COMPETENCIES OF IT PROJECT MANAGERS: A SOUTH AFRICAN PERSPECTIVE

WIKUS ERASMUS

Applied Information Systems, University of Johannesburg, 1 Bunting Road, Auckland Park, Johannesburg, 2092, South Africa, werasmus@uj.ac.za

NAZEER JOSEPH

Applied Information Systems, University of Johannesburg, 1 Bunting Road, Auckland Park, Johannesburg, 2092, South Africa, njoseph@uj.ac.za

CARL MARNEWICK

Applied Information Systems, University of Johannesburg, 1 Bunting Road, Auckland Park, Johannesburg, 2092, South Africa, cmarnewick@uj.ac.za

Abstract

Information technology (IT) projects are plagued by poor performance rates. Project management competency continuously emerges as a key factor influencing project success. The notion is that project management competency directly influences project performance and subsequently organisational performance. Project management competency consists of three dimensions: skills, knowledge and personal characteristics. Project management skills are often classified as technical or soft skills. A project manager's competence is also determined by their tacit and explicit knowledge. The personal characteristics of a project manager are often overlooked and are argued as a driving factor influencing their competence. The personal characteristics of a project manager directly impacts their ability to manage a project effectively and efficiently. It is important to understand what factors influence project managers' abilities to deliver projects successfully. Failure to do so may lead practice to de-emphasise project management as a means to deliver business value. The purpose of this paper is to determine factors in personal and performance competencies. This quantitative study utilised a survey that was distributed among IT project managers in South Africa. Data from 220 IT project managers were analysed to determine their performance and personal competency levels. The survey requested project managers to evaluate their own performance and personal competencies. Performance competencies focus on the skills and knowledge required for the five phases of project management. Personal competencies focus on the personal characteristic dimensions of communicating, leading, managing, cognitive ability, effectiveness and professionalism. The responses were analysed by way of factor analysis to determine whether these sub-competencies can be grouped into related topics. Current performance and personal competencies are exorbitant as this research shows that the units of competence can be narrowed down into fewer underlying project management competencies. The implications for project management could be that project success is measured on an incorrect basis or that competencies for IT projects are wholly different than for other types of projects. It remains important for practice to ensure that project managers are equipped with the correct skills and that these skills are actually performed properly during the course of the project lifecycle. Practitioners and researchers are thus compelled to address the disjoint between theory and practice as current competencies are inadequate for IT projects. Project management can only thrive as a profession once practical competencies are established as in other true professions.

Keywords: project management competence, project success, factor analysis, South Africa, Information Technology

Introduction

Information technology (IT) projects continue to suffer from poor performance rates. Project management competency (PMC) continuously emerges as a key factor influencing project success (Fisher, 2011; N. Joseph, Erasmus, & Marnewick, 2014). The notion is that PMC directly influences project performance and subsequently organisational performance. The 2015 Chaos Report states that 29% of IT projects successful while 52% are challenged and 19% are failures (Hastie & Wojewoda, 2015). The report however views project management expertise as the second least important factor influencing project success. This contrasts previous finding and brings into question the role of PMC and project performance. It is possible that the factors which influence a project's manager's ability to deliver successful projects requires further investigation. Failure to do so may lead practice to deemphasise project management as a means to deliver business value.

The purpose of this paper is to determine factors in personal and performance competencies to deliver successful projects. The paper has the following structure. Section one details a literature review which discusses the concept of project management competency and the components thereof. Section two details the research methodology used for this research. Section three analyses and discusses the results of the exploratory factor analysis. Section four concludes this paper by summarising the findings as well as detailing research limitations and future research.

Literature Review

Multiple factors influence the success of project. One factor which often surfaces is that of PMC. PMC has a direct influence on project performance (Crawford, 2005). South African research has shown that PMC is a success factor which has varied in importance from 2003 to 2013 (Labuschagne & Marnewick, 2009; Marnewick, Labuschagne, Eloff, Steyn, & Tobin, 2013; Sonnekus & Labuschagne, 2003). Nazeer Joseph and Marnewick (2014) assessed fourteen project success factors and compared the rankings between 2003 and 2013. The study showed that competency ranked fifth in 2003, twelfth in 2008 and 2011 as well as sixth in 2013. An argument could be made that the inconsistent rankings imply PMC is not as important as often advocated. N. Joseph et al. (2014) studied project success factors further and revealed that competency is viewed as more important for successful projects than challenged and failed projects. Moreover, the relationship between PMC and project performance was analysed. The study showed there was no relationship between competency and project success. The influence of PMC on project performance thus has to be questioned.

The definition of PMC varies amongst researchers and practitioners (Stevenson & Starkweather, 2010). Takey and Carvalho (2015, p. 785) define competency as the "*ability to mobilise, integrate and transfer knowledge, skills and resources to reach or surpass the configured performance in work assignments, adding economic and social value to the*

organisation and the individual". The Project Manager Competency Development Framework (PMCDF) asserts that PMC incorporates knowledge, performance and personal competencies (Project Management Institute, 2002). The Individual Competence Baseline (ICB) argues PMC consists of people, practice and perspective competencies (International Project Management Association, 2015). C. Bredillet, Tywoniak, and Dwivedula (2015) studied the various dimensions of PMC and discovered that there are three key dimensions: skills, knowledge and personal characteristics.

Skills

Skills relating to project management can be categorised into technical and soft skills (Brière, Proulx, Flores, & Laporte, 2015; Petter & Randolph, 2009; Starkweather & Stevenson, 2011). Technical skills revolve around an individual's ability to use project management tools and techniques (Keil, Lee, & Deng, 2013). El-Sabaa (2001) contends that these skills are acquired over time and through training. Soft skills however revolves around areas such as leadership, decision making, delegation, teamwork and problem solving (El-Sabaa, 2001; Stevenson & Starkweather, 2010). More emphasis is placed on soft skills that technical skills in the project management domain (Leybourne, 2007; Stevenson & Starkweather, 2010). A comparison of technical and soft skills is provided in table 1.

Table 1. Technical and soft project management skills compared

Technical skills	Soft skills
• Use of various tools and techniques (Brière et al., 2015; El-Sabaa, 2001; Keil et al., 2013; Takey & Carvalho, 2015) • Understanding business methods, processes and procedures (Brière et al., 2015; El-Sabaa, 2001; Keil et al., 2013; Takey & Carvalho, 2015) • Computer usage (Brière et al., 2015; El-Sabaa, 2001) • Understanding project management frameworks, standards and methodologies (Brière et al., 2015; El-Sabaa, 2001; Keil et al., 2013; Takey & Carvalho, 2015) • PMP certification (Brière et al., 2015; Starkweather & Stevenson, 2011; Stevenson & Starkweather, 2010) • Planning and organising (Brière et al., 2015; El-Sabaa, 2001; Keil et al., 2013; Leybourne, 2007; Takey & Carvalho, 2015)	• Verbal skills (Creasy & Anantatmula, 2013; El-Sabaa, 2001; Keil et al., 2013; Leybourne, 2007; Starkweather & Stevenson, 2011; Stevenson & Starkweather, 2010; Takey & Carvalho, 2015) • Ability to communicate at multiple levels (Brière et al., 2015; Creasy & Anantatmula, 2013; El-Sabaa, 2001; Keil et al., 2013; Leybourne, 2007; Starkweather & Stevenson, 2011; Stevenson & Starkweather, 2010; Takey & Carvalho, 2015) • Ability to deal with ambiguity and change (Creasy & Anantatmula, 2013; Keil et al., 2013; Starkweather & Stevenson, 2011; Stevenson & Starkweather, 2010) • Ability to escalate (Creasy & Anantatmula, 2013; Starkweather & Stevenson, 2011; Stevenson & Starkweather, 2010) • Decision making (Brière et al., 2015; El-Sabaa, 2001; Fisher, 2011; Leybourne, 2007; Takey & Carvalho, 2015) • Leadership (Brière et al., 2015; El-Sabaa, 2001; Fisher, 2011; Keil et al., 2013; Leybourne, 2007; Takey & Carvalho, 2015) • Motivation (Brière et al., 2015; El-Sabaa, 2001; Fisher, 2011; Keil et al., 2013; Takey & Carvalho, 2015) • Negotiation (Brière et al., 2015; El-Sabaa, 2001; Fisher, 2011; Keil et al., 2013; Leybourne, 2007; Takey & Carvalho, 2015) • Team building (Brière et al., 2015; Fisher, 2011; Keil et al., 2013; Takey & Carvalho, 2015) • Problem solving (Brière et al., 2015; El-Sabaa, 2001; Fisher, 2011; Keil et al., 2013; Takey & Carvalho, 2015)

The importance of soft skills is evident from table 1. Technical skills such as uses of various tools and techniques and understanding business methods are primarily attained through training. For example, PMI's Project Management Professional (PMP) certification provides a platform for attaining these skills. Soft skills revolve around communication and people management (Fisher, 2011). Project managers are required to have excellent verbal skills as they must communicate effectively with project members and the various stakeholders (El-Sabaa, 2001; Takey & Carvalho, 2015). A common challenge for project managers is the

language barrier which exists for geographically dispersed projects. Project teams often exhibit phases of demotivation where they are reluctant to continue working on a project (Brière et al., 2015). Project managers can resolve this through negotiation and delegation as well as facilitating team building exercises to improve and promote comradery (Fisher, 2011).

Knowledge

Project management knowledge forms the foundation of project manager's competency (Mnkandla & Marnewick, 2011). Knowledge exists in two forms, *viz.* explicit and tacit knowledge (Koskinen, Pihlanto, & Vanharanta, 2003). Explicit knowledge is primarily understood through numbers and words which are easier to communicate. For example, the PMBOK® Guide provides explicit knowledge regarding project management as this knowledge is detailed in the ten knowledge areas. Conversely, tacit knowledge is primarily acquired from experience and is extremely difficult to communicate (Pant & Baroudi, 2008). Furthermore, there is specific knowledge around the organisation, project type and industry such as engineering, information systems and finance (C. N. Bredillet, Conboy, Davidson, & Walker, 2013). Explicit knowledge is arguably comparable to technical skills while tacit is comparable to soft skills.

Project managers become subject matter experts over time as they acquire significant experience from working on various project types and sizes. This experience translates to tacit knowledge and directly influences their soft skills. For example, soft skills such as decision making, problem solving and leadership are enhanced through extensive exposure and provide guidance on what to do under varying circumstances. Petter and Randolph (2009) proclaim that experience and exposure are the only true methods to develop soft skills. There is a challenge however when transferring tacit knowledge from senior project managers to juniors or amongst other project managers as the knowledge is imbedded within the individual. Petter and Randolph (2009) discovered three methods for sharing and reusing knowledge for project management: verbatim, synthesis and creation. Poor knowledge transfer is an Achilles' heel in project management which needs to be addressed to ensure knowledge is effectively disseminated for sustainable project success.

Personal characteristics

Personal characteristics play a more pivotal role in project management than previously believed (Bakhsheshi & Nejad, 2011). An aggregated view of project manager personal characteristics is provided in table 2.

Table 2. Comparison of project manager personal characteristics (adapted from Bakhsheshi and Nejad (2011))

Personal characteristics of project managers	Study
Flexibility and adaptability; preference for significant initiative and leadership; aggressiveness, confidence, persuasiveness, verbal fluency; ambition, activity, forcefulness; effectiveness as a communicator and integrator; broad scope of personal interests; poise, enthusiasm, imagination, spontaneity; able to balance technical solutions with time, cost, and human factors; well organized and disciplined; a generalist rather than a specialist; able and willing to devote most of his time to planning and controlling; able to identify problems; willing to make decisions; able to maintain proper balance in the use of time	(Archibald, 1976)

Multidisciplinary oriented, global problem oriented, effective decision maker and problem solver , have management knowledge, have analytical ability, creative, impressive communicator, motivator, flexible, and the most important one proper temperament such as calm, realistic, quick thinking	(Stuckenbruck, 1976)
Drive and ambition; the desire to lead and influence others; honesty and integrity; self-confidence; intelligence; technical knowledge	(Kirkpatrick & Locke, 1991)
Problem-solving ability; results orientation; energy and initiative; self-confidence; perspective; communication; negotiating ability	(Turner, 1999)
Honest; competent; forward looking; inspiring; intelligent; fairness; open minded; courageous; straightforward; imaginative	(Peters, 2007)
Ambition; drive and tenacity; self-confidence; psychological openness; realism and an insatiable appetite for learning	(Lafley & Charan, 2008)
Dealing with problems; risk evaluations; honesty and integrity; understanding project team problems; having knowledge about project technology; business management competence; management principals; communications; alertness and quickness; versatility; energy and toughness; decision making ability	(Kerzner, 2009)

Initial impression of the characteristics shows that they are comparable to soft skills. Although, certain soft skills can be learnt from experience, others are natural to the individual. The most prevalent characteristics revolve around people interactions which corresponds to the notion project management is predominately a people management discipline (Fisher, 2011).

Meyers-Briggs Type Indicator (MBTI) is a popular tool for assessing personal characteristics of project managers (Cohen, Ornoy, & Keren, 2013; Creasy & Anantatmula, 2013). MBTI is used to identify personality traits of individuals by assessing four personal traits: (1) Extrovert (E) versus Introvert (I); (2) Sensing (S) versus Intuitive (N); (3) Thinking (T) versus Feeling (F) and (4) Judging (J) versus Perceiving (P).

Thinking and judging are the two most important characteristics for project managers. This is logical as project managers are required to, amongst others, make decisions, solve problems as well as manage people and resources. Project managers can be both introverted and extroverted implying that a sociable individual is not necessarily the best individual for the job. Bevilacqua, Ciarapica, Germani, Mazzuto, and Paciarotti (2014) did however discover that extroverted managers deliver projects with less delays and less wasted time while introverted managers tend to waste time by "*over-processing*". Cohen et al. (2013) expanded their study and discovered that project managers require intuitive and thinking characteristics which corresponds to the soft skills previously discussed.

PMC encompasses three key dimensions: skills, knowledge and personal characteristics. C. Bredillet et al. (2015) argues that is unethical for project managers to claim they are competent while projects continue to perform poorly. It is the project manager's responsibility to ensure they have the adequate traits to manage projects successfully. Each dimension does not operate in isolation as they are inexplicably interrelated as previously discussed. Personal characteristics support and enable both technical and soft skills. Personal characteristics also supports and enables the generation of explicit and tacit knowledge as project managers should crave acquiring knowledge throughout their careers. Explicit and tacit knowledge form the foundation of technical skills in particular and also help in improving soft skills. The three dimensions work together in developing PMC. Improved project success should be realised when the appropriate PMC has been attained. Improving project success subsequently allows organisations to realise strategic goals and overall organisational success. The relationship between the three dimensions, project management competency, project success and organisational success are shown in figure 1.
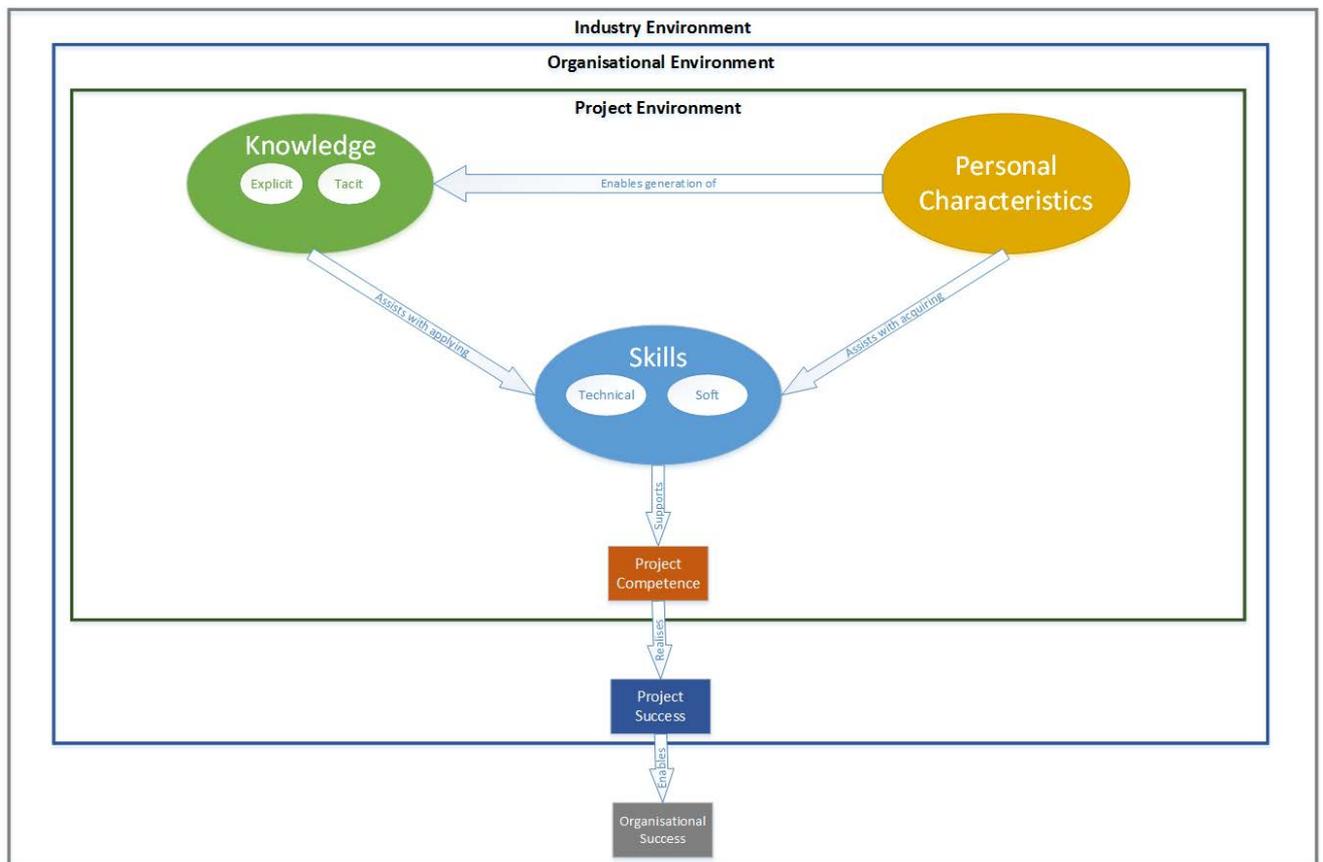
Figure 1. Conceptual model of project management competency

The conceptual model of figure 1 forms the basis of this research. Knowledge and skills are categorised as performance competencies while personal characteristics are categorised as personal competencies for this research. Furthermore, the purpose of this paper is to determine the factors in personal and performance competencies that influence project success.

Research Methodology

A quantitative study was performed in order to determine statistically significant factors that influence personal and performance competencies in project managers. A survey tool in the form of a questionnaire was electronically distributed to potential respondents. The respondents were selected by way of convenience sampling. This sampling method was selected since the exact population of project managers are very dispersed and not accurately known (Zikmund, Babin, Carr, & Griffin, 2013).

The questionnaire is structured to collect demographic data regarding the geographic location of project managers, what types for projects they are involved in, as well as the sector in which they perform their project management duties.

The main body of the questionnaire required the respondents to rate their competence in two subsections namely performance competencies and personal competencies.

Performance competencies addressed activities that project managers should be able to do during the project lifecycle. These were derived from the Project Management Body of Knowledge (PMBoK® Guide) (Project Management Institute, 2013). These process groups are:

i)   Initiating a project: Performing the work to authorize a new project and define its scope;

ii)   Planning a project: Performing the work to define and mature the project scope, develop the project management plan and identify and schedule the project activities;

iii)   Executing a project: Performing the work in the project management plan to accomplish the project objectives under the project scope statement;

iv)   Monitoring and controlling a project: Performing work to compare actual performance with planned performance, to analyses variances, to assess the trends to effect the process improvements, to evaluate possible alternatives and to implement appropriate corrective actions as needed, and;

v)   Closing a project: Performing the work to formally terminate a project and transfer the complete product to operations or to close a cancelled project.

Each process group is taken as a unit of competence.

The personal competencies section included subsections that relates to behaviors, characteristics and core personality traits that contribute to project success. Once again, the respondents were requested to rate their own competence related the following areas:

i)   Communication: Effectively exchanging accurate, appropriate and relevant information with stakeholders using suitable methods;

ii)   Leadership: Guiding, inspiring and motivating team members and other project stakeholders to manage and overcome issues to effectively achieve project objectives ;

iii)   Managing: Effectively administering the project through appropriate deployment and use of human, financial, material, intellectual and intangible resources;

iv)   Cognitive ability: Applying an appropriate depth of perception, discernment and judgement to effectively direct a project in a dynamic environment;

v)   Effectiveness: Producing desired results by using appropriate tools, resources and techniques in project management activities, and;

vi)   Professionalism: Conforming to an ethical behavior governed by responsibility, respect, fairness and honesty in the practice of project management.

Each of these six areas were also taken as a unit of competence.

For the purposes of this paper, the data is analyzed for significant factors that may influence performance and personal units of competence. Exploratory factor analysis attempts to further describe and understand the underlying structure of variables (Zikmund et al., 2013). Great amounts of variables can then be condensed into a manageable number of factors that can be interpreted. The importance of each variable determines to which factor it correlates. Each unit of competence is measured in this way.

The method of factor extraction used is principle axis factoring (PAF). PAF is used as an extraction method when the distribution of variables are skewed either positively or negatively

(Field, 2013). Due to the nature of the questionnaire that included a "Not Sure" option for selection, a skewed distribution of most variables were obtained.

Through the use of IBM SPSS, eigenvalues are determined for each variable in the unit of competence. Each positive eigenvalue indicates a dimension (Rietveld & Van Hout, 1993). However, only factors with eigenvalues above one are preferred according to the Guttman-Kaiser rule. This rule allows the researcher to discard factors that may not be of importance or that may not be actual factors.

These results need to be rotated in order to facilitate interpretation and naming of factors (Field, 2013). Various methods for rotation exist. In this study, promax rotation is used. This rotation method is used because the factors are assumed to be correlated to some extent. Therefore an oblique rotation method is preferred above orthogonal rotating methods.

The validity and adequacy for factor analysis of each unit of competence must also be calculated. This is done by using the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy. The values for all units of competence exceeded 0.8 and is thus very adequate for factor analysis (Field, 2013). In addition, Bartlett's Test of Sphericity (BTS) is conducted to determine if there are correlations in the data set for appropriate factor analysis. In this test, all the units of competence in the data set exhibited a Sig value of 0.000 which indicated this correlation and thus validated factor analysis as an appropriate tool.

Analysis and Discussion

Industries represented

A total of 403 responses were gathered through the electronically administered questionnaire. Of these responses, 220 were used as these indicated an involvement in IT projects. As indicated by figure 2, indicates the responses received from various industries:
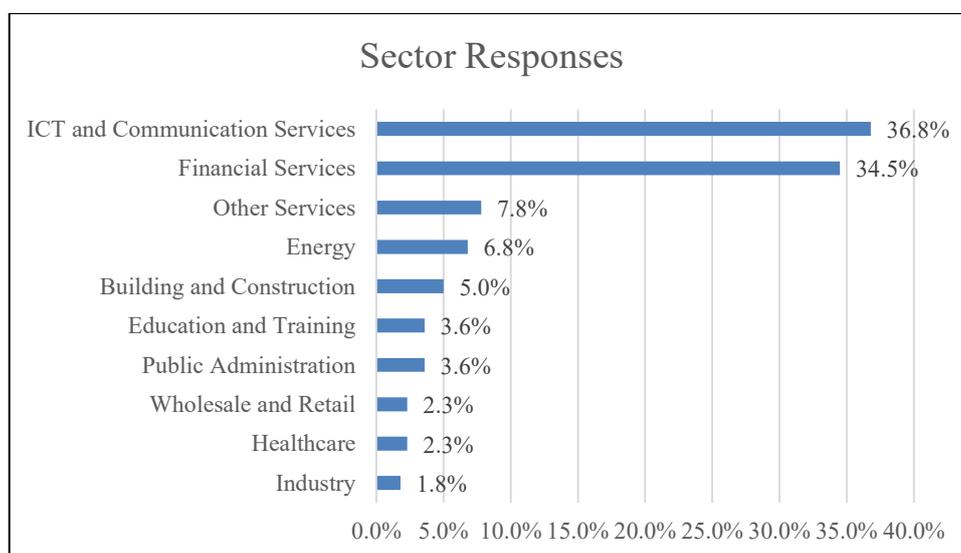

Figure 2. Response by sector

The majority of responses were from project managers in the Financial Services and Information and Communications Technology Services (ICT) sectors. These two sectors represent more than two thirds of the total responses. The minority of responses includes sectors such as building and construction and various other consolidated services.

The analysis and discussion of these results takes place under each unit of competence.

Performance competencies

Performance factors are all the activities detailed by literature, theta a project manager must conduct in order to complete a project. The factors identified in the five units of competence are analyzed and discussed in the following sections.

Unit of competence: Initiation

The respondents were required to rate their own perceived competence as it pertains to initiating a project. Subsections included activities that can be grouped under:

i)   Project alignment with organizational and customer objectives;
ii)   Ensuring the preliminary scope statement reflects customer and stakeholder expectations;
iii)   Ensuring that high-level risks, expectations and constraints are understood;
iv)   Ensuring stakeholders are identified and their needs are understood, and;
v)   Gaining approval of the project charter.

The KMO value is very strong at 0.939 and indicates the adequacy of the sample for determining factors. One valid factor is identified in this particular data set as indicated by the factor matrix in table 3.

Table 3. Factor Matrix for Unit of Competence: Initiating a project

Observed Variable	Factor 1
Understanding the alignment of the project	.803
Achieving agreement on project alignment with project sponsor	.772
Establishing the needs and expectations of key stakeholders'	.677
Determining the characteristics of the product or service	.680
Selecting and using a suitable project management methodology or process	.656
Understanding the preliminary scope of the project	.780
Framing a high-level project scope ensuring alignment with organisation and customer needs and expectations	.752
Establishing the project's high-level assumptions and constraints	.749
Identifying, qualifying and quantifying the project's high-level risks	.792
Identifying project stakeholders	.675
Conducting stakeholder analysis to gain buy-in and identifying the needs for the project	.727
Identifying high-level communication requirements	.712
Developing a high-level project strategy	.770
Establishing the project's key milestones and deliverables	.808
Developing a summary budget	.667
Supporting the project charter preparation	.718
Using governance processes to obtain sponsor approval and commitment	.731

The single extracted factor could be interpreted as being related to stakeholder management and explains 54% of the dataset. This would include identifying stakeholders, identifying their

needs and managing their expectations (Clements & Gido, 2012; Schwalbe, 2013). Many of these activities require clear and consistent communication in order to ensure the project has the highest probability of success right from the outset.

Since much of the project's detailed information is not available in the initiation phase, much communication must happen between the project manager and all stakeholders involved.

Unit of competence: Planning
This unit of competence is the largest of the performance competencies. This is due to the fact that the greatest part for the project manager's effort goes into planning the project, although the total organizational effort seems much less since no work is actually being performed on site (Clements & Gido, 2012; Marchewka, 2012).

The questionnaire requested respondents to rate their competence in producing a project management plan that includes sections on (i) schedule, (ii) budget, (iii) quality, (iv) risk, (v) quality, (vi) communication, (vii) scope, (viii) procurement, (ix) change control and (x) approving the project plan.

Analysis yielded 10 factors. The KMO value for this set of factors is extremely high 0.918 and indicates that the identified factors extracted are valid. These factors also explain almost 70% of the data.

These 10 factors correspond with the 10 subsections as listed above. The conclusion can be made that the correct factors for planning competency are identified in current practice and literature.

The greatest factor by far pertains to Scope Management as it explains 44% of the dataset. The factor loading for each variable regarding this factor is illustrated in table 4.

Table 4. Loading for "Scope Management" Factor

Factor Loadings	
Communicating approved plan to key stakeholders	.831
Conducting kick-off meeting	.800
Communicating the planned budget to stakeholders	.624
Scheduling activities to address the communication plan	.551
Establishing project baselines	.547
Communicating the project schedule with stakeholders	.518
Integrating the planning activities into a complete project management plan	.500
Building a project communication plan	.361

Clearly these variables all address major aspects in the development of the project scope. These include actions such as defining activities and their interdependencies, identifying stakeholder, creating baseline plans for the schedule and budget and ultimately condensing all the planning activities in a project management plan.

This data indicates a satisfactory approach in project management practice as it relates to this unit of competence.

Unit of competence: Execution
This unit of competence focused on how competent project managers perceived themselves to be in performing the work as detailed in the project management plan to accomplish what is set out in the scope statement. These activities were grouped under five subsections. These are (i) achieving project scope, (ii) managing stakeholders' expectations, (iii) managing human resources, (iv) managing quality against the quality management plan, and (v) managing material resources.

The factor analysis yielded three valid factors with a strong KMO of 0.855. These factors explains 61.2% of the dataset. The pattern matrix associated the variables with the 3 factors in table 5.

Table 5. Pattern matrix - Executing a project

Observed Variable	Factor		
	1	2	3
Verifying task completion as defined in the project plan	.863	-.102	-.052
Closing identified performance gaps	.832	-.077	.003
Managing phase transitions	.779	.111	-.148
Reviewing stakeholder expectations throughout the project to ensure they are being met within the project scope	.759	-.084	.074
Executing risk management plan	.722	.086	-.073
Interacting with stakeholders to ensure support for the project	.675	-.027	.082
Ensuring compliance with quality standards and processes	.499	.172	.130
Executing quality assurance activities	.436	.145	.202
Selecting suitable sellers	-.062	.950	-.011
Executing procurement tasks against schedule commitment	.004	.914	-.032
Requesting seller information	-.069	.913	.020
Acquiring internally supplied resources	.177	.662	.041
Building project team	.083	-.047	.801
Acquiring human resources per staff management plan	-.053	.037	.747
Developing project team members	-.051	.005	.736

Of the five subsections, only three factors seem to summarize the activities during the execution phase of a project. Factor 1 seems to be associated with ensuring stakeholder satisfaction during the working phase of the project. This necessitates informing the stakeholders on progress, performing the work in accordance to the requirements as set out in the scope statement and closing performance gaps as they appear.

Factor 2 seems to be associated with procuring and managing material resources. This includes external procurement as well as internal resource acquisition. Factor 3 revolves around managing human resources such as the project team. These two factors are already contained in the literature and practice as should continue to be addressed in this manner.

A case could be made to say that scope management, stakeholder expectation management and quality management addresses stakeholder satisfaction as a whole. Should the project manager falter in anyone of these three subsections, the level of stakeholder satisfaction will be degraded.

It is also then important to note that stakeholder satisfaction does not only enter into the discussion during the closeout stage of a project or only when deliverable are produced. Stakeholder satisfaction is an important factor to consider whilst doing the actual work of the project management plan.

Unit of competence: Monitoring and controlling
The competencies in the monitoring and controlling process group focuses on measuring the performance during execution against the project plan (Burke, 2013; Schwalbe, 2013). This would also entail taking corrective action when variances occur as well as documenting any required changes to the project management plan.

The subsection in the questionnaire addressed (i) tracking project status and communicating to stakeholders, (ii) managing project change), (iii) monitoring and controlling quality, (iv) monitoring and controlling risk, (v) managing the project team and (vi) administering contracts. The pattern matrix in table 6 describes the factor loading for each variable.

Table 6. Pattern matrix - Monitoring and controlling a project

Observed Variable	Factor			
	1	**2**	**3**	**4**
Identifying changes to baseline project plans	**.821**	.061	-.121	.010
Executing the process for capturing project information	**.802**	-.061	-.013	.005
Ensuring action plans are put in place to address any variations to plan	**.786**	-.105	.027	.025
Identifying the impact of the changes to the project plan	**.766**	.007	-.290	.257
Following the change management process to manage and record changes	**.714**	.080	-.191	.100
Communicating changes to project stakeholders	**.711**	.036	.231	-.210
Communicating status to stakeholders	**.633**	-.152	.248	-.025
Executing configuration management process	**.506**	.343	.071	-.139
Collecting seller performance metrics	.102	**.871**	.062	-.135
Ensuring seller contracts are effectively managed	.003	**.844**	.219	-.212
Facilitating contract audits	-.098	**.826**	-.114	.236
Ensuring sellers are part of the project team culture	-.071	**.716**	.049	.069
Facilitating quality audits	.014	**.553**	-.128	.401
Providing feedback on team and individual member performance	.036	.053	**.842**	-.085
Holding regular team meetings	-.071	-.104	**.821**	.100
Monitoring team satisfaction	.068	.082	**.723**	.002
Conducting team building activities	-.196	.058	**.713**	.054
Collecting project and product metrics	-.017	.129	**.400**	.377
Monitoring deviation from project baselines	.107	.160	**.321**	.308
Recommending corrective and preventative actions	.140	.273	**.287**	.254
Recognizing when unknown risks occur	.038	.042	-.062	**.801**
Recognizing new risk	-.058	.018	.141	**.756**
Establishing workarounds for previously unknown risks	.057	.103	.154	**.592**
Facilitating risk audits	-.068	.491	-.158	**.557**
Updating risk response plan	.278	-.086	.176	**.542**
Reviewing risk response strategies	.245	-.080	.272	**.496**
Recording acceptance of completed deliverables	.031	-.025	.392	**.457**

The factor analysis identified four factors at a high KMO value of 0.899. Therefore the four identified factors are statistically valid. The four factors explain 62.9% of the dataset. These four factors can be described as (i) change management, (ii) contract administration, (iii) managing human resource and (iv) risk management. The major factor in this data set appears to competencies related to change management. This is not surprising as much literature identifies change management as an area of practice where projects have a great chance failure (Aubry, Müller, Hobbs, & Blomquist, 2010; Erasmus & Marnewick, 2014; Geraldi, Lee-Kelley, & Kutsch, 2010; Pollack, Costello, & Sankaran, 2013; Wong, Cheung, & Wu, 2010). This is also the strongest factor in the unit of competence of monitoring and controlling. This factor also includes elements of communication with stakeholders which is also a major factor influencing the outcome of projects.

Managing risk and managing human resources are a recurring theme form the planning unit of competence. Any deviations from the plan in these two areas require corrective action and may necessitate change management process to be followed. Contract administration may be a continuation from the procuring and gathering material resources factor from the execution unit of competence.

It appears as though managing and correcting deviations have a human resource management element to the competency. This could be correct since deviations require the project managers to address the issue with relevant team members and investigate why performance is not at the level required by the project management plan. An intervention may be required as necessitated by human resource management practices.

Unit of competence: Closing
In closing out a project, the project manager is required to be competent in completing the final tasks to formally close a project. The literature identified four areas of importance namely (i) gaining acceptance of project outcomes, (ii) releasing project resources, (iii) measuring and analyzing stakeholder perceptions and (iv) formally closing the project.

Factor analysis of this unit of competence identified two factors at a high KMO value of 0.897. Therefore the two identified factors are valid for this dataset. The factor loadings categorized the variables into two factors as shown in table 7.

Table 7. Pattern matrix - Closing a project

Observed Variable	Factor	
	1	2
Providing feedback to the organisation regarding team members' performance	.843	-.139
Providing performance feedback to project team members	.824	-.173
Closing all project contracts	.699	.081
Notifying stakeholders formally of project closure	.679	.137
Executing organisational processes for releasing project resources	.638	.109
Executing closure activities for the project	.585	.257
Documenting and publishes project learning	.484	.177
Updating organisational process assets	.442	.279
Closing all financial activities associated with the project	.382	.379
Analysing result of feedback	-.195	1.008
Surveying project stakeholders	-.060	.877
Meeting all contractual requirements where required	.053	.691
Obtaining final acceptance	.244	.558
Transitioning all deliverables to operations	.214	.549

The two factors seem to divide these closing out activities into creating final documentation and completing final activities. Creating the final documentation includes the final communication with project stakeholders in order to formally complete the project.

The final activities factor includes the surveying of project stakeholders as well as gaining final acceptance and transitioning the project into operations. This distinction is important since practitioners and the literature agrees that a project is only formally completed once the customer accepts the deliverables and the project has been formally documented (Clements & Gido, 2012; Schwalbe, 2013).

Personal competencies

Personal competencies are those behaviours, attitudes and core personality characteristics that contribute to a person's ability to manage projects. This section analyses and discusses the following personal units of competence: communicating, leading, managing, cognitive ability, effectiveness and professionalism.

Unit of competence: Communicating
The KMO value was 0.890 for the communicating unit of competence and thus implies that the results for this unit of competence are adequate and valid. The results in table 8 show that there are three underlying factors with regard to communicating. These factors explain 55.1% of the dataset. Factor one relates to using appropriate communication methods. Not all methods are suitable for communicating, for example e-mail. The project manager thus has to be selective regarding the communication method used as the method used should be able to convey the information effectively and in a timely manner (Brière et al., 2015; El-Sabaa, 2001).

Factor two relates to the intangibles associated with communicating such as listening and articulating stakeholder views. Stakeholders have varying views regarding the project. The project manager is therefore required to articulate this and convey these views in manner which all will understand (Kerzner, 2009; Stuckenbruck, 1976). Factor three revolves around project information access. Although a project manager may be able to use the correct communication method and articulate stakeholder insight, they must be able to validate project information to ensure it is accurate. This ensures that there is transparency in the project as there is common understanding amongst all stakeholders (Archibald, 1976; Kerzner, 2009).

Table 8. Communicating unit of competence pattern matrix

Observed Variable	Factor		
	1	2	3
Providing relevant information	**0.808**	-0.105	0.051
Using suitable communication method for the audience	**0.765**	0.037	-0.058
Aligning communication with environment or setting	**0.750**	-0.159	0.112
Engaging stakeholders proactively	**0.623**	0.128	-0.019
Maintaining formal and informal communication	**0.614**	0.230	-0.069
Disseminating information effectively	**0.525**	0.209	0.049
Listening actively	0.033	**0.799**	-0.087
Responding to and acts upon expectations, concerns and issues	-0.085	**0.794**	0.122
Understanding explicit and implicit content of communication	0.030	**0.698**	0.022
Providing accurate and factual information	-0.019	-0.055	**0.954**
Seeking validation of information	0.062	0.069	**0.529**
Using appropriate information sources	0.100	0.235	**0.359**

Unit of competence: Leading
The KMO value was 0.917 for the leading unit of competence, thus implying that the results are adequate and valid. Table 9 shows that there are two underlying factors with regard to leading. These factors explains 52.2% of the dataset. Factor one is associated with supporting the project team while factor two focuses on encouraging team performance. Project managers are required to set the example while also supporting the team through good and bad periods (Kirkpatrick & Locke, 1991). Furthermore, the project team should be encouraged, motivated and rewarded accordingly throughout a project's lifecycle (Peters, 2007; Turner, 1999). A poor leader could result in the team performing poorly which could result in project failure and lack of strategic realisation for organisational success.

Table 9. Leading unit of competence pattern matrix

Observed Variable	Factor	
	1	**2**
Confining relationships to work-related matters appropriate to the project and local culture	**0.810**	-0.100
Aligning personal activities and priorities toward increasing likelihood of achieving project goals	**0.749**	-0.110
Applying appropriate influencing technique to each stakeholder	**0.731**	0.069
Establishing mentoring relationships for team members' development	**0.639**	0.061
Using experts or third parties to persuade others	**0.621**	-0.102
Supporting and promotes team's actions and decisions	**0.570**	0.228
Building trust and confidence with stakeholders	**0.560**	0.278
Rewarding performance according to organisation guidelines	**0.460**	0.274
Establishing and communicating to the team the project vision, mission statement, and strategic value	-0.196	**0.954**
Promoting team learning and advocates professional and personal development	-0.178	**0.931**
Demanding and models high performance	0.155	**0.522**
Creating an environment that encourages openness, respect and consideration of stakeholders	0.358	**0.493**
Demonstrating ownership of, accountability for, and commitment to the project	0.294	**0.447**
Expressing positive expectations of team	0.278	**0.428**
Encouraging teamwork consistently	0.318	**0.424**

Unit of competence: Managing

The managing unit of competence had an adequate and valid KMO value of 0.908. There are two underlying factors for managing as shown in Table 10.

Table 10. *Managing unit of competence pattern matrix*

Observed Variable	Factor	
	1	**2**
Tailoring generally accepted practices for successful completion of the project	**0.838**	-0.120
Organising project information, emphasizing appropriate levels of detail	**0.775**	-0.013
Insisting on compliance with processes, procedures, and policies	**0.732**	0.000
Applying organisation or industry standards and generally accepted practices to the project	**0.655**	0.119
Working with others to clearly identify project scope, roles, expectations, and task specifications	**0.639**	0.127
Ensuring that the team and stakeholders are fully aware of team rules	**0.496**	0.316
Recognising conflict	-0.081	**0.800**
Resolving conflicts	0.059	**0.745**
Maintaining a positive attitude and effective relationships among team members	0.006	**0.715**
Ensuring expectations and responsibilities are clear to team members and they understand their importance to the project	0.118	**0.637**
Identifying, evaluating, and selecting internal and external talent	-0.027	**0.598**
Promoting healthy work-life balance	0.143	**0.386**

These factors explain 51.4% of the dataset. Factor one focuses on a project manager's ability to adapt and tailor project management practices to organisational practices. Organisations have varying management styles which influence their practices. It is therefore essential that the project manager is able to adapt project management practices to align with organisational practices to ensure projects realise the organisation's strategic goals (Keil et al., 2013; Kerzner, 2009). Factor two relates to managing team dynamics. IT projects in particular have varying team dynamics as individuals inside and outside of IT are involved. Project managers subsequently must be able to identify and resolve conflicts while ensuring comradery is maintained within the project team (Fisher, 2011; Peters, 2007).

Unit of competence: Cognitive ability

The cognitive ability unit of competence had an adequate and valid KMO value of 0.910. Cognitive ability has three underlying factors as per table 11. These factors explain 57.8% of the dataset. Factor one focuses on a project manager's ability to critically analyse project information. Project managers must be able to consolidate project information to identify exploitable opportunities and threats which need to be addressed. An innate analytical ability is essential as project managers must manage ambiguity and change continuously while making decisions which benefit the project and reduce possible threats (Brière et al., 2015; Keil et al.,

2013; Stuckenbruck, 1976). Factor two relates to understanding the organisation's environment. Project managers cannot manage projects in isolation of the organisation as a single project is often part of a greater programme initiative used to realise strategic goals. Furthermore, a project often influences day-to-day business operations thus making it pivotal to understand the greater role of a project. The project manager's ability to apply various tools and techniques is the essence of factor three. Application of tools and techniques is a technical skill project managers require (Brière et al., 2015; El-Sabaa, 2001). There is a plethora of tools and techniques available to project managers to assist the management process. The challenge for project managers is to select the correct tool and ensure the tool provides value while managing the project.

Table 11. Cognitive ability unit of competence

Observed Variable	Factor		
	1	2	3
Aggregating multiple related issues to understand the complete picture	**1.036**	-0.102	-0.254
Observing discrepancies, trends and interrelationships in project data	**0.721**	-0.055	0.058
Simplifying complexities for a complete and accurate analysis	**0.583**	0.144	-0.003
Providing a framework to address opportunities and concerns	**0.544**	0.039	0.155
Applying complex concepts or tools when needed	**0.542**	-0.045	0.287
Looking for opportunities to improve project value or execution	**0.531**	0.065	0.204
Applying lessons learned to resolve current project issues	**0.400**	0.360	-0.107
Seizing relevant opportunities as they emerge	**0.319**	0.297	0.217
Understanding how project actions impact other areas of the project, other projects and organisational environment	0.066	**0.824**	-0.125
Understanding project stakeholders needs, interests, and influence for project success	0.012	**0.797**	-0.060
Understanding both the formal and informal structure of organisations	-0.080	**0.778**	0.052
Understanding organisational politics	-0.098	**0.745**	0.081
Consolidating opportunities and passes them to the organisation	0.333	**0.351**	0.151
Using emotional intelligence to understand and explain others' past actions and current attitudes, and anticipate future behaviour	0.274	**0.295**	0.185
Selecting appropriate tools and/or techniques	-0.183	0.023	**1.012**
Understanding PM tools and techniques	-0.031	0.044	**0.862**
Applying selected tools and/or techniques to project management	0.154	-0.128	**0.829**

Unit of competence: Effectiveness
The adequacy and validity of the effectiveness unit of competence was confirmed with a KMO value of 0.916. Exploratory factor analysis revealed three underlying factors within the effectiveness unit of competence as shown in table 12.

Table 12. Effectiveness unit of competence pattern matrix

Observed Variable	Factor		
	1	2	3
Using stakeholder communication to maintain stakeholder motivation	**0.861**	0.119	-0.217
Using objectivity for consensus building	**0.781**	0.086	-0.100
Including experts in meetings and discussions to influence and obtain stakeholder support	**0.776**	-0.278	0.142
Validating that proposed solutions resolve the problem and are within the project boundaries	**0.633**	0.121	0.064
Constantly seeking opportunities to communicate project status and directions to meet the needs and expectations of stakeholders	**0.608**	-0.097	0.241
Employing appropriate problem solving techniques	**0.476**	0.267	0.087
Choosing solutions that maximize project benefit and minimize negative impacts	**0.408**	0.229	0.193
Making timely decisions based on facts while managing ambiguity	-0.103	**0.853**	-0.002
Preventing inconclusive discussion, makes a decision, and takes appropriate action	-0.022	**0.801**	-0.064
Showing persistence and consistency in actions	0.070	**0.685**	0.043
Taking initiative when required, assuming calculated risks to expedite project delivery	0.018	**0.570**	0.180
Enabling a change-friendly environment by fostering continuous learning	-0.058	-0.080	**0.904**
Taking positive actions to capitalize on opportunities to resolve present problems	0.059	-0.023	**0.789**
Acting as a change agent	-0.015	0.098	**0.541**
Adapting to changes in the project environment to minimize adverse project impacts	0.052	0.273	**0.469**
Demonstrating flexibility towards changes that benefit the project	0.049	0.263	**0.436**

These factors explain 56% of the dataset. Factor one revolves around a project manager's facilitation ability. Project managers must facilitate communication amongst stakeholders as well as problem solving faced during a project (El-Sabaa, 2001). Factor two focuses on the initiative of project managers. Time and cost are criteria which project managers struggle to control. It is therefore imperative that they act quickly and take initiative during projects (Archibald, 1976; Turner, 1999). Projects experience continuous change thus making it important that project managers are well adept at change management (Keil et al., 2013). Poor change management could have detrimental effects on a project resulting in projects being challenged or failures.

Unit of competence: Professionalism
The KMO value was 0.896 for the professionalism unit of competence and indicates the results are adequate and valid. Table 13 shows that there are three underlying variables for professionalism. These factors explain 59.4% of the dataset.

Table 13. Professionalism unit of competence

Observed Variable	Factor		
	1	2	3
Balancing individual interest with organisational interest	0.916	-0.214	-0.024
Respecting the organisational framework for running projects	0.790	0.180	-0.208
Assigning team members in an unbiased way to appropriate tasks	0.764	-0.230	0.199
Developing elements of trust and respect within the project environment	0.738	0.157	-0.044
Creating an environment of confidence and respect for individual differences	0.671	0.041	0.114
Ensuring team's adherence to cultural issues, legal requirements, and ethical values	0.630	0.177	-0.048
Respecting personal, ethnic, and cultural differences	0.548	0.306	-0.023
Maintaining self-control in all situations and responds calmly	0.484	0.068	0.057
Adhering to all legal requirements	-0.070	0.970	-0.086
Respecting the intellectual property of others	0.033	0.824	-0.076
Working within a recognised set of ethical standards	-0.093	0.745	0.173
Maintaining and respects confidentiality of sensitive information	0.099	0.696	0.119
Seeking to avoid and discloses any possible conflict of interests to all stakeholders	0.147	0.635	0.136
Making sacrifices where necessary to move project forward	-0.055	-0.032	0.742
Understanding and actively supports the project's and organization's missions and goals	-0.162	0.226	0.692
Cooperating with all stakeholders to achieve project objectives	-0.006	0.217	0.632
Admitting shortcomings and explicitly accepts responsibility for failures	0.246	-0.161	0.588
Learning from mistakes to improve future performance	0.349	0.039	0.475

Factor one refers to cultural management. Project management is a team effort which combines the skills and experience of multiple internal and external stakeholders, especially team members. Cultural differences are inevitable particularly in the South African context. It is arguable that South African project managers are required to be more adept at cultural issues and be able to mitigate or avoid issues which could negatively affect project outcome. Factor two focuses on ethical behaviour. Regardless of project type, projects have ethical concerns and ramifications. While a project manager may have extensive knowledge of the discipline's practices, they must also take extensive consideration of ethical implications. It is therefore imperative that project managers apply an ethical "lens" when managing a project. Factor three focuses on lessons learnt by project managers. Each project allows the project manager to learn as there are various positives and negatives that come out of projects. Lessons learnt primarily become tacit knowledge and add to a project manager's experience. Furthermore, it could be argued that both technical and soft skills are enhanced as the project manager grows from these lessons learnt.

Conclusion

The factor analysis of performance competencies serves to focus on the important issues in the project management lifecycle or process groups. During the initiation phase, a project manager is yet to be appointed in some cases and the project manager has little say in whether a project is to be approved. During this time, it is advised that a project manager focuses on stakeholder management issues as this is the primary area identified. Stakeholder management has been deemed so important, that the Project Management Institute (PMI) added a tenth knowledge area to its traditional nine in the 5th edition of the Project Management Body of Knowledge (Project Management Institute, 2013).

The planning unit of competence yields the most factors as it is the area where project managers exert the greatest effort. In addition, this is arguably also the most important phase of a project. If the project is estimated and planned incorrectly, it will be executed incorrectly. Therefore there will be many factors to consider before the project can actually be undertaken.

During the execution phase of a project, the actual work is being done and now the entire organization is expected to exert some effort in conjunction with the project manager. The project manager must ensure that stakeholders remain satisfied during this phase and not attempt to leave this important factor to be focused on during close-out of the project. In additional, the project manager must ensure that internal and external resources execute the plan as detailed.

The monitoring and controlling phase takes place concurrently with the execution phase. Some of the factors that influenced the project management plan re-emerges since what is being executed needs to be compared to the plan. The results reiterates the fact that project change management is a major factor in completing a project successfully. Once again internal and external resources need to be managed but the project manager needs to be aware of new and emerging risks and manage them accordingly.

During the final phase of the project, total organizational effort decreases however, the final activities still need to be completed in order to formally close the project. The factors identified relate to final activities to be completed and documentation to be completed. This is standard project management practice but rarely implemented to a satisfactory extent.

It is recommended that all these factors need to be competently addressed by the project manager and in particular during the planning phase. This seems to be a critical time in any project that requires a skilled project manager to diligently complete these tasks.

Additionally, it is recommended that stakeholder satisfaction be an important dimension of a project manager's duties. This factor spans various units of competence and seems to be more important during the planning and execution phases than any other. This would include keeping the stakeholders informed and appraised of progress. Additionally this requires ensuring the stakeholders' satisfaction while the work is being done and not only when a deliverable is handed over.

Factor analysis of personal competencies revealed that the current perception of PMC can be simplified into fewer factors. The communicating unit of competence was represented by (i) communication methods, (ii) communication intangibles and (iii) information access. The implication is that three areas must be addressed for successful communication to occur especially considering project management is primarily stakeholder management.

Leading was summarised into (i) project team support and (ii) project team encouragement. Leading is paramount in any profession and project management is no exception. Project teams require continuous support and encouragement to ensure they perform as required to achieve project and organisational goals.

Managing ability is an unquestionable pre-requisite for project managers. This unit of competence has two factors: (i) practice adaptation and (ii) team dynamics. Project managers must adapt project management practices to the project and organisation accordingly to ensure success. Furthermore, project teams have various dynamics which need to be managed throughout a project's lifecycle.

Project management often tests a project manager's cognitive ability and particularly (i) analytical ability, (ii) environment understanding and (iii) tools and techniques usage. Critical analysis is pivotal throughout a project and subsequently requires the project manager to be well grounded in multiple areas. Furthermore, the project manager must ensure they understand the environment in which they operate as projects are part of a greater plan to realise organisational success. Multiple tools and techniques are available to project managers. The challenge is to select the correct tool and technique at the correct time during a project. Comprehensive understanding of tools and techniques is therefore required by project managers.

Project managers must be effective in everything they do including (i) facilitation ability, (ii) initiative and (iii) change management. Facilitation is important as the project manager is a key link amongst stakeholders. This in turn requires that they have initiative and are able to solve problems and make key decisions during a project. Projects exhibit continuing change which has to be managed during a project to ensure the project delivers as expected.

Professionalism unit of competence is represented by (i) cultural management, (ii) ethical behaviour and (iii) lessons learnt. Cultural differences are arguably poorly managed in project management especially with regard to South African and multinational projects. A professional project manager understands various cultural differences to ensure these differences do not negatively influence the project outcome. Ethical behaviour is questionable within the African context thus making it even more paramount that project managers always consider ethical implications when making decisions. Project managers learn from every project they manage and should apply this knowledge to future projects to ensure these projects do not experience the same mistakes.

This research had a number of limitations and opportunities for future research. Firstly, the results provided a wide overview of performance and personal competencies rather than detailed view. Future research should take a qualitative approach to gain more depth of knowledge regarding these competencies. Secondly, only exploratory factor analysis was

conducted where confirmatory factor analysis could be used in future to confirm the identified factors and structural equation modelling could be used to identify relationships amongst factors. Thirdly, these results pertain to South Africa and future research could look to gain insight at an international level.

It remains important for practice to ensure that project managers are equipped with the correct skills and that these skills are actually performed properly during the course of the project lifecycle. Practitioners and researchers are thus compelled to address the disjoint between theory and practice as current competencies are inadequate for IT projects. Project management can only thrive as a profession once practical competencies are established as in other true professions.

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