a)	0.129	0.123	2.68	Business success
c PM Staff	.451(c)	0.203	0.198	2.564	
d PM Policy and strategy	.405(d)	0.164	0.159	2.625	
e PM Partnerships and resources	.376(e)	0.141	0.136	2.661	
f PM Lifecycle management processes	.401(f)	0.161	0.155	2.631	
g PM KPIs	.438(g)	0.192	0.186	2.582	
h PM Performance	.506(h)	0.256	0.251	2.477	
a PM Leadership	.369(a)	0.136	0.131	2.685	Project efficiency
c PM Staff	.365(c)	0.133	0.128	2.69	
d PM Policy and strategy	.229(d)	0.052	0.046	2.813	
e PM Partnerships and resources	.254(e)	0.065	0.059	2.794	
f PM Lifecycle management processes	.332(f)	0.11	0.104	2.726	
g PM KPIs	.417(g)	0.174	0.168	2.626	
h PM Performance	.421(h)	0.177	0.172	2.621	
a PM Leadership	.459(a)	0.211	0.206	2.268	Preparing for future
c PM Staff	.431(c)	0.186	0.181	2.304	
d PM Policy and strategy	.444(d)	0.197	0.192	2.288	
e PM Partnerships and resources	.395(e)	0.156	0.15	2.346	
f PM Lifecycle management processes	.505(f)	0.255	0.25	2.203	
g PM KPIs	.478(g)	0.229	0.224	2.243	
h PM Performance	.572(h)	0.327	0.323	2.095	

Legend:



Top 10 model fit values



Bottom 10 model fit values

Table 6
Summary results of multiple regression tests.

Model	R	R Square	Adjusted R Square	F	Sig.
1	.683 ^a	.467	.445	21.472	.000 ^a
2	.683 ^b	.467	.449	25.925	.000 ^b
3	.681^c	.464	.450	32.294	.000^c
4	.664 ^d	.440	.429	39.323	.000 ^d

Dependent Variable is Project Success for all 4 models presented in Table 6 above. Model 3, shown in bold in Table 6, is best fit out of the 4 models.

^a Predictors: (Constant), PM KPIs, PM Partnerships & Resources, PM Leadership, PM Policy & Strategy, PM Staff, PM Lifecycle Management Processes.

^b Predictors: (Constant), PM KPIs, PM Partnerships & Resources, PM Leadership, PM Staff, PM Lifecycle Management Processes.

^c Predictors: (Constant), PM KPIs, PM Partnerships & Resources, PM Leadership, PM Staff.

^d Predictors: (Constant), PM Partnerships & Resources, PM Leadership, PM Staff.

benefits for the organisation like learning and continuous improvement.

- b) PM Staff is the next most important individual independent variable contributing towards project success. The items measuring PM Staff were related to PM training of staff and the relevance of staff appraisal to their PM performance. The results show a relatively higher influence of the PM Staff variable on Project Success, which is consistent with best practice HRM. The role of PM staff and their training is also recognised in the PM literature (Cooke-Davies and Arzymanow, 2003; Edum-Fotwe and McCaffer, 2000; Loo, 2002) and PM training is recognised as a CSF (Fortune and White, 2006). This study also confirms the positive influence of trained PM staff on Project Success.
- c) The results show that PM Leadership with correlation coefficient value of 0.538 ($p < 0.01$) also has a high contribution towards Project Success. Christenson and Walker (2004) also found a significant positive effect for PM leadership on the success of a project. The results indicate that to enhance Project Success, PM Leadership needs to: develop a project-centered culture in the organisation; open new avenues for partnerships; enhance relationships between internal and external customers and use PM methodologies to drive positive change.
- d) PM Lifecycle Management Processes also have a positive statistical relationship with Project Success. The importance of life-cycle model implementation along with appropriate procedures is highlighted through these results.
- e) PM Partnership & Resources, and Policy & Strategy are the lowest ranked in terms of correlation with Project success.

Table 7
Multiple regression models' coefficients.

Model		Unstandardised Coefficients	t	Sig.
3	(Constant)	15.572	2.928	5.318 .000
	PM Leadership	1.160	.378	3.069 .003
	PM Staff	1.532	.485	3.157 .002
	PM Partnerships & Resources	.826	.439	1.882 .062
	PM KPIs	.775	.299	2.591 .011

Table 8
Re-organisation of the PM Performance factor.

Initial factors	Re-organised factors
PM Leadership	PM Leadership (Some culture items within PM Leadership scale were merged with PM Environment)
PM Policy and Strategy	Retained as is
PM Partnerships and Resources	Retained as is
PM Staff	These three terms were merged with culture items from PM Leadership scale and renamed 'PM Environment'
Project Lifecycle	
Management Processes	
PM KPIs	

These variables are part of the macro-level policies of an organisation and respondents might not have been able to relate directly to the macro-managed components of an organisation's governance framework.

However, when we look closer at the multiple regression results, they indicate that by excluding the variables of Policy & Strategy and PM Lifecycle Management Processes, the collective output is more meaningful than either the combined effect of all independent variables or any single variable's individual variance. Therefore, the combined effect of PM KPIs, Staff, Leadership and Partnerships and Resources explains most of the variance in Project success. The redundancy of PM Policy & Strategy is understandable considering the fact that it is a macro-managed component of the organisation's governance framework and the effect of this variable might not be visible at the operational level of the project environment. However, the redundancy of the Project Lifecycle Management Processes variable is somewhat of a surprise. This may be explained by considering the fact that the items relevant to the Lifecycle Management Processes variable are sometimes considered inherent to any PM system and therefore are not identified by the best fit multiple regression model. The difference in the explained variance after removing Project Lifecycle Management Processes from the model is only 0.1% which is negligible and hence there is a limited justification for retaining it and so it was removed from the model.

Table 9
Re-organisation of the Project Success factor.

Initial factors	Re-organised factors
Project Efficiency	Retained as is
Impact on the Customer	Merged with Financial Success items from Business Success scale and renamed 'Impact on the Customer and Financial Success'
Impact on the Project Team	Retained as is
Business Success	Split and merged with other factors
Preparing for the Future	Merged with Organisation's reputation and market share items of Business Success and renamed 'Impact on Long Term Benefits'

5.3. The relationships of PM Performance construct and its variables with individual Project Success variables

The findings of this study also provide confirmatory evidence that enhanced outcomes can be achieved for individual Project Success variables by focusing on PM Performance variables. It is the first time that the relationships between the PMPA framework elements and Project Success variables have been explored. This is a new contribution of this study.

The linear regression results showed that:

- a) Impact on Project Team is the single-most-variance-explained Project Success variable by the majority (4 out of 6) of Project Performance variables. The same result was earlier found during correlation of Project Success variables with Project Performance variables indicating that the Impact on Project Team has the highest correlation with each variable of Project Performance. The results show the importance of the Impact on Project Team variable for PM practitioners. Project performance can have a major impact on project teams. The perception of a successful project motivates the team and increases team member engagement and commitment to the project as well as to the team itself. It is also seen that PM KPIs explain the most variance (32.5%) among the individual PM Performance variables in Impact on Project Teams. This result showing PM KPIs as being the most effective variable to explain variance in Impact on Project teams highlights an important finding for Project Managers and HR Managers, i.e., having an effective PM KPI management framework positively and highly influences the engagement of project teams.
- b) PM KPIs seem to have the most wide-ranging impact across the different variables of Project Success. It has the highest correlation with Impact on Project Teams, followed by Project Efficiency, Preparing for Future and Business Success, in the same rank order. Therefore, it is concluded that having a formal management system for developing, managing and updating KPIs formally in an organisation can directly impact on Team Performance and Project Efficiency.
- c) The results also indicate that in addition to PM KPIs, PM Lifecycle Management Processes and PM Staff are also explaining a reasonable amount of the variance in the PM Success variables. These three variables concern the operational aspects of the PM Performance construct. This result is consistent with the study of [Stefanovic and Shenhar \(2007\)](#) who suggest that operational excellence in PM environments positively influence project success. It is worth noting that these variables of PM performance are derived from a TQM philosophy which is based on the theme of operational excellence.
- d) Another interesting observation is that Project Efficiency was found to be the least impacted variable on an overall basis as it had the lowest correlation coefficient values with every variable of PM Performance, except for PM KPIs. It can be argued that the constraints of time, budget and efficient management should be the most highly impacted aspects of a Project by the PM Performance level within an

organisation. This result shows conversely that although there is a significant relationship between the PM performance variables with Project efficiency, it is not the most highly impacted.

- e) The next lowest ranked variable was Business Success, although it did have a relatively higher correlation with PM KPIs and PM Staff. This could be due to the fact that Business Success might not be visible to everyone in the organisation and hence the results might be skewed. This shows the need for keeping all the project relevant staff informed about the Business Success that is being achieved through individual projects. The result indicating Project Efficiency and Business Success being least explained by all variables of Project Performance deserves additional investigation as that does not conform to generally believed PM practices.
- f) An organisation's future success (represented by Preparing for Future) is greatly impacted by lifecycle management processes and systems implemented in the organisation as shown by the results. This provides empirical evidence of the long-term benefits that an organisation can achieve by investing in the lifecycle management processes and systems within the organisation.

5.4. Validation of the PMPA framework and project success construct

This study also explored the validity of the variables/factors that were proposed by the literature in the context of this study (i.e. project-based organisations in the UAE).

An exploratory Principle Component Factor Analysis was performed for PM Performance and Project Success scales to determine the resultant factors. These modified PM Performance and Project Success constructs were renamed as PM_Performance_Modified and Project_Success_Modified. From the results re-organisation of PM performance factors was made, shown in [Table 8](#).

Examining the PM Leadership Component loadings it can be interpreted that some items relevant to PM culture did not actually belong to this scale. It was noticeable that the PM Leadership scale had the lowest reliability initially ($\alpha = 0.568$) which was increased to 0.649 after removal of two questions. The value was still less than the more widely accepted alpha value of 0.7. Therefore, some re-organisation was expected in this scale.

Based on the PCA results, the initial six variables were reorganised into four factors. The processes within the organisation (i.e. processes to manage staff, project lifecycle management and KPIs) were difficult to differentiate from each other and hence were merged to create one factor, PM Environment. This we take to mean that all of these components contribute to the overall environment of PM within an organisation.

The final four factors seem to be coherent and can be divided into two distinct groups, either being 'Directly-relatable' (factor of PM Environment which is very much visible to employees at all levels and managed by themselves) to employees or 'Indirectly-relatable' (such as Partnerships and Resources, Policy

and Strategy, and Leadership) for employees in general as they relate to the higher-level strategy and governance of an organisation. It is also worth noting that the PM Environment is the strongest factor (being the first factor) explaining the most variance in the PM_Performance_Modified construct which is followed by the other three 'Indirectly-relatable' factors.

The re-organisation resulting from PCA conducted on Project Success is presented in Table 9. The PCA outcomes are very close to the original construct. It can be argued that financial success can be considered as a contributing factor to the Impact on the Customer because financial success indirectly suggests that the customer is satisfied. The same approach is adopted by Atkinson (1999) who amalgamated the Impact on the Customer and Business Success together into one factor 'The benefits'.

Furthermore, the increase in market share and increase in reputation would actually benefit the long term plans of an organisation and hence can be merged with the Preparing for Future factor. Lipovetsky et al. (1997) names a similar factor as 'Benefits to the Developing Organisation'.

Finally, the results also showed that Project Efficiency is the last component identified by PCA explaining only 11.26% in Project_Success_Modified construct. This again supports the previous argument that Project Efficiency, which is generally considered the most important factor in project success, in actual project settings is actually the least significant compared to other factors like Impact on Customer and Financial Success, Impact on Project Team and Impact on Long Term Benefits. It can be argued that the other factors when compared to Project Efficiency are more important for organisational success because it is understandable that if financial success is achieved, customer and project team members are likely to be satisfied and achieve long-term benefits. Thus it might become quite insignificant over the long run whether the schedule, budget and timelines were met exactly or not or if the project was executed in the most efficient manner.

6. Recommendations

The main recommendation arising from this study is that project based organisation should invest in a PM Performance framework in order to enhance the probability of achieving Project Success.

This study also assessed the individual relationships between the PM Performance variables and Project Success construct and some important results were identified from which we make the following recommendations:

- a. PM KPIs variable was observed to be the most significant individual variable contributing towards the success of any project. This is evidence for the necessity of performance measurement in an organisation to enhance Project Success. Therefore, organisations should invest time, effort and financial resources to formally develop PM methods to manage KPIs. These methods should focus on the alignment of KPIs with the organisation strategy and should ensure that

all the stakeholders' perspectives are taken into account while designing and implementing KPIs.

Furthermore, these methods should ensure that the KPIs encompass not only the short-term benefits (for example, meeting cost, time, quality objectives of current projects), but also the long-term benefits for the organisation like learning and continuous improvement.

- b. This research found evidence that the PM Staff variable has an important role in achieving success in projects. Organisations must ensure that Project-related training is imparted to PM staff. The appraisal system in PM organisations should be designed to evaluate performance mainly on the performance of staff on project-related activities.
- c. This study showed that some macro-managed components of an organisation's governance framework influence Project Success but these were usually ranked lower in terms of influencing Project Success due to perhaps these components being less visible to the project staff. It is recommended that such components like relations with customers and partners, and Policy and Strategy should be made more visible in the organisation to all levels in the PM hierarchy. Visibility and transparency in the policies and strategies of the organisation will ensure that all employees are enabled to work towards achieving the strategic objectives and hence will contribute to the success of the projects and the organisation.
- d. The results showed the importance of PM Performance for project team members. A well performing PM Performance framework can have a major positive impact on project teams. Organisations are recommended to build on this finding by investing in PM Performance frameworks, because an organisation employing motivated team members is more likely to achieve better project results, higher employee engagement and improved retention rates.
- e. It was also seen that an organisation's future success (represented by Preparing for Future) is greatly impacted by lifecycle management processes and systems implemented in the organisation. This conclusion is an important lesson for business and project managers as they can lead their organisations in preparing for the future and sustainable long-term success by investing in processes and systems.

7. Contribution of this research

This study provides empirical evidence of the relationship between PM Performance and Project Success and explains how factors of PM performance can enhance the project success rate.

The relationships between PMPA factors and PM success factors have not been explored in previous literature and this is the first study to explore the relationships at factor-level. It contributes to validating the PMPA framework and proposes refinements of the model.

These findings provide support for PMPA in the context of the UAE and will be helpful to project management practitioners working in GCC countries and elsewhere.

8. Study limitations and recommendations for future research

The study limitations are listed below along with suggestions for areas of future research:

- a. This study is limited to the context of the UAE and therefore the results may only be considered valid in this particular context. Future research can collect data from other geographical locations to see whether the findings are replicated and to explore the influence of national culture on the relationship between PM Performance and Project Success.
- b. Due to time constraints and the sampling of data over many organisations, cross-sectional methods were used in this study. A longitudinal design would be beneficial particularly if the research is focused on a particular sector or organisation.
- c. The questionnaire is only administered in English and therefore, native English speakers might have had an advantage over non-native English speakers who are more likely to experience difficulty in understanding complex use of language or idiom.
- d. It is acknowledged that other factors influence Project Success besides PM Performance. Indeed 45% of variance (as shown by the best fit model from multiple regression analysis) is explained by the PM Performance construct whereas 55% variance remains unexplained. Prior work also suggests that Project Success perceptions are influenced by various other factors relating to the project environment, for example, the inherent risk (Din et al., 2011), or the choice of contract type (Sadeh et al., 2000). This and other sources of unexplained variance can therefore be explored further.
- e. A limitation of this study is it is based on self-report responses and such responses are often known to be affected by participants' biases. It is possible that bias was introduced as participants, in their retrospective assessments, cannot or do not, always accurately recall a past situation's attributes. Future studies could be designed to have two (or more) perspectives from each organisation.
- f. The survey was dependent on only one group of respondents for the independent and dependent variables (self-report responses). The survey data collection therefore suffers from the common method variance problem (Podsakoff et al., 2003). To eliminate the occurrence of response bias, future research could collect data from other relevant project stakeholders, particularly, project owners, executive directors, and project steering groups.

9. Conclusion

This research study demonstrates that PM performance is correlated to Project Success within UAE organisations. By paying greater attention to this relationship, organisations can increase their rate of project success.

It was seen through linear regression analysis that PM Performance explains at least 44.9% variance in Project Success. A significant influence of different variables of PM Performance on Project Success was also observed; PM KPIs and PM Staff

were found to be the most influential while PM Policy and Strategy was found to be least significant. It was found that variables which employees can relate directly to in their project environments have the most impact on Project Success as compared to higher-level and less directly related variables. This implies that organisations need to make specific initiatives to communicate issues of Strategy and Policy, in ways that are likely to be visible and meaningful to employees.

An important finding was the comparatively low impact of PM Performance on Project Efficiency. The PM Performance construct and its variables had markedly greater impact on project success attributes than did Project Efficiency which is more limited in its influence. The value of Project Management is not so much in achieving Project Efficiency in individual projects rather it lies in its overall degree of success which encompasses customer satisfaction, business success of the organisation and achievement of long-term benefits.

The PMPA framework was found to be an appropriate representation of PM Performance but while implementing the PMPA framework, care should be taken to ensure that the high level factors in the framework (Policy and Strategy, Partnerships and Resources and Leadership) are made visible and meaningful to employees.

PCA also confirmed the multi-dimensionality of the Project Success construct and it was seen confirmed that the model used in this study is a fairly accurate representation of the construct.

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