Factor analyzing project management practices in the United Arab Emirates

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Abstract

Purpose – The purpose of this paper is to examine the underlying dimensional structure of project management practices to identify key factors that underpin the successful completion of projects.

Design/methodology/approach – It employs exploratory factor analyses to investigate the interrelationships of the survey items synthesized from the literature by retaining and reorganizing the important information from the original data while redundant information is removed.

Findings – The nine theoretical constructs comprising 64 items were coalesced onto five latent constructs comprising 50 items while explaining 50.914 percent of the total variance. The extracted five constructs that describe the best project management practices have been labelled risk management, organizational culture, stakeholder approach, management approach, and project leadership.

Practical implications – The study results benefit both practitioners and the academic community as five broad categories of best project management practices are identified and their interdependencies are established. Project management professionals can use the latent factors as the critical factors for project success, whereas the research community can use the authors' results to build higher order structural models and to test hypotheses by linking the latent variables with project performance measures.

Originality/value – The study contributes to the discourse on project management by identifying critical practices that contribute to the successful completion of projects.

Keywords UAE, Project, Project-based organization, Success factors, Project management practices

Paper type Research paper

1. Introduction

In the last three decades, the body of knowledge on project management (PM) has advanced substantively and, as a discipline, PM has gained considerable prominence and significance (Mir and Pinnington, 2014; Zhai *et al.*, 2009). Now, business activities are becoming increasingly "projectised" or project-oriented (Martinsuo *et al.*, 2006), and "management by projects" has become an influential way to incorporate organizational functions and encourage groups to accomplish complex objectives and achieve higher efficiency (Morris, 1997). As a result, a growing number of organizations are implementing their business operations through projects (Kerzner, 2009). However, identifying practices that contribute to successful PM remains a challenge. The success of a project entails the fulfillment of certain expectations for stakeholders, such as vendors, organizers, engineers, suppliers, or workers. The complexity of identifying the best project practices is accentuated by the possibility that expectations may vary across the stakeholders (Sanvido *et al.*, 1992). Furthermore, the stakeholders' expectations may be context specific and the PM practices may also fluctuate significantly from one type of project to another (Payne and Turner, 1999), so much so that the diverse tools, procedures, and methods may also be applied to projects within the same organization to meet the specific needs of each project (Crawford *et al.*, 2005). Both academics and managers highlight the

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importance of identifying and implementing precise methodologies and tools as critical to the success of projects (Ika *et al.*, 2010; Papke-Shields *et al.*, 2010). This research aims to address this aspect of PM by employing statistical analyses to identify critical factors for project success from a myriad of reported PM practices.

With increasing competitive pressures, project-based organizations are now required to derive maximum value for their stakeholders in an efficient manner (Ihuah *et al.*, 2014). As a corollary, project-based organizations need to execute their corporate strategies by employing the best PM practices (Baccarini, 2003). However, by the very definition of projects, the PM discipline has been associated with the term "temporary organization." This positioning reflects a modern organization that brings value to its customers through projects and has preferred to organize its activities by initiating, executing, and delivering projects to respond to business needs. Managing the often competing needs of project efficiency and responsiveness entails critical analyses of the practices that can help project-based organizations to best address this trade-off (Ingason, 2015).

Meanwhile, contemporary PM practices of organizations do not continuously guarantee project success. Success greatly depends on how the project has been managed and controlled. The central problems with PM practices have always been planning, project implementation, cost and time overruns and quality non-achievement (Alias *et al.*, 2014). A large number of decisions need to be made during the planning and execution stages of PM practices. If project managers are not aware of the key factors that could influence the goals set in the initiation phase, then the project will not be successful. Academics and practitioners indicate that companies willing to succeed in managing projects need to be compliant with certain practices (Golini *et al.*, 2015). The empirical evidence for these considerations is vast and diffused. There is also limited empirical evidence in support of similar best PM practices in the UAE context. This lack of evidence provides the premise for this research because there is a need for a better understanding of the underlying mechanisms of the PM practices that contribute to successful outcomes. This study will identify the key factors that affect the level of project performance through PM practices and rank those factors that enable project-based organizations to successfully implement supporting practices. Moreover, this study aims to make a contribution in the PM field by developing a framework to help organizations improve and embed PM practices in an effective way. More specifically, the framework achieves the following:

(1) identifies the key factors contributing to successful projects; and

(2) uncovers the underlying dimensional structure of PM practices in the UAE.

2. Literature review

PM has advanced over the previous years as academics and practitioners have struggled to recognize the grounds of project failure and the several factors that lead to project success (Alias *et al.*, 2014). Early PM techniques were established from the desires of businesses to plan, control and accomplish big and multifaceted tangible projects (Morris, 1997). Theoretical hard factors of project success standards come in the forms of monitoring and managing time, cost and scope. However, recently PM can also be realized as being about handling change (Bourne and Walker, 2004), and project managers should recognize themselves as change agents with a supplementary PM role and added focus on the so-called soft factors of relationship management (Bourne and Walker, 2004). Furthermore, consistent with Bourne and Walker (2004), in most organizations, project managers are responsible for the successful delivery of whole projects. Progressively, this success depends on the dispensation and utilization of PM practices, which may primarily seem inconsistent. A successful project manager must establish flexibility and competency in many areas, including hard and soft factors, introverted and reflective conduct, and extroverted and social conduct. Many of the initiatives for improving the practice and profession of PM have focused on augmenting techniques and methods related to abilities that comprise effective management of time, cost, and scope.

2.1 PM practices
PM practices can be applied to any project ranging from simple tasks, office overhauls, or renovations to multifaceted and complex projects, such as the design and building of an airfield or hospital compound (Tan, 1996). Practically any project entails the application of the art and science of PM practices. The level of technology required with the grade of sophistication of the tools and techniques and the kinds and number of personnel involved will be contingent on the size, complexity, and nature of the project. The project manager's work is viewed as harmonizing a procedure of consistent functions that are neither entirely random nor strictly programed but are variable as the project stages develop (Ferreiraa *et al.*, 2013). Additionally, the management science and decision support methods along with organizational culture support the project managers in making multifarious decisions in PM practices (Silvaa and Gomes, 2015).

After suitable application, best PM practices allow managers to improve effectiveness and output (Ferreiraa *et al.*, 2013). According to Pinto and Kharbanda (1996), PM practices have become critical for numerous organizations as they can incite improved progress of their projects in order to ensure the enhanced administration of the resources, within typical project time, cost, and quality constraints. However, organizations must align the strategic orientation of their projects with the organizational mission before applying superior practices (Cooke-Davies *et al.*, 2009).

2.2 Project success
According to Ika *et al.* (2010), from the beginning of the PM approach, academics have strained to define what project success is and which dynamics subsidize it, and these criteria are still not agreed upon (Jugdev and Müller, 2005). Project success is a multidimensional paradigm that consists of both short-term PM success competence and the longer-term accomplishment of desired outcomes from the project. However, to reach a mutual understanding of what leads to successful project practices, these should be quantifiable and well-defined in terms of success factors (Muller and Turner, 2007).

The understanding of project success factors has been developed from the basic triple constraint concept (time, scope, and cost) to one that embraces several additional success factors (Müller and Judgev, 2012). Factors can be classified into environment-related (project location-based), people-related (Tishler *et al.*, 1996), processes- and tools-related (Khang and Moe, 2008), and context-related factors (Sauser *et al.*, 2009). According to Abowd *et al.* (1999), project context is any information that can be utilized to illustrate the circumstances of the project that comprise physical and mental characteristics. The physical characteristics of the project context contain previous projects in addition to the project atmosphere that the project really exists in, while the mental characteristics contain social, emotional, or informational situations. Later, scholars realized that creating project success factors without grouping, structure, and context would cause augmented project risks; hence, success factor frameworks were presented (Jugdev and Müller, 2005).

2.3 Key success factors for PM practices
As mentioned above, project success factors are characteristics, settings, or variables that can have a substantial influence on successful PM practices when appropriately sustained, upheld, or accomplished (Milosevic and Patanakul, 2005). As Fortune and White (2006) observed, several studies have recognized diverse kinds of factors but they lack consistency in the standards for judging project success and the factors that encourage successful PM practices.

The key PM success factors were initially premeditated by Rubin and Seeling (1967). They established that the technical aspect was a measure of project success. Then, Avots (1969) claimed that uncooperative top management was the central cause of project failures. Baker *et al.* (1983) recommended that rather than using cost, time, and performance as measures of project success, supposed performance should be the measure. Hughes (1986) contended that the inadequate emphasis of a management system by gratifying the incorrect activities and the lack of communication of project goals were the major reasons for project failures. Accordingly, Schultz *et al.* (1987) advised that two sets of factors were accountable for project success. The first group contains strategic factors such as project mission, top management support, and project scheduling, while another includes tactical factors such as client consultation, personnel selection, and training. Gow and Morse (1988) articulate that project success consists of political, financial, and environmental factors; institutional actualities, personnel constrictions and technical support; discrepancy factors; reorganization and involvement factors; timing; information systems; contradictory agendas factors; and nourishing project benefits restraints.

According to Pinto and Slevin (1987), project success factors are theoretically constructed instead of empirically grounded, which may cause some of the success factors to be nonspecific in scope whereas others are on precise matters of specific projects. Pinto and Slevin (1989) established a project success framework covering organizational effectiveness, technical validity, and organizational validity. Freeman and Beale's (1992) project success framework involved efficiency of execution, technical performance, managerial and organizational implications, manufacturability, personal growth, and business performance. Shenhar (2001) claim that no one-size-fits-all approach exists by using a four-dimensional framework, presenting how diverse kinds of projects need different success factors that are determined by the strategic nature and the short- and long-term project objectives. Furthermore, several studies covering key PM success factors have noted the effect of context on which factors are well-thought-out as most significant as well as whether certain factors are positively related to successful PM practices (Alias *et al.*, 2014) (Table I).

Belassi and Tukel (1996) clustered the success factors that regulate project success into four sets containing the improvement project factors, the project team factors, the institutional factors, and the outer surroundings factors. Likewise, Chan *et al.* (2002) maintained that the PM success factors are project team potential; contractor capabilities; risk and accountability valuations; client aptitudes; end users' requirements and enforced boundaries. However, in the literature, Pinto and Slevin's (1987) 12 success factors have been considered to be the foundational PM success factors until today. However, these success factors are not generalizable for all projects and organizations in different countries (Qiang *et al.*, 2015), so this study works to determine project success factors in the UAE context.

Key factors	References
Senior management/leadership	White and Fortune (2002)
Organizational culture	Silvaa and Gomes (2015)
Stakeholders	Chua *et al.* (1999), Chan *et al.* (2001)
Organizational structure	Belout and Gauvreau (2004)
Project management process	Chua *et al.* (1999), Chan *et al.* (2001)
Risk planning and identification	Chan *et al.* (2001, 2002)
Risk analysis	Chan *et al.* (2001, 2002)
Risk mitigation	Chan *et al.* (2001, 2002)
Process integration and improvement	White and Fortune (2002), Chan *et al.* (2001)

Table I.
Key project success factors

3. Research methodology

3.1 Research design

The survey items were developed with literature support, and this research aims to examine the underlying structure or relationships between variables. Exploratory factor analyses (EFA) have been frequently employed to investigate if the a priori understanding of the theoretical constructs is correct (Henson and Roberts, 2006). This study employs EFA for the following objectives:

- to reduce the number of variables;
- to validate theoretical constructs by examining their underlying structure;
- to evaluate the construct validity of the survey instrument; and
- to extract and interpret the new factors representing their underlying relationships.

3.2 Instrument development

Past research was reviewed to obtain general insights into PM practices, and an initial list of items was identified to represent the salient aspects of PM practices. The items were vetted with extensive discussions with PM practitioners and academics to ensure high research design quality. The survey instrument is divided into two sections; Section 1 of the instrument addresses the general information on the respondent's reference project, while Section 2 contains questions related to the nine theoretical constructs representing PM practices (Figure 1). For details, please see the Appendix.

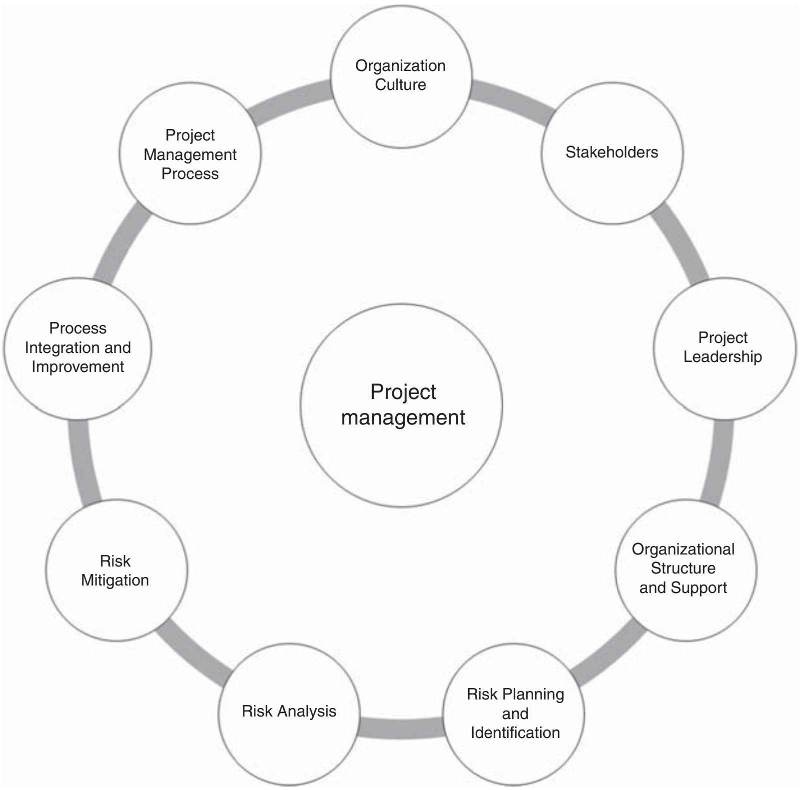


Figure 1. The theoretical constructs of project management practices

3.3 Sample selection
The population of interest for this research was the managerial cadre of the project organizations based in the UAE. Access to a group of managers in these organizations was the principal reason for the selection of potential respondents. This convenience sampling has been reported as an acceptable sampling method with manager respondents (Chien and Shih, 2007; Zhu *et al.*, 2007; Holt and Ghobadian, 2009) and for exploratory studies (Holbrook and Schindler, 1989; Ahmed *et al.*, 2007; Fenner *et al.*, 2012).

3.4 Sample size adequacy and relevance
We were able to obtain 111 responses from the managerial cadre of the project-based organizations working in the UAE. This sample size satisfies Hair *et al.*'s (2013) suggested criterion that sample sizes should be 100 or greater. Beavers *et al.* (2013) reported various sample size requirements for factor analyses such as 51 more cases than the number of variables (Lawley and Maxwell, 1962) and a sample size of 100 when three to four strong items (loadings of 0.70 or greater) comprise a factor (Fabrigar *et al.*, 1999; MacCallum *et al.*, 2001). EFA have been applied with good results on samples as small as 62 (Shah and Ward, 2007) and for sample sizes of 50 (Sapnas and Zeller, 2002). All this cited work affirms the sample adequacy for this study, especially because the respondents were managers in their respective organizations, and their self-reported evaluations are likely to be consistent with their objective observations since they occupy an appropriate position in the organization to make such evaluations (Gowen *et al.*, 2006).

3.5 Descriptive statistics
As shown in Figure 2, data were collected from projects with durations varying from 1 to 5 years. Most of the respondents' groups are from 1 to 3 years. These projects' cost varies from US$1 to US$ 500 million. Most of the respondents were from construction, oil and gas, and information technology projects along with other types of projects such as telecommunications and electrical projects. The size of the projects the respondents came from varies from a total number of 20 to 500 team members.

4. Data analyses and results
Williams *et al.* (2012) suggested the following five step protocol for conducting EFA, which is being adhered to in this study:

(1) determining the suitability of data for factor analysis;

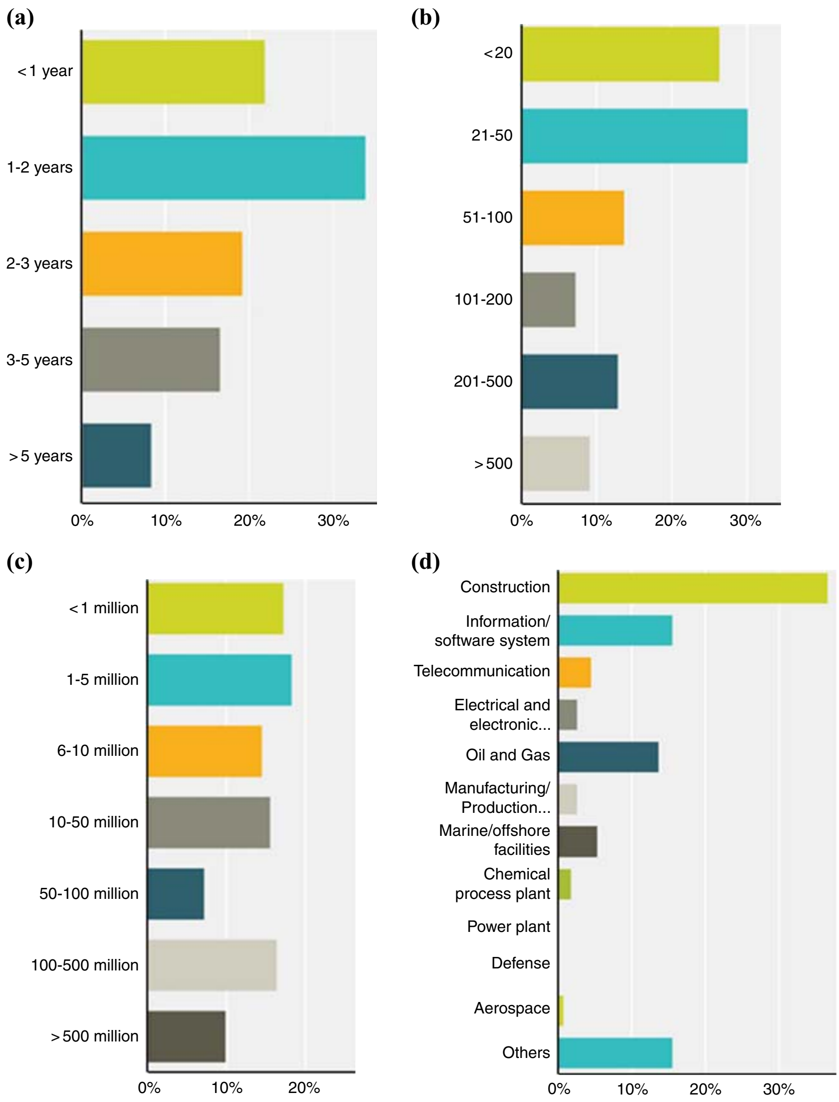
(2) selecting a factor extraction method;

(3) choosing an appropriate factor extraction criterion;

(4) selecting a rotational method; and

(5) interpretation and construct labeling.

4.1 Factorability of theoretical construct items
The theoretical construct items were initially examined for their coalescence on factors, which is also known as the factorability of factors. The use of a correlation matrix displaying the relationships between individual items has been advocated for initial factorability analyses variables (Henson and Roberts, 2006; Williams *et al.*, 2012). Tabachnick and Fidell (2007) opine that data are only factorable if several sizable correlations exist, and they question the use of factor analyses if no correlation exceeds 0.30. Similarly, Hair *et al.* (2013) suggest that if no correlations go beyond 0.30, then the researcher should reconsider whether factor analysis



Notes: (a) Duration of projects (years); (b) size of projects (no. of employees); (c) cost of projects; (d) types of projects

Figure 2.
Descriptive statistics

is the appropriate statistical method to utilize. The authors also created a rule of thumb that categorizes the co-relation of ±0.30 as minimal, ±0.40 as important and ±0.50 as significant.

With this literature support, the 64 construct items of this study were examined for factorability. Up to 59 of the 64 items correlated at least 0.3 with at least one other item, indicating suitability of the data for factor analyses according to the criterion advocated by Tabachnick and Fidell (2007) and Williams *et al.* (2012). With Hair *et al.*'s (2013) rule of thumb, up to 58 items showed minimal co-relation, 25 showed important co-relation, and

20 showed significant co-relation. The co-relation was much higher for items within a theoretical construct supporting their theoretical underpinnings.

As noted by Tabachnick and Fidell (2007), high bivariate correlations may not necessarily endorse factors in data, but further examination of the partial correlations is necessary for factorability confirmation. A partial correlation is a value that measures the strength of the relationship between a dependent variable and a single independent variable when the effects of other independent variables are held constant (Hair *et al.*, 2013). The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was used to evaluate the correlations and partial correlations to determine if the data are likely to coalesce on factors. Williams *et al.* (2012) recommend a KMO value $\geqslant 0.5$ for factor analyses. Kaiser (1974) gives a more categorized sampling adequacy measure with a KMO > 0.6 as mediocre, 0.7 as middling, 0.8 as meritorious, and 0.9 as marvelous. The KMO measure of sampling adequacy for these data was recorded as 0.803 for the 111 responses, well above the recommended values of the aforementioned criteria (Table II). Bartlett's (1950) test of sphericity is also recommended to test the appropriateness of factor analyses, which tests the hypothesis that the correlation matrix is an identify matrix; i.e., all diagonal elements are 1 and all off-diagonal elements are 0, implying that all of the variables are uncorrelated. There are co-relations in our data implying data coalescing. Therefore, this test was significant as shown in Table II.

This initial examination for the factorability of our data gives us confidence that the data are likely to coalesce on factors, and we should proceed with a formal factor analyses.

4.2 Factor extraction method

The next step in an EFA is to determine the factor extraction method, which largely depends upon the research purpose. Williams *et al.* (2012) listed numerous factor extraction methods such as principal components analysis (PCA), principal axis factoring (PAF), image factoring and maximum likelihood (ML). PCA is primarily a variable reduction technique that maximizes the amount of variance accounted for in the observed variables by a smaller group of variables called "components." It is computed without regard to any underlying structure caused by latent variables; components are calculated using all of the variance of the manifest variables, and all of that variance appears in the solution (Ford *et al.*, 1986). However, as noted by Costello and Osborne (2005), most studies are based on some theoretical constructs and researchers are mostly concerned with a factor analysis that can reveal any latent variables that cause the manifest variables to co-vary. Because PCA cannot estimate the unknown structure of data, some studies do not consider it as a factor analysis method (Costello and Osborne, 2005; Henson and Roberts, 2006; Matsunaga, 2010). Costello and Osborne (2005) suggested that the general PAF and ML extraction methods are likely to give the best results whereas Fabrigar *et al.* (1999) believed that the ML method is the best choice as a factor extraction method. This study uses ML as the factor extraction method.

4.3 Factor extraction criteria

The aim of this research is to develop a parsimonious instrument for determining PM practices in the UAE by reducing a large number of items into similar items and a reduced

Table II. KMO and Bartlett's test

Kaiser-Meyer-Olkin measure of sampling adequacy	0.803
Bartlett's test of sphericity	
Approx. χ^2	5,405.138
df	2,016
Sig.	0.000

number of factors. The number of factors extracted is an important step in achieving this and researchers have used multiple criteria for this such as in (Williams *et al.*, 2012):

- eigenvalues > 1 (Kaiser's rule);
- scree test; and
- parallel analysis.

Kaiser's rule of extracting the factors that have eigenvalues greater than one (Ledesma and Valero-Mora, 2007) is the default setting of many statistical packages. The cumulative percentage of variance and the number of factors extracted (criterion: eigenvalues > 1) for this study are presented in Table III. There are 14 factors identified, which does not help because the number of extracted factors is even greater than the nine theoretical constructs being measured. However, the variance (68.82 percent) explained is better than the suggested thresholds (50-60 percent) for humanities (Pett *et al.*, 2003; Hair *et al.*, 2013).

The scree test is a graphical presentation that has visual similarities to the rock debris at the foot of a mountain, and, generally, a bend in a scree plot determines the number of extracted factors. The visual interpretation generally requires a subjective judgment that may vary (Thompson, 2004; Tavakol and Dennick, 2011). To avoid this variability, Williams *et al.* (2012) suggested drawing a straight line through the smaller eigenvalues until the point where a departure from this line occurs. The point above/after this break indicates the number of factors to be retained. For this study, the inspection of the scree plot and eigenvalues produced a departure from linearity coinciding with a nine-factor result (Figure 3) suggesting that the data coalesce on nine factors.

Parallel analysis uses Monte Carlo simulation to randomly generate eigenvalues, which are compared with actual eigenvalues. Factors are retained when actual eigenvalues surpass random ordered eigenvalues. Many studies have found parallel analysis to be among the best methods for deciding how many factors to extract or retain (Zwick and Velicer, 1986; Thompson, 2004; Watkins, 2005; Matsunaga, 2010; Williams *et al.*, 2012). The parallel analysis reveals five factors emerging from the data under consideration (Table IV).

As seen in Tables III-IV, Figure 3, the three different factor retention methods resulted in different factors, which is in line with previous studies, such as Henson and Roberts (2006) who reported that these rules did not necessarily lead to the same decision regarding the number of factors to retain. Similarly, in a Monte Carlo evaluation, Zwick and Velicer (1986)

Total variance explained						
	Initial eigenvalues			Extraction sums of squared loadings		
Factor	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	20.238	31.622	31.622	19.870	31.046	31.046
2	5.785	9.039	40.661	5.185	8.102	39.148
3	3.718	5.809	46.470	2.643	4.130	43.278
4	2.825	4.415	50.885	3.275	5.117	48.394
5	2.567	4.011	54.895	1.854	2.896	51.291
6	2.293	3.583	58.478	2.254	3.521	54.812
7	1.862	2.909	61.388	1.609	2.514	57.326
8	1.756	2.743	64.131	1.476	2.307	59.633
9	1.502	2.347	66.478	1.232	1.926	61.559
10	1.374	2.147	68.625	1.046	1.634	63.193
11	1.216	1.899	70.524	0.944	1.475	64.668
12	1.162	1.815	72.339	0.835	1.304	65.972
13	1.124	1.757	74.096	0.857	1.339	67.312
14	1.058	1.653	75.749	0.836	1.307	68.618

Table III.
Extracted factors – Kaiser's rule

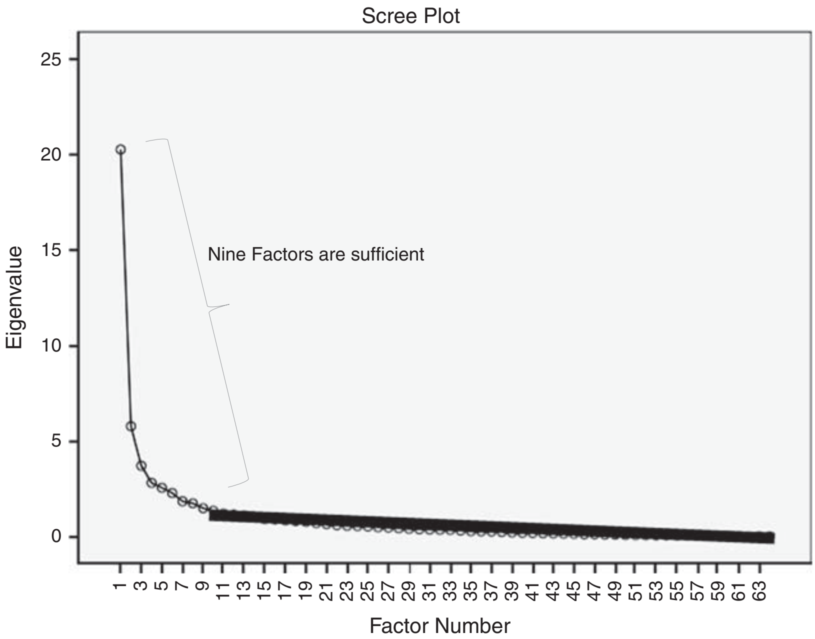


Figure 3.
The scree test factor extraction criterion

Table IV.
The parallel analysis factor extraction criterion

Factor	Actual eigenvalues	Randomly generated eigenvalues	Decision
1	20.238	3.0343	Accept
2	5.785	2.8253	Accept
3	3.718	2.6754	Accept
4	2.825	2.5449	Accept
5	2.567	2.428	Accept
6	2.293	2.3249	Reject
7	1.862	2.2278	Reject
8	1.756	2.1384	Reject
9	1.502	2.0562	Reject
10	1.374	1.976	Reject
11	1.216	1.9002	Reject
12	1.162	1.8274	Reject
13	1.124	1.756	Reject
14	1.058	1.6899	Reject

found that the eigenvalue > 1 rule almost always severely overestimated the number of factors to retain. This study also observed that Kaiser's rule suggested the most factors to retain. Matsunaga (2010) also reported the factors over retention produced by the Kaiser rule (eigenvalue > 1), leading to inaccurate results.

This study follows the Henson and Roberts (2006) and Matsunaga (2010) recommendation of reliance on researchers' judgment on the meaningfulness of the latent factors for the selection of an appropriate factors retention method. After careful consideration of the resulting factors and their individual items, the researchers preferred the parallel analysis because it resulted in extracted factors that made the most conceptual sense.

4.4 Selection of rotational method

Factors rotation maximizes high item loadings and minimizes low item loadings, therefore producing a more interpretable and simplified solution (Williams *et al.*, 2012). There are two common rotation techniques:

(1) orthogonal rotation; and

(2) oblique rotation.

The general consensus in academia is that a orthogonal rotation method, such as varimax, should be used if the retained factors are not correlated (Thompson, 2004; Williams *et al.*, 2012). The correlation matrix for the five retained factors shows that none of these are related (Table V). Therefore, the orthogonal-varimax rotation method was used to provide easier interpretation of the results and produce a solution that is more parsimonious.

4.5 The labeling and interpretation of the new factors

The factor pattern/structure matrix rotated to the varimax criterion is mentioned in Table VI. The initial 64 items within nine categories have been reduced to 50 items (loading $\geqslant 0.5$) within five factors accounting for 50.9 percent of the variance. The variance explained meets the suggested threshold of 50-60 percent for humanities (Pett *et al.*, 2003; Hair *et al.*, 2013). In the rotated factor matrix (Table VI), a clear factor structure is displayed, i.e., each item loads predominantly on one factor. For instance, 27 items from the initial theoretical constructs of risk analysis, risk mitigation, risk planning and identification, organization culture and organization structure and support load virtually exclusively on Factor 1. The individual examination of Factor 1 items revealed project-related risks as the common theme that led to the labeling of Factor 1 as risk management. Similarly, items from the theoretical constructs of stakeholders, organization structure and PM process coalesce on Factor 2 with an undercurrent of the culture and practices prevailing in an organization. Therefore, Factor 2 is rebranded as organizational culture. Factors 3-5 coalesced, respectively, on items relating to the management approach, project leadership and stakeholder management and have been labelled accordingly. Table VI also displays the amount of variance accounted for in the items' variance-covariance matrix by each of the factors and cumulatively by all the factors. Factor risk management accounted for 15.004 percent of the total variance, whereas the

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1					
Pearson correlation	1	0.000	0.000	0.000	0.000
Sig. (2-tailed)		1.000	1.000	1.000	1.000
Factor 2					
Pearson correlation	0.000	1	0.000	0.000	0.000
Sig. (2-tailed)	1.000		1.000	1.000	1.000
Factor 3					
Pearson correlation	0.000	0.000	1	0.000	0.000
Sig. (2-tailed)	1.000	1.000		1.000	1.000
Factor 4					
Pearson correlation	0.000	0.000	0.000	1	0.000
Sig. (2-tailed)	1.000	1.000	1.000		1.000
Factor 5					
Pearson Correlation	0.000	0.000	0.000	0.000	1
Sig. (2-tailed)	1.000	1.000	1.000	1.000	

Table V. The correlation matrix for the extracted factors

Item no.	Factors 1 Risk management	2 Organizational culture	3 Management approach	4 Project leadership	5 Stakeholder management	Extracted communalities h^2
3	*0.508*					0.490
29	*0.505*					0.438
30	*0.582*					0.476
31	*0.701*					0.554
32	*0.716*					0.590
33	*0.778*					0.647
34	*0.516*					0.342
35	*0.618*					0.438
37	*0.817*					0.682
38	*0.803*					0.676
39	*0.740*					0.598
40	*0.711*					0.547
41	*0.654*					0.486
42	*0.594*					0.439
43	*0.726*					0.544
44	*0.749*					0.590
45	*0.672*					0.523
46	*0.729*					0.570
47	*0.824*					0.692
48	*0.775*					0.639
49	*0.737*					0.709
50	*0.764*					0.667
51	*0.712*					0.534
52	*0.724*					0.630
55	*0.570*					0.449
56	*0.693*					0.565
57	*0.727*					0.638
1			*0.593*			0.513
4			*0.659*			0.566
5			*0.735*			0.652
6			*0.571*			0.387
7			*0.677*			0.478
8			*0.595*			0.548
11					*0.534*	0.539
13					*0.562*	0.351
14					*0.626*	0.631
15					*0.541*	0.520
16					*0.795*	0.695
18				*0.801*		0.731
19				*0.764*		0.711
20				*0.636*		0.475
21				*0.713*		0.564
25				*0.560*		0.367
9		*0.547*				0.479
26		*0.512*				0.316
58		*0.522*				0.483
59		*0.580*				0.485
62		*0.501*				0.389
63		*0.649*				0.459
64		*0.666*				0.602
% Variance	15.004	5.196	4.018	3.759	3.080	50.914

Note: Items with factor loading less than 0.5 were dropped during factor extraction

Table VI.
Exploratory factor analysis: factor loadings for explanatory variables

remaining four factors of organizational culture, management approach, project leadership and stakeholder management accounted for 5.196, 4.018, 3.759 and 3.080 percent, respectively. Furthermore, the extracted communalities for individual items are mostly in the 0.40-0.70 range, meeting the acceptable range for humanities research (Costello and Osborne, 2005). Only 6 of 50 extracted items had an extracted communality less than 0.40, with 0.316 for item 26 –organizational culture being the lowest, but even this communality is acceptable according to the standard established by Tabachnick and Fidell (2007).

5. Discussion of results and implications for practice

Through the survey findings, we found support for the strength and validity of the vast majority of best PM practices. Our results reveal that the key to the successful completion of projects lies in providing a proactive organizational culture and management approach, active engagement of stakeholders, strong leadership, and a structured risk management process that puts a premium on the lessons learned from current and past project executions (Figure 4). The criticality of an organization culture that facilitates the delivery of projects has attracted a great deal of academic attention, and our empirical findings support this notion by highlighting the salient organizational cultural features and management approaches that are likely to contribute to the better management of projects. The group phenomena of organizational culture and the management approach jointly determine how projects are conceived, initiated, planned, and executed. Our empirical findings show that more collaborative and proactive organizations with well-developed processes and infrastructure provide the foundation to maximize the value derived from their initiated projects.

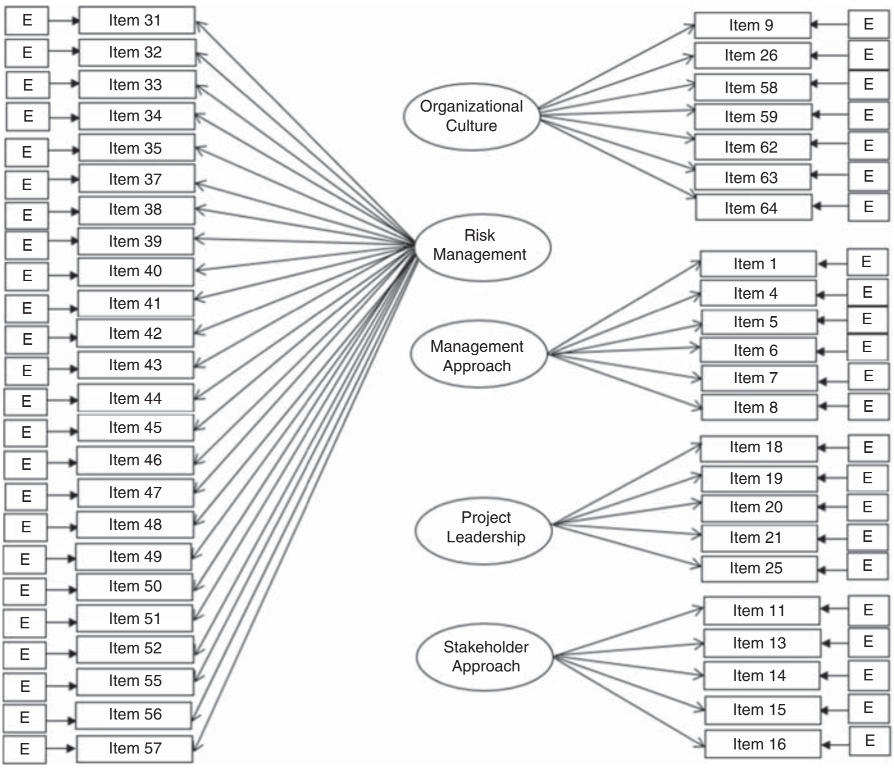


Figure 4.
Latent project management practices driving the observed items

The ability to harness the full potential of project human resources also seems to be a key dimension of the management approach that shapes an organizational culture conducive to successful project delivery. For example, the continuity of project personnel and the focus on providing team members with an environment where they are encouraged to think and implement innovative ideas have been identified as important organizational traits. The organizational trait of supporting positive team interaction has also been identified as a success factor for a US Fortune 500 company (Doolen *et al.*, 2003). The strategic importance of identifying uncertainties and managing their consequences for PM is also highlighted, as the managerial awareness of project risks and involvement of stakeholders in the risk management process is seen as a crucial element for the success of projects.

The contribution of stakeholders to successful project delivery has been well documented in academic literature and practitioner best practices, such as the *Project Management Body of Knowledge* (*PMBOK*). Our statistical analysis validates some of the established stakeholder management practices, but, more importantly, it emphasizes a more strategic and collaborative partnerships with suppliers. Similar to the broader operations literature, this finding shows an emerging understanding of the strategic importance of procurement in the PM practitioner's community. The other findings of our survey, wherein the respondents' identified risk and reward sharing with contractors as an important element of PM, accentuates the notion of stakeholder partnerships for the successful delivery of projects.

Project team contributions have always been seen as an important determinant of project success. However, team dynamics assumes an even greater importance for the emerging agile PM approach. The positive synergies of a project team are at the center of agile thinking, with the overarching aim being fully harnessing the potential of the development team in pursuit of innovative ideas and cooperative teamwork. The same has been reflected in our survey findings, wherein the respondents perceive the project leader as someone who empowers and supports the self-organization of team members. The project manager is also seen as someone who facilitates the project work by forging cooperative relationships with intra- and inter-organizational actors. The "relationship-oriented" view to leverage influence on stakeholders seems to follow the prevailing understanding of project leadership in other cultural settings as reported by Prabhakar (2005) with a study sample of 28 countries from Asia, Europe, Africa, North America, and Australia. The managerial implication for these findings is that the "visible" project work of planning, scheduling, and controlling projects is just a small part of the overall responsibilities of a project manager, whereas the bulk of effort needs to be directed to the "invisible" requirements of forging cooperative networks within and outside the core project team.

Risk management and PM are intertwined as reflected in the academic literature and the practitioner's body of knowledge (*PMBOK*). Therefore, the coalescing of 27 survey items into a risk management factor was not surprising. However, what constitutes project risk management as per our results shows interesting findings. First, we found that the respondents recognize the need for a structured risk management process and that they emphasized the accuracy of the risk evaluation process through the quantitative measures for risk events and for risk thresholds. Second, conducting project reviews and incorporating lessons learned from past projects are seen as proactive risk management measures. Both these findings are relevant for the practitioners as they reinforce the need to organize formal project risk management and project closure processes, such as "the retrospectives," which are increasingly identified as the best practice for closing projects. Furthermore, the survey findings also make a case for formal trainings in risk management methodologies and standards for the project team to improve the coverage and accuracy of project risk assessments.

6. Conclusion and directions for future research

The research aim was to use EFA to identify a set of latent factors that reconstructed the complexity of the observed variables by retaining and reorganizing the important information from the original data while unnecessary/redundant information was removed. During the new factors extraction, the shared variance of a variable is partitioned from its unique variance and error variance to reveal the underlying factor structure. Therefore, the extracted factors model diagram (Figure 4) shows the arrows pointing to the observed variables reflecting the assumption that the true value of the factor and the error combine to result in the observed score(s).

Our research started with a review of the published literature that identified nine broad categories comprised of 64 items. The EFA helped us investigate the relationships between the items without any preconceived imposition on the studied data. The 64 items were reduced to 50 items coalescing on five constructs as shown in Figure 4. Strong empirical results were obtained for the five latent variables. Nevertheless, the findings are limited by the responses that were obtained from the United Arab Emirates only. The interrelationships of the manifest variables and the research instrument need to be tested in other geographical regions before the robustness of these results can be established. Despite this limitation, this research makes an important contribution by estimating the underlying structure from a myriad of reported PM practices that have been identified as contributing to the success of projects. The obtained results can benefit both practitioners and researchers. PM professionals can use the latent factors as the critical factors for project success, whereas the research community can use our results to build higher order structural models and to test hypotheses by linking our latent variables with project performance measures.

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Appendix. Questionnaire/Survey

You may respond to the questionnaire based on your experience in ONE of your recent projects as a reference case.

Organizational culture:

(1) We were aware of the risk and uncertainty facing the project.

(2) We had open communication on project risks within project team.

(3) We had a proactive risk management culture.

(4) Team members felt free to try innovative ideas, and high tolerance to people make mistakes.

(5) Team members are allowed to challenge and seek changes to stated underlying assumptions in strategy, decision and actions when taking a "Big Picture."

(6) We also identified and exploited opportunities under uncertainty.

(7) We used informal methods to complement formal methods in risk management.

Stakeholders:

(8) We identified and involved relevant stakeholders in the risk management process monitoring and measuring internal supply chain processes.

(9) There was an agreed project vision among all stakeholders.

(10) We maintained good relationship with project's key customer/user.

(11) We maintained good relationship with project's key suppliers.

(12) Both formal and informal methods were used to build relationship and coalition.

(13) We had longterm arrangements (e.g. partnership) with key stakeholders.

(14) We had risk/reward sharing arrangements with key contractors.

(15) We established a collaboration environment for free and open communication of risk among stakeholders.

(16) We communicated with affected parties and address their concerns.

Project leadership:

(17) Project leader exercised democratic management style.

(18) Project leader empowered project team members.

(19) Project leader created the context for self-organization/decision making at team levels.

(20) Project leader spent to motivate and energize team members.

(21) Project leader was strong in networking abilities and making strategic alliances and coalition arrangements.

(22) Project leader had good rapport with project sponsor and corporate senior management.

Organization structure and supports:

(23) Teamwork emphasized within the company.

(24) Teamwork was emphasized across participating companies.

(25) There was a sense of "ownership" and strong team identify.

(26) The project got top management support.

(27) Senior management supported risk management activities/initiatives.

(28) Senior management provided adequate resources for performing risk management activities.

(29) We had periodic training and personal development on project risk management.

Risk planning and identification:

(30) We defined risk sources, risk categories, risk events, risk lists of the project.

(31) Risk parameters such as risk probability, risk consequence, and thresholds to trigger management activities were defined.

(32) We assigned responsibility and authority for performing the risk management process, i.e. assigning a risk manager or equivalent.

(33) We identified a broad range of risks, including internal, external, technical, nontechnical risks.

(34) We learned and documented lessons from previous projects and utilize historical information.

(35) We involved key project/function members in risk identification.

(36) We used external consultants/specialists in risk identification.

Risk analyses:

(37) We evaluated the identified risk parameters such as probability (P) and impact (I).

(38) We categorized and grouped risks into risk categories for the purpose of efficient handling.

(39) We prioritized risk events based on their risk exposure/severity (probability $\times$ impact).

(40) We conducted quantitative risk analysis (e.g., Monte Carlo simulation analysis) reduction of discriminatory employment practices.

(41) We set aside management reserves (outside budget) for unexpected risk events.

(42) We set aside contingency allowances (within budget) for potential variations of specific risk items.

Risk mitigation:

(43) We developed risk response plans for the most critical risks to the project.

(44) We used a variety of risk mitigation strategies avoidance, transfer to third party, mitigation/reduction, and acceptance with or without contingency.

(45) We considered the costtobenefit ratio of implementing the risk mitigation plan.

(46) We determined and assigned risk ownership to appropriate stakeholders and project functions.

(47) We implemented risk mitigation plans when monitored risks exceed the defined thresholds.

(48) Risk mitigation actions and residual risks were monitored and controlled.

Process integration and improvement:

(49) Risk management process was adequately integrated with the other project management processes.

(50) We had a formal risk management process.

(51) We identified and managed risks continuously through all phases of the project's life cycle.

(52) Data for risk analysis and reporting were of good quality.

(53) Risk report was used for decision making by senior management.

(54) We measured the effectiveness of risk management with performance metrics.

(55) We conducted postproject review and documented lessons learned.

(56) We collected process improvement information and benchmarked our risk management practices with industry best practices.

(57) We had a risk management information system containing risk database, checklist, and risk status report.

Project management process:

(58) We had formal PM processes.

(59) We had adequate frontend project planning.

(60) We had a project management information system (PMIS).

(61) We had an integrated project performance measurement/control system (e.g. using earned value method).

(62) We had effective change management procedures.

(63) We ensured personnel continuity in the project.

(64) We used latest IT/internet to facilitate information exchange and communication.

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