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Empirical Study of Project Managers Leadership Competence and Project Performance

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Abstract: The role of a project manager's leadership competence in improving project performance is critical. However, little attention has been given to people-related competencies of the project manager as a leader. This study aims to develop and test a model of project manager leadership competence. To investigate the influence of a project manager's leadership competence on project performance, 289 project managers working on public sector projects in Pakistan were surveyed. Both exploratory and confirmatory factor analyses were used to analyze interrelationships among specific competencies and to explain these competencies in terms of their common underlying dimensions. Hierarchical Regression Analysis and Structural Equation Modeling were employed to test research hypotheses and the model. Findings from this study demonstrate that all five leadership competencies of a project manager are significantly related to achievement of project performance in terms of schedule, cost, and quality, as well as stakeholder satisfaction.

Keywords: Competence, Leadership, Project Manager, Project Performance

EMJ Focus Areas: Leadership; Program & Project Management

Improving project performance is a common issue in almost all organizations. Project performance cannot be completely assessed until the project is delivered and used by the customer (Razmdoost & Mills, 2016). Assessing project performance involves detailed analysis of all aspects of a project (Todorović, Petrović, Mihić, Obradović, & Bushuyev, 2015). As ongoing research efforts are aimed to develop theories and models for improving project performance (Williams, 2005), it is necessary to improve understanding of critical competencies that must be utilized in a project context (Loufrani-Fedida & Missonier, 2015). To specify the interactions and mix of competencies leading to success, prior research studies have focused on identifying leadership competencies to develop leadership models (Hollenbeck, McCall, & Silzer, 2006).

The number of leadership competencies identified in the field of project management has steadily increased (PMI, 2013), but further research is needed to identify the specific abilities to manage projects efficiently and successfully (i.e., the competencies required for project managers in their role as leaders; Wright & Taylor, 1985; Yukl, 1989). In the engineering management and project management literature, the issue of project manager leadership competencies continue to provoke debate with regard to their contribution to project success, which highlights the need for research on leadership competencies to fully understand how they relate to project performance (Anantatmula, 2010; Battilana, Gilmartin, Sengul, Pache, & Alexander, 2010; Muller, Geraldi, & Turner, 2012; Nixon, Harrington, & Parker, 2012; Yang, Wu, Wang, & Chin, 2012). Past studies focused on analyzing and recognizing project manager leadership competencies (Berg, Karlsen, & Sarkis, 2016) and identified lack of leadership competence as the reason for many project failures. This competency represents one of the main reasons for the inability of project managers to organize available resources, to meet stakeholder expectations, to meet deadlines, and to take corrective actions for improving project performance (Ogunlana, Siddiqui, Yisa, & Olomolaiye, 2002; Sunindijo, 2015).

According to Berg et al. (2016), specialized and sophisticated project management tools alone are not enough to improve project performance, and development of a project manager's leadership competencies is also required. In other words, the focus from tools and techniques is required to shift to "soft skills" with a specific emphasis on leadership competencies that deliver desired results. Anantatmula (2010) conducted a study to identify and develop a better understanding of how people-related competencies relate to project performance, and suggests that future studies should develop and test a leadership model for project managers by employing different quantitative methods representing a wide range of industries or business sectors.

There is a growing need for leadership competency models in organizations utilizing multiple projects in order to address and improve project performance (Todorović et al., 2015). Hollenbeck et al. (2006) discuss theoretical assumptions of leadership competency models but did not develop or test any specific leadership competency model that can be used to improve project performance in an organization. Anantatmula (2010) identified leadership competencies based on a comprehensive literature review and used a survey questionnaire and interpretive structural modeling (ISM) methodology to analyze survey data from 69 project management professionals in the United States. Hollenbeck et al. (2006) suggest that efforts should be made to identify the association among leadership competencies to develop and expand current leadership models. Attakora-Amaniampong (2016) suggests future research efforts to assess the relationship between project manager competencies and project performance. These assertions highlight the need to investigate the influence of project manager leadership competence on project performance at the industry, sector, or country levels (Anantatmula, 2010; Attakora-Amaniampong, 2016; Berssaneti & Carvalho, 2015; Loufrani-Fedida & Missonier, 2015), because of limited empirical studies on this subject (Yang, Wu, & Huang, 2013). This research aims to address the following research question:

- What is the relationship between project manager leadership competencies and project performance?

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This study aims to contribute to the engineering and project management disciplines in the context of leadership competence and project performance in several ways: developing and validating a project manager leadership competence model, identifying the association between leadership competence and project performance, and addressing research gaps and limitations of earlier studies identified by various researchers (Anantatmula, 2008a, 2010; Fung, 2014; Hollenbeck et al., 2006; Loufrani-Fedida & Missonier, 2015; Yang et al., 2013). In this study, a survey questionnaire was administered across different industries within Pakistan, and hierarchical regression analysis (HRA) and structural equation modeling (SEM) were used to test hypotheses and the research models.

Further, this study addresses the limitations of earlier studies on leadership competence and project performance models, including models developed by Attakora-Amaniampong (2016), Berg et al. (2016), Berssaneti and Carvalho (2015), Sunindijo (2015), Todorović et al. (2015), Loufrani-Fedida and Missonier (2015), Anantatmula (2010), Hollenbeck et al. (2006), McCrae and John (1992), and Bass and Avolio (1990). Based on proposing and testing research hypotheses, a robust theoretical framework on project manager leadership competence and project performance is developed.

The remainder of this article is structured in the following manner. First, a literature review is presented to document the metrics and models associated with project manager leadership competence and project performance. Using the literature review findings, research hypotheses and the research model are presented in the following section. Next, research methods and data collection procedures are described, followed by the results from the study. Finally, discussion of the results and their implications for engineering managers, limitations of the study, and future directions are presented.

Literature Review and Theoretical Framework

Project Manager Leadership Competencies and Models

Leadership is "a process of influencing the activities of an individual or a group to achieve project goals in a given situation" (Hersey & Blanchard, 1982, p. 94). Due to an increase in project-based organizations, project managers' competencies with respect to leadership are becoming more important in research (Kaulio, 2008).

According to Loufrani-Fedida and Missonier (2015, p. 1121), competence is "the ability of an individual, a team, or a company to mobilize and combine resources (i.e., knowledge, skills, and attitudes) in order to implement an activity in a situation." Project manager leadership competencies as critical factors of failure or success are considered a means to assess project performance (Anantatmula, 2010; Geoghegan & Dulewicz, 2008; Keller, 1992; Kerzner, 1987; Nixon et al., 2012). Leaders can be effective in some situations but not in all circumstances (Hollenbeck et al., 2006). A number of studies examine the influence of project manager leadership competencies (intellectual, managerial, and emotional) on project success (Geoghegan & Dulewicz, 2008; Muller et al., 2012; Müller & Turner, 2010a, 2010b), and project manager leadership styles (transformational and transactional) on project success or performance (Yang, Huang, & Wu, 2011; Yang et al., 2012, 20132). However, limited research has been conducted to examine the relationship between people-oriented leadership competencies of project managers and their relationship with project performance (Anantatmula, 2008a, 2010; Fung, 2014).

The 'great man' theory suggests that leadership competency models facilitate the process of grooming project managers as leaders (Hollenbeck et al., 2006). Project managers, through leadership competencies, symbolize an important role to motivate people for successful accomplishment of projects. Effective project managers articulate project vision and develop project spirit aligned with the project strategy (Shenhar, 2004). Project managers identify potential risks associated with projects (Hastak & Shaked, 2000), employ a systematic process to manage risks (Yoon, Tamer, & Hastak, 2014), and communicate important decisions to the project team members according to the situation (Strider, 2002).

A number of competency frameworks evolved in the field of project management, such as the International Project Management Association (IPMA) Competence Baseline and the Guide to the Project Management Body of Knowledge (PMBOK), developed by the Project Management Institute (PMI, 2013). The IPMA classifies 46 competency elements into three groups: (a) contextual, (b) behavioral, and (c) technical competencies. PMI (2013), on the other hand, organizes project management competences into 10 knowledge areas of project management. The IPMA competencies baseline and the PMBOK knowledge areas provide a comprehensive guide for management of a project in general. Such competency models do not reflect leadership competencies required to improve project performance or achieve the strategic objectives of an organization (Hollenbeck et al., 2006). The models of Hollenbeck et al. (2006) and McCrae and John (1992) refer to personality dimensions and leadership styles, respectively, focusing on general management theories. Leadership competency models are considered useful for project managers to accomplish project objectives, as lack of project manager leadership competence is directly linked with failure of projects (Nixon et al., 2012). Furthermore, project managers should be efficient in planning, implementation, and completion of project activities (Mantel, Meredith, Shafer, & Sutton, 2011).

In projects, an important leadership competence is developing trust among the project team members and key stakeholders. Trust is known to influence project performance (Brewer & Strahorn, 2012); this relationship establishes an environment of confidence among project team members and other project stakeholders. Trust promotes willingness among team members and subordinates to accomplish project activities (Burke, Sims, Lazzara, & Salas, 2007), which ultimately impacts project performance (Brewer & Strahorn, 2012). Trust is a two-way process in projects where both project manager and project stakeholders accept a certain level of mutual vulnerability. The project manager (trustor) must display trusting behavior while stakeholders (trustee) also need to display trustworthy behavior (Brewer & Strahorn, 2012).

In addition to promoting trust, project managers need to be aware of project activities and take steps to make decisions in accordance with the given situation. Project priorities should be identified and must be adhered to. In addition, unambiguous roles and responsibilities should be assigned to the right people in the right projects at the right time. Moreover, project managers must communicate with all project stakeholders to integrate the project into the wider spectrum of the organization in order to benefit both the customer and the organization (Kloppenborg, Shriberg, & Venkatraman, 2003). Thus, project managers should keep motivating project stakeholders to accomplish organizational objectives through projects (Lunenburg, 2011). A

Exhibit 1. Summary of Literature on Project Manager Leadership Competencies

Authors	Project Manager Leadership Competencies				
	Define Roles and Responsibilities	Communicate Expectations	Employ Consistent Processes	Clarity in Communication	Establish Trust
Day (1998)	√	√		√	√
Fedor, Ghosh, Caldwell, Maurer, and Singhal (2003)				√	
Hartman and Ashrafi (2002)	√	√	√	√	
Jugdev and Müller (2005)				√	
Mullaly (2004)	√	√	√	√	√
Pinto and Prescott (1987)		√			
Potts (2000)				√	
Schultz, Selvin, and Pinto (1987)	√	√		√	
Smith (2001)			√		
Thamhain (1999)	√	√	√	√	√
Thamhain (2004)	√	√		√	
Weiss (2001)	√	√		√	

summary of the literature on project manager leadership competencies is presented in Exhibit 1.

Project Performance Measures

Every project is unique, and project performance is measured in terms of successful completion of the project (Cheng, Ryan, & Kelly, 2012). Project information can be used to analyze and monitor project success or project performance to establish a knowledge base and enhance the process of managing future projects (Todorović et al., 2015). According to the Standish Group International (2015), 29% of projects are deemed to be successful, 52% are "challenged" projects, and 19% are considered a failure. The rate of project success has declined from 34% in 2004 to 19% in 2015.

Project performance has been traditionally defined and evaluated on the basis of the amount of resources required for completion of the project (Razmdoost & Mills, 2016). In accordance with the "iron triangle," a project is considered a success when the estimated schedule is met, the cost is very close to the initial planned budget, and all deliverables meet the requirements of project stakeholders (Berssaneti & Carvalho, 2015). The short-term aspects of project performance are focused on the iron triangle, which are crucial for clients to achieve immediate project success. However, long-term competitive advantage of projects is also significantly important for clients and project stakeholders (Berssaneti & Carvalho, 2015; Mir & Pinnington, 2014; Yang, Chen, & Wang, 2014; Yang et al., 2013).

The stakeholder salience theory suggests that the interests of various stakeholders have a strong influence on project performance (Berssaneti & Carvalho, 2015). Typically, compliance with cost, schedule, and quality performance have often been used to measure project performance. Project management processes have a significant impact on the time and the cost of the project (Almahmoud, Doloi, & Panuwatwanich, 2012), but time and cost alone are not sufficient to assess project performance (Nixon et al., 2012). Project performance should be measured through time, cost, and quality because project completion on time, within budget, and within quality parameters are considered the three primary objectives of project success (Meng, 2012). Cost overrun and time delays are common in projects (Ibbs, Wong, & Kwak, 2001) due to adoption of poor project management practices (Wright, Cho, & Hastak, 2014). Thus, other dimensions, such as quality performance and stakeholder satisfaction, must be considered in order to fully measure project performance (Almahmoud et al., 2012; Berssaneti & Carvalho, 2015; Yang, Huang, & Hsu, 2014; Yang et al., 2013; Yeung, Chan, Chan, Chiang, & Yang, 2012). Project performance should be measured according to the schedule, planned budget, quality specifications, and stakeholder satisfaction (Berssaneti & Carvalho, 2015). Project performance measures summarized from the literature are presented in Exhibit 2.

Literature on project management suggests that new models of project performance should be multi-dimensional (Todorović et al., 2015). Project performance depends on leadership competence, organizational control processes, and the perceived relevance of prior performance (Chen, 2015). In terms of control process, process-oriented performance increases the possibility of integrating the best available resources required to meet the project objectives (Razmdoost & Mills, 2016). Further, there are two key aspects that improve project performance during execution: (a) project management processes and (b) the working relationship between project stakeholders (Meng, 2012). Both are related to project leadership. In this study, measures of overall project performance were based on dimensions of schedule performance, cost performance, quality performance, and stakeholders' satisfaction.

Schedule Performance. Performance with respect to time has a significant influence on projects (Sunindijo, 2015) and can significantly contribute to overall project performance (Ahadzie, Proverbs, & Sarkodie-Poku, 2014). Meng (2012) argues that schedule is a key factor affecting project

Exhibit 2. Summary of Project Performance Measures

Authors	Project Performance			
	Cost	Schedule	Quality	Stakeholder Satisfaction
Cox, Issa, and Ahrens (2003)	√	√	√	
Yeung, Chan, Chan, and Li (2007)	√	√	√	
Kim and Huynh (2008)	√	√	√	√
Skibniewski and Ghosh (2009)	√	√	√	√
Rankin, Fayek, Meade, Haas, and Manseau (2008)	√	√	√	
Ling, Low, Wang, and Lim (2009)	√	√	√	
Swarup, Korkmaz, and Riley (2011)	√	√	√	
Almahmoud et al. (2012)	√	√	√	√
Yeung et al. (2012)	√	√	√	√
Yang et al. (2013)	√	√	√	√
Yang et al. (2014)	√	√	√	√
Yang et al. (2014)	√	√	√	√
Berssaneti and Carvalho (2015)	√	√	√	√

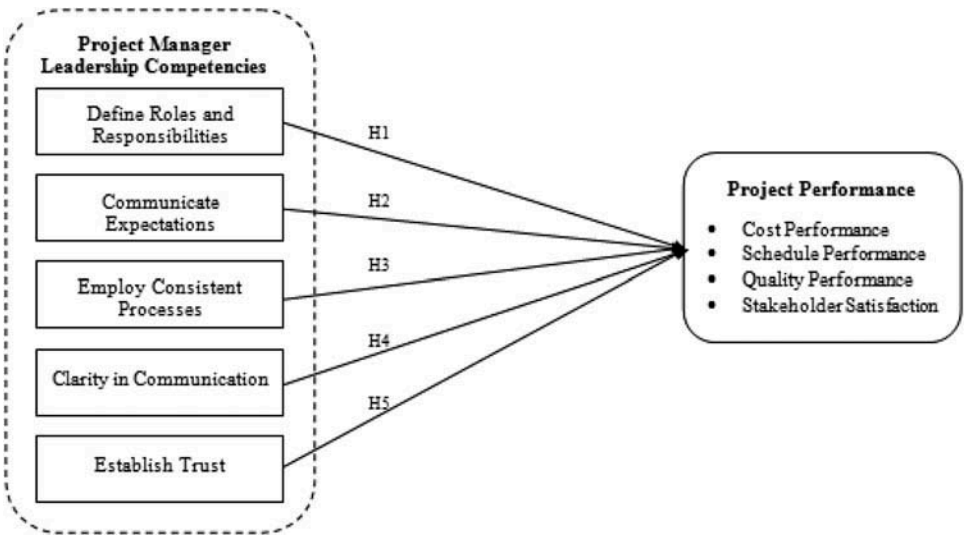
performance as it requires collaboration among stakeholders across projects, and this collaboration is also time-consuming. Schedule performance can be affected by many factors that lead to revised schedule actions, such as schedule estimates, schedule control mechanisms, quality estimates, design documents, environmental factors, project management, and leadership skills (Sunindijo, 2015).

Cost Performance. Cost can only reflect efficiency of a project but has significant impact on project stakeholders (Razmdoost & Mills, 2016). Similar to schedule performance, cost performance can be affected due to poor project planning, poor cost estimates, and inefficient cost control mechanisms that lead to a revised project budget (Sunindijo, 2015).

Quality Performance. Mir and Pinnington (2014) argue that in addition to schedule and cost performance, quality performance is a critical dimension of project performance. Quality performance is about meeting the aesthetic, functional, and legal requirements of a project and project outcomes. Project requirements may be simple or complex. Quality is accomplished if a completed project conforms to the specified requirements. To improve project performance, project managers should focus on required quality parameters in all project activities and processes.

Stakeholder Satisfaction. The performance of a project depends on effective communication and coordination among all project stakeholders. Project performance cannot be absolutely measured until the project outcome is delivered and used by the customer or client (Razmdoost & Mills, 2016). For successful accomplishment of a project, project managers need to focus on customer benefits, customer needs, and stakeholder expectations

Exhibit 3. Leadership Competence and Project Performance Model



(Berssaneti & Carvalho, 2015), in addition to cost, time, and quality specifications (Attakora-Amaniampong, 2016). Project stakeholders articulate requirements during the initial planning phase and expectations during the project implementation phase. The cost and time have significant impact on project efficiency and project stakeholders (Razmdoost & Mills, 2016).

Research Hypotheses and Research Model

A number of leadership dimensions in competency models have been explored to identify dimensions of leadership competencies across people and situations (Hollenbeck et al., 2006). This study operationalizes dimensions of project manager leadership competencies and project performance in order to examine the relationship between leadership competencies and project performance (see Exhibit 3). These five people-related leadership competencies are chosen because they represent the five most commonly cross-referenced by several past research studies.

Define Roles and Responsibilities

The right person in the right place at the right time can improve project performance. Defining clear roles and responsibilities is important in projects that steer almost all other factors towards project success, either directly or indirectly (Anantatmula, 2010). Day (1998) suggests that project managers should clearly define the roles and responsibilities of project team members to avoid any conflict. Unclear roles and responsibilities is one of the key problems in managing project activities (Elonen & Artto, 2003). During the initiation of a project, it becomes crucial to identify and reduce fundamental causes of conflicts, gaps, and duplication in the roles and responsibilities of the project team, which are critical for project performance (Elbarkouky & Fayek, 2011). Improvement in performance of projects is not possible without clear definition of roles and responsibilities (Anantatmula, 2010). However, unclear roles and responsibilities affect project performance and may lead to project failure. Frequent and rapid changes in roles and responsibilities, just as with organizational structure, are not vital in project performance (Elonen & Artto, 2003). The project manager should be able to recognize the strengths of individuals and align these strengths with specific responsibilities in the project team. Defining roles and responsibilities unambiguously has become essential for project managers to manage projects. Thus, the relationship between defining roles and responsibilities and project performance needs to be examined.

H_1 Defining roles and responsibilities is significantly associated with project performance.

Communicate Expectations

Previous studies identified a number of project success factors, which include adequate communication with project team members and project stakeholders with a clear focus on what is expected and to manage unexpected problems (Ahmed & Mohamad, 2016; Anantatmula, 2010; Muller et al., 2012; Müller & Turner, 2010a, 2010b; Nixon et al., 2012). In other words, communicating expectations emphasizes the responsibilities of project team members and stakeholders in terms of desired work ethics, deliverables, and work performance. However, project deliverables must be deliberated with the customer in the early stages to clearly define project boundaries that determine what is included and what is not included in the project scope. The project manager should be efficient in documenting the expectations of stakeholder or customers to achieve desired outcomes and avoid uncertainties. In projects, the process of managing communication ensures timely collection, generation, storage, and disposition of project information. Nonetheless, it is critical to clarify what is expected from external and internal stakeholders, including project team members (Anantatmula, 2008b). Project managers should effectively communicate to create a bridge between diverse stakeholders involved in a project, share various levels of expertise, establish different cultural and organizational backgrounds, and build an environment of trust to achieve project outcomes (PMI, 2013). The project manager should communicate customer expectations with the project team to identify roles and tasks, define the level of accountability, define responsibilities of individual team members, and create an environment of trust among team members to support the team in times of crises (Thamhain, 1999).

H_2 Clear communication of expectations is significantly associated with project performance.

Employ Consistent Processes

A process is a collection of interconnected tasks or activities undertaken to accomplish specific outcomes. To accomplish project activities, project managers employ project management as an application of knowledge, skills, tools, and techniques during initiating, planning, executing, monitoring and controlling, and closing processes (PMI, 2013). Rad and Anantatmula (2010) identified three factors—competent people, project teams, and project-friendly organizations—that promote consistent practices and processes essential for achieving sophistication in managing complex projects. The project manager must ensure appropriate selection and deployment of consistent project management processes during project implementation to improve performance, efficiency, risk mitigation, ambiguity reduction, and success of projects. However, required inputs, outputs, and tools and techniques of project management processes must be followed in spirit. Just as with defining roles and responsibilities, developing consistent project management processes is one of the most important steps for successfully leading and managing projects (Anantatmula, 2010). Project managers need to eliminate unnecessary processes and redundant information in order to create efficient and smooth project planning (Barriga, Jeong, Hastak, & Syal, 2005). Project managers identify inter-relationships among processes and develop strategies to enhance project performance (Anantatmula, 2015).

H_3 Employing consistent processes is significantly associated with project performance.

Clarity in Communication

Communication can affect project performance in the field of project management (Abu-Hussein, Hyassat, Sweis, Alawneh, & Al-Debei, 2016). Clarity in communication is focused on getting the message across to the receiver such that it is received as intended. Communication is considered an important enabling factor (Potts, 2000) and a critical success factor in projects (Day, 1998; Hartman & Ashrafi, 2002). Project managers must possess excellent communication capabilities to create harmony among team members and facilitate stakeholder involvement. Weiss

(2001) identified different drivers and barriers of project performance; drivers include project manager's leadership competence while barriers include weak processes and poor communication channels among project stakeholders. Communication directly influences project performance (Katz, 1982), and close communication is required to keep projects on a fast track (Day, 1998). High-level project performance is based on rich project communications that encourage effective and sustainable working relationships (Andersen, Birchall, Jessen, & Money, 2006). Clear and timely communication has a significant impact on achieving project objectives and mission. On the other hand, ineffective communication may lead to scope creep, which may lead to unnecessary cost and schedule overruns as well as customer dissatisfaction.

H_4 Clarity in communication is significantly associated with project performance.

Establish Trust

Trust is the basic element to facilitate human interaction during the initial stages of a project. Communication is an important factor for developing trust among subordinates and project stakeholders (Burke et al., 2007). Trust is an important influencing factor of project performance to effectively work collaboratively and address identified problems throughout a project efficiently. The project manager must develop an environment of trust in projects, and team members need to display trustworthy behavior (Brewer & Strahorn, 2012). Anantatmula (2010) argues that trust is the most important aspect of leadership to motivate the team, mitigate risks, resolve conflicts among stakeholders, and ensure accomplishment of project objectives. Project managers should develop a relationship of trust among team members and other stakeholders so that team members will perform project tasks more willingly (Brewer & Strahorn, 2012).

H_5 Establishment of trust is significantly associated with project performance.

Research Methods

Data Collection

To examine the influence of project manager leadership competence on project performance through the set of research hypotheses discussed in the previous section, a survey methodology was employed. An online survey questionnaire was developed to collect data to measure the leadership competencies of project managers as well as project performance. The survey was comprised of three sections: demographic information, project manager leadership competency measurement items, and project performance measurement items. Besides demographic information, the questionnaire includes 23 questions to assess leadership competencies and 14 questions to assess project performance. The survey was distributed to participants through email and reminder emails were sent every 2 weeks to ensure greater participation in the study.

Participants and Procedures

Professionals working as project directors or project managers on public sector projects in Pakistan and possessing project management experience were chosen as potential respondents of the study. These respondents were selected based on reports of the Federal and Provincial government's planning and development departments. For this study, the sample encompasses different industries of Pakistan in which projects were funded by the Federal or Provincial government. The survey was sent to the project directors and project managers working on 400 different public-sector projects in Pakistan. The unit of analysis for this study, and for the survey, was the project. In the online survey, all survey items were annotated as "required" to respond. In other words, the survey link did not allow participants to submit the survey unless all of the items were completed. Thus, there were no missing values from survey responses.

Measurement and Operationalization of Variables

Survey items from validated constructs used in previous studies were adapted to operationalize variables in the research model (Dulewicz & Higgs, 2005; Keller, 1995; Kwak & Ibbs, 2002; Larson & Gobeli, 1989; Müller & Turner, 2007; Pinto & Slevin, 1987; PMI, 2007; Whitener, Brodt, Korsgaard, & Werner, 1998; Yang et al., 2013). However, in order to operationalize the construct of "Define roles and responsibilities," measurement items were developed by the authors based on the role theory of Mintzberg (1979). The operationalization of variables is presented in Exhibit 4.

The dimensions of project manager leadership competence were assessed based on the measurement instruments adapted from earlier studies (see Exhibit 4). We used a 5-point Likert scale (1 = "strongly disagree," 2 = "disagree," 3 = "neutral," 4 =

Exhibit 4. Summary of Measurement of Variables

Coding	Variable(s)	Number of Items	Source for Questions Adapted From the Literature
Project Manager Leadership Competencies		***23***	
CXP	Communicate Expectations	4	Pinto and Slevin (1987)
CIC	Clarity in Communication	6	PMI (2007); Dulewicz and Higgs (2005)
ECP	Employ Consistent Processes	4	Kwak and Ibbs (2002)
DRR	Define Roles and Responsibilities	5	Developed by the authors based on Mintzberg (1979)
ETR	Establish Trust	4	Whitener et al. (1998)
Project Performance		***14***	
SPF	Schedule Performance	4	Pinto and Slevin (1987); Larson and Gobeli (1989); Müller and Turner (2007); Keller (1992); Yang et al. (2013); Berssaneti and Carvalho (2015)
CPF	Cost Performance	3	
QPF	Quality Performance	4	
SSF	Stakeholder Satisfaction	3	

"agree," and 5 = "strongly agree") to measure leadership competence. Project performance was measured by aggregating the items from dimensions of schedule performance, cost performance, quality performance, and stakeholder satisfaction. Accordingly, to measure the dimensions of project performance, questions were adapted from Pinto and Slevin (1987), Larson and Gobeli (1989), Müller and Turner (2007), Keller (1992), Yang et al. (2013), and Berssaneti and Carvalho (2015). A 5-point Likert scale (1 = "strongly disagree," 2 = "disagree," 3 = "neutral," 4 = "agree," and 5 = "strongly agree") was also used to measure overall project performance. The specific survey items for project manager leadership competence and project performance are shown in Exhibit 5.

Pilot Study

Prior to data collection for the full study, a pilot study ($N = 50$) was conducted to assess construct validity and reliability. Participants in the pilot study were project directors or project managers working on public sector projects in Pakistan; pilot study participants represented the population chosen for the study. Factor analysis was used to check the hypothesized structure of latent variables (Pison, Rousseeuw, Filzmoser, & Croux, 2003) and to ensure construct validity (Bernstein & Nunnally, 1994; Gorsuch, 1983; Guilford, 1946; Nunnally, 1978). The accuracy of the instrument used for the survey is referred to as validity (Mirabella, 2008). There was no issue of content validity as most of the measurement items were adapted from previously-published studies. The factor loadings for all items measuring project manager leadership competencies were well above the cutoff value of 0.50, which is in line with recommendations by Hair, Black, Babin, Anderson, and Tatham (2010). Thus, no items were required to be dropped during analysis. In the pilot study, we used the eigenvalue one-rule (Kaiser, 1960), Bartlett (1950) Test of Sphericity, and scree test methods (Cattell, 1966), which provide the most preferred solution for factor retention. Hair et al. (2010) recommend evaluating the appropriateness of the factor analysis by using Kaiser-Meyer-Olkin (KMO) greater than 0.60 and Bartlett's Test of Sphericity with significant value ($P < 0.001$). The pilot study reveals a KMO value of 0.841 for project manager leadership competence and 0.830 for project performance, well above the threshold of 0.60. Bartlett's test yielded significant results for project manager leadership competence [χ^2 (156.069), $N = 50$, $df = 21$, $p < .001$] and project performance [χ^2 (471.474), $N = 50$, $df = 91$, $p < .001$] (Tabachnick & Fidell, 2007). Factor loadings for project manager leadership competence ranged from 0.566 to 0.841 and between 0.528 to 0.840 for project performance, which are well above the cutoff value of 0.50, in accordance with Hair et al. (2010).

Data Analysis Methods

To test research hypotheses, this study employed HRA and SEM techniques. For this purpose, Statistical Package for the Social Sciences and Analysis of Moment Structures software applications were used. A summary of demographic results, reliability and validity, factor analyses, and model fit is presented in the next section.

Results

In this section, we discuss results from the survey questionnaire, including demographic results from the survey, evidence of evaluating psychometric properties of survey measures, model fit results, and results from testing hypotheses.

Demographic Results

A total of 289 responses (72.3%) were received, with 85% male and 15% female participation in the survey. The respondents were asked about their experience. In Pakistan, public sector projects are often assigned to the existing employees working in government organizations who have project management or related experience instead of hiring new project managers or project directors. However, the professionals working in middle- or top-level management positions are often assigned as project managers on federal or provincial government funded projects in Pakistan who possess higher qualifications, such as PhD, MS/MPhil, or Master's degrees. Of the respondents in this research, 4% have more than 15 years experience, 9% have 10–15 years experience, 21% have 5–10 years experience, 16% have 3–5 years experience, and 50% have about 3 years experience. The respondents indicated that 31% were small projects, 47% were medium projects, and 22% were large projects on the basis of budget, duration, and team size. Following Armstrong and Overton (1977), early respondents (50 responses) were compared to late respondents (50 responses) to check non-response bias. Based on analysis of variance tests with regard to the respondent types, no significant differences in the mean responses of constructs were found. More details of demographics regarding respondents and project characteristics are shown in Exhibit 6.

Results From Assessing Reliability and Validity

Cronbach's alpha value above 0.70 is considered acceptable (Hair et al., 2010), and the pilot study satisfies the minimum requirement of Cronbach's alpha in the case of all variables in the study. Following Roberts, Priest, and Traynor (2006), no dimensions were dropped as the Cronbach's alpha values of the extracted factors of project manager leadership competence and project performance exceeded the cutoff value of 0.70 (see Exhibit 7). Bartlett (1950) Test of Sphericity and KMO measure of sampling adequacy (Kaiser, 1974) were employed for factorability of the exploratory factor analysis. The KMO test revealed a value of 0.916 for project manager leadership competence and a value of 0.927 for project performance, which are well above the threshold value of 0.60. The Bartlett's test indicated significant results for project manager leadership competence [χ^2 = 4,059.620, $n = 289$, $df = 465$, $p < .001$] and for project performance [χ^2 = 2,357.869, $n = 289$, $df = 91$, $p < .001$]. A summary of the factor loadings, KMO values, Barlett's test results, *df*, and Eigenvalue values of each dimension of project manager leadership competence and project performance is given in Exhibit 7.

To test construct validity, Hair et al. (2010) recommend using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) methods. They recommend a minimum sample size of 100 responses to run EFA and CFA. Thus, the sample size of $N = 289$ fulfills the prerequisite to run both EFA and CFA to assess construct validity. Thus, we first conducted an EFA to determine the validity of constructs and then a CFA to confirm the validity of the constructs. EFA is a preferred technique to validate the prior measurement model with a clearly specified number of latent factors and their respective indicators (Alhija, 2010). According to Hair et al. (2010), the value of KMO should be greater than 0.60, Barlett's Test of Sphericity should be significant ($p < .001$), and correlation among variables should be greater than 0.30.

As mentioned earlier, a total of 289 responses was received in this study. To decide the grouping of project manager leadership competence and project performance, factor analysis with

Exhibit 5. Survey Questions Used for Each Variable

Variable	Code	Survey Questions
Project Manager Leadership Competency		
Clarity in Communication	CIC1	Vision and instructions were communicated to the team members appropriately.
	CIC2	All stakeholders were engaged to win support for the project through lively and enthusiastic communication.
	CIC3	Communication was tailored according to project team and stakeholders interests, accessibility and approachability.
	CIC4	Formal communication channels were maintained.
	CIC5	Informal communication channels were maintained.
	CIC6	Communication was employed for coaching and mentoring the team members.
Define Roles and Responsibilities	DRR1	The roles and responsibilities of project team and other stakeholders were defined clearly.
	DRR2	Clear definition of roles and responsibilities has highest priority in projects.
	DRR3	Clarity in project roles and responsibilities was essential to avoid conflicts and encourage teamwork.
	DRR4	Unambiguous roles and responsibilities significantly contributed to improve project performance.
	DRR5	The project roles and responsibilities were performed and monitored effectively.
Communicate Expectations	CXP1	The clients were given the opportunity to provide input early in the project development stage.
	CXP2	The client or user was kept informed of the project's progress.
	CXP3	The value of the project was discussed with the eventual clients.
	CXP4	The limitations of the project were discussed with the clients.
Employ Consistent Processes	ECP1	Project management processes were identified and employed consistently.
	ECP2	The processes were improved continuously to maximize project efficacy and minimize project risks.
	ECP3	Innovative ideas were used to improve processes and practices.
	ECP4	Systematic and structured project planning and controlling performed to improve project performance.
Establish Trust	ETR1	Trust in others involved in project reflects an expectation or belief that they will act benevolently.
	ETR2	Trust involves a willingness to be vulnerable and risk that the others may not fulfill the expectations.
	ETR3	Trust involves some level of dependency on the other so that the outcomes of one individual are influenced by the actions of another.
	ETR4	Trust can be viewed as an attitude held by one individual toward another.
Project Performance		
Schedule Performance	SPF1	All project assignments were followed as per planned schedule.
	SPF2	The schedule for each phase of the project was essentially the same as planned.
	SPF3	Major project activities were completed on-schedule.
	SPF4	The project was delivered on schedule.
Cost Performance	CPF1	The cost objectives were met in the project.
	CPF2	The budget for each phase of the project was essentially the same as planned.
	CPF3	The overall budget for the project was essentially the same as planned.
Quality Performance	QPF1	The project deliverables were of high quality.
	QPF2	The project deliverables were highly reliable and required minimal maintenance.
	QPF3	The quality objectives were achieved for the project.
	QPF4	The facilities were built based on the owner's requirements.
Stakeholder Satisfaction	SSF1	The project owner was satisfied with the project's deliverables and the project management process.
	SSF2	The project team was satisfied with the project's deliverables and the project management process.
	SSF3	The customer was satisfied with the project's deliverables and the project management process.

Exhibit 6. Demographic Results from Survey

Demographic	Min	Max	Mean	SD	Item	Frequency	Percent
Gender	1	2	1.1	0.35	Male	247	85.5
					Female	42	14.5
Age	1	5	2.1	1.08	18–25	111	38.4
					26–33	91	31.5
					34–40	56	19.4
					41–49	22	7.6
					50 and Above	9	3.1
Education	1	4	3.1	0.86	Bachelor Degree	8	2.8
					Master Degree	71	24.6
					MS/MPhil Degree	100	34.6
					PhD Degree	110	38.1
Experience	1	5	2.0	1.21	<3 Years	146	50.5
					3 to 5 Years	45	15.6
					5 to 10 Years	60	20.8
					10 to 15 Years	26	9.0
					>15 Years	12	4.2
Sector	1	2	1.4	1.20	Federal government	112	38.8
					Provincial government	177	61.2
Industry	1	10	5.8	2.99	Education	46	15.9
					Health	17	5.9
					Manufacturing	13	4.5
					Construction	30	10.4
					Financial services	9	3.1
					Chemicals	3	1.0
					Engineering	31	10.7
					IT & Telecom	97	33.6
					Professional services	12	4.2
					Others	31	10.7
Team size	1	5	2.2	1.47	≤10	136	47.1
					11–20	52	18.0
					21–30	36	12.5
					31–40	24	8.3
					>40	41	14.2
Project type	1	3	1.9	0.73	Small	89	30.8
					Medium	135	46.7
					Large	65	22.5
Project duration	1	5	1.8	1.05	≤1 year	144	49.8
					≤3 years	90	31.1
					≤5 years	32	11.1
					≤5 years	11	3.8
					>5 years	12	4.2
PMP	1	2	1.8	0.41	Yes	61	21.1
					No	228	78.9

Exhibit 7. Evidence for Construct Validity and Reliability

Variables of Study	KMO	Bartlett's Test of Sphericity	*df*	Sig	Eigen Values	No. of Items	Cronbach's Alpha (α)
Project Manager Leadership Competency	***0.916***	***4059.620***	***465***	***.000***		***23***	***.934***
Clarity in Communication	.764	301.929	15	.000	10.738	6	.730
Define Roles and Responsibilities	.841	538.493	10	.000	1.869	5	.842
Communicate Expectations	.753	285.607	6	.000	1.719	4	767
Employ Consistent Processes	.775	324.855	6	.000	1.408	4	.788
Establish Trust	.755	234.352	6	.000	1.246	4	.733
Project Performance	**0.927**	**2357.869**	**91**	**.000**		**14**	**.927**
Schedule Performance	.751	495.039	6	.000	7.275	4	.841
Cost Performance	.733	379.663	3	.000	2.711	3	.853
Quality Performance	.802	448.330	6	.000	2.323	4	.837
Stakeholder Satisfaction	.720	311.474	3	.000	2.695	3	.823

varimax rotation was used. Only the factors with greater than 0.6 factor loading were extracted according to guidelines defined by Hair et al. (2010). By employing PCA with varimax rotation, factor loadings ranging from 0.603 to 0.849 indicate a high level of internal consistency among the items for project manager leadership competence (see Exhibit 8). Only the items associated with loadings below the cutoff value of 0.60 were dropped from further analysis. Accordingly, four items were dropped, which were below the threshold: two items from Clarity in Communication (CIC3, CIC5) and two items from Define Roles and Responsibilities (DRR1, DRR5). Results from EFA show factor loadings for the items measuring the dimensions of project performance ranging from 0.620 to 0.783, indicating a high level of internal consistency (see Exhibit 8).

Model Fit Results

Following Lisak (2013), we applied CFA on a two-factor model to confirm the factor structure of project manager leadership competence and project performance. In order to estimate this model, we first designed a first-order factor model of project manager leadership competence (see Exhibit 9). The factor loadings from CFA range from 0.611 to 0.784 for all factors of project manager leadership competence on a one-factor model. All items significantly loaded on the respective corresponding factors ($P < .001$) and fit indices provided evidence of a good fit [χ^2 (255.785) = 2.046, $p < .001$; Comparative Fit Index (CFI) = .923; Tucker Lewis Index (TLI) = .905; Root Mean Square Error of Approximation (RMSEA) = .060]. Results were higher than .90 for CFI and TLI, and lower than .07 for RMSEA, as recommended (Browne, Cudeck, & Bollen, 1993; Hu & Bentler, 1999).

Similarly, all of the items measuring project performance as a first-order factor model (see Exhibit 10) significantly loaded on their corresponding factors ($P < .001$) and fit indices provided evidence of a good fit [χ^2 (57.041) = 1.501, $p < .001$; CFI = .989; TLI =.984; RMSEA =.042], which indicate higher than .90 for CFI and TLI, and lower than .07 for RMSEA. The factor loadings range from 0.643 to 0.820 for all factors of project performance on a one-factor model.

We compared this model with a two-factor model by loading the five dimensions of project manager leadership competence on the first factor and the four dimensions of project performance on the second factor (see Exhibit 11). The results for the two-factor model of project manager leadership competence and project performance were significant [χ^2 (26.108) = 1.865, $p < .001$; CFI = .988; TLI = .976; RMSEA = .055]. Thus, we found support for the two-factor model structure.

Results from Hypothesis Testing. The objective of conducting factor analyses was to determine how to reduce the data with a minimal loss of information contained in the original variables by using a smaller set of variables (factors). Factor analysis becomes an objective basis for creating summated scales when there is a need to provide an empirical estimate for the structure of the variables. Correlation analysis was performed to check the significant association between variables of the study. To verify a high degree of significant correlation between Clarity in Communication and Define Roles and Responsibilities (r = 0.653), Schedule Performance and Cost Performance (r = 0.698), and between Quality Performance and Stakeholder Satisfaction (r = 0.771), multicollinearity diagnostics were conducted. Based on VIF (<10) and tolerance (>.10) thresholds per Hair et al. (2010), no multicollinearity was found. A summary of means, standard deviations, and correlation analysis is reported in Exhibit 12.

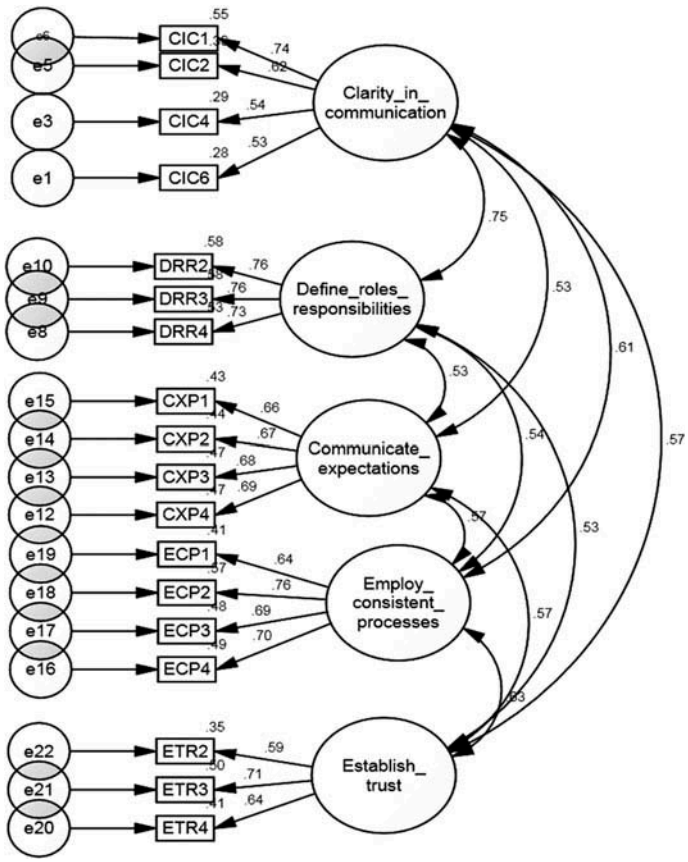
In order to conduct regression analysis, the conditions of homoscedasticity, linearity, multicollinearity, and normality were investigated and were satisfied, in accordance with guidelines of Hair et al. (2010). For testing research hypotheses, we performed regression analysis to determine the relationship between project manager leadership competencies and overall project performance. Following the regression analysis procedure, each dimension of project manager leadership competency was entered in the regression analysis. The results indicate that each dimension of project manager leadership competence significantly influences project performance, with reference to and in agreement with the guidelines defined by Hair et al. (2010) and Huselid (1995).

We formulated and tested research hypotheses using principles and guidelines from Hair et al. (2010) and Humaidi, Anuar, and Said (2010). To test Hypothesis 1, investigating the relationship between Defining Roles and Responsibilities and overall Project Performance, hierarchical regression analysis

Exhibit 8. Exploratory and Confirmatory Factor Analyses

Variables of Study	Exploratory Factor Analysis Items	Exploratory Factor Analysis Loadings	Confirmatory Factor Analysis Items	Confirmatory Factor Analysis Loadings
Project Manager Leadership Competency				
Clarity in Communication (CIC)	CIC1	.610	CIC1	.755
	CIC2	.632	CIC2	.627
	CIC3	.503	CIC3	—
	CIC4	.615	CIC4	.646
	CIC5	.310	CIC5	—
	CIC6	.849	CIC6	.611
Define Roles and Responsibilities (DRR)	DRR1	.490	DRR1	—
	DRR2	.730	DRR2	.721
	DRR3	.748	DRR3	.679
	DRR4	.678	DRR4	.705
	DRR5	.471	DRR5	—
Communicate Expectations (CXP)	CXP1	.622	CXP1	.662
	CXP2	.733	CXP2	.661
	CXP3	.703	CXP3	.682
	CXP4	.753	CXP4	.685
Employ Consistent Processes (ECP)	ECP1	.726	ECP1	.636
	ECP2	.700	ECP2	.755
	ECP3	.608	ECP3	.696
	ECP4	.623	ECP4	.704
Establish Trust (ETR)				
	ETR1	.603	ETR1	.694
	ETR2	.715	ETR2	.561
	ETR3	.718	ETR3	.686
	ETR4	.612	ETR4	.625
Project Performance				
Schedule Performance (SPF)	SPF1	.783	SPF1	.727
	SPF2	.776	SPF2	.672
	SPF3	.620	SPF3	.726
	SPF4	.661	SPF4	.782
Cost Performance (CPF)	CPF1	.693	CPF1	.820
	CPF2	.774	CPF2	.807
	CPF3	.725	CPF3	.812
Quality Performance (QPF)	QPF1	.761	QPF1	.799
	QPF2	.715	QPF2	.776
	QPF3	.753	QPF3	.786
	QPF4	.723	QPF4	.643
Stakeholder Satisfaction (SSF)	SSF1	.773	SSF1	.759
	SSF2	.677	SSF2	.647
	SSF3	.749	SSF3	.644

Exhibit 9. First-Order Factor Model of Project Manager Leadership Competencies



was performed and results are shown in Exhibit 13. The variable, Define Roles and Responsibilities, yielded a significant positive association with Project Performance (β = .453, t = 8.817, ΔR^2 = .252, p < 0.001). As a predictor, Define Roles and Responsibilities explained 26.1% of the variance in Project Performance. Thus, Hypothesis 1 is supported. The results of

Exhibit 10. First-Order Factor Model of Project Performance

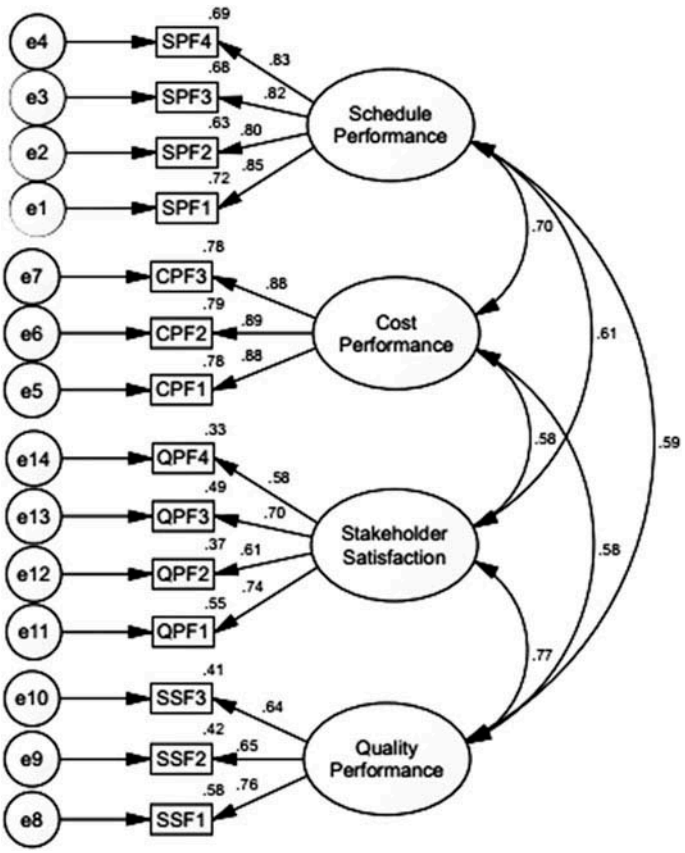
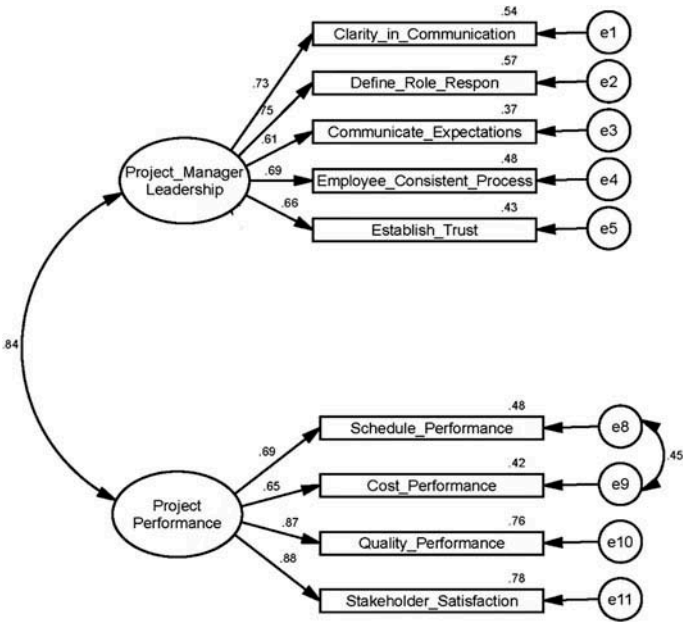


Exhibit 11. Second-Order Factor Model of Project Manager Leadership Competencies and Project Performance



testing Hypothesis 2 show a significant positive relationship between Communicate Expectations and overall Project Performance ($\beta = 0.389$, $t = 7.196$, $\Delta R^2 = 0.151$, $p < 0.001$). Additionally, Communicate Expectations explained 15.9% of the variance in Project Performance (see Exhibit 13). Thus, Hypothesis 2 is supported. Results of testing Hypothesis 3 show a significant positive relationship between Employ Consistent Processes and overall Project Performance ($\beta = 0.524$, $t = 10.504$, $\Delta R^2 = 0.274$, $p < 0.001$). As shown in Exhibit 13, Employ Consistent Processes explained 28.4% of the variance in overall Project Performance. Therefore, Hypothesis 3 is supported. Hypothesis 4 predicted a positive significant association between Clarity in Communication and Project Performance ($\beta = 0.537$, $t = 10.845$, $\Delta R^2 = 0.287$, $p < 0.001$). Further, Clarity in Communication explained 29.7% of the variance in overall Project Performance, as shown in Exhibit 13). Consequently, Hypothesis 4 is supported. Hypothesis 5 shows a significant positive relationship between Establish Trust and overall Project Performance ($\beta = 0.392$, $t = 7.265$, $\Delta R^2 = 0.154$, $p < 0.001$). Additionally, this variable explained 15.9% of the variance in Project Performance. Thus, Hypothesis 5 is also supported.

Discussion of Findings

Findings from this study substantiate the research hypotheses and demonstrate the significant relationship between project manager leadership competencies and project performance. We tested each leadership competency of project managers with overall project performance according to the formulation of research hypotheses. In line with Hair et al. (2010), the purpose of testing each competency separately was to predict the changes in the dependent variable in response to changes in each leadership competency—representing independent variables.

Implications of the Study

This study enhances understanding of engineering and project managers in finding ways to improve project performance and accomplish desired outcomes through a set of leadership competencies that cannot be achieved through any single competency alone. The models of McCrae and John (1992) and Bass and Avolio (1990) refer to personality dimensions and leadership styles, respectively; these models focus only on general management theories. The research described in this study is focused on a model that is developed in the context of different projects and for project managers. This study contributes to theory through a robust theoretical framework of project manager leadership competence and project performance.

The theoretical contribution of this study implies that increasing the level of clarity in communication and defining unambiguous roles and responsibilities remain impactful to project performance, which entails that clarity in communication and roles and responsibilities have a positive and significant impact on project performance. This research effort presented and tested a research model to help practitioners in defining, planning, developing, and evaluating project manager leadership competence and project performance across industries, sectors, or countries. The literature on project manager leadership competence and project performance is abundant, but there is still a lack of practical support and implications for project managers.

Exhibit 12. Mean, Standard Deviation, and Correlation Analysis

	Variable	Mean	SD	1	2	3	4	5	6	7	8	9
1	Clarity in Communication	3.72	0.617	1								
2	Define Role and Responsibilities	4.04	0.750	.653**	1							
3	Communicate Expectations	3.81	0.756	.459**	.470**	1						
4	Employee Consistent Processes	3.77	0.755	.439**	.520**	.444**	1					
5	Establish Trust	3.68	0.674	.474**	.487**	.459**	.528**	1				
6	Schedule Performance	3.62	0.854	.453**	.460**	.282**	.486**	.335**	1			
7	Cost Performance	3.59	0.912	.401**	.347**	.275**	.397**	.270**	.698**	1		
8	Quality Performance	3.90	0.702	.533**	.528**	.482**	.477**	.424**	.591**	.582**	1	
9	Stakeholder Satisfaction	3.87	0.757	.555**	.573**	.434**	.528**	.449**	.607**	.583**	.771**	1

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

Exhibit 13. Regression Analysis for Testing Research Hypotheses

		Project Performance						
Hyp	Variables	β	*t*	R^2	Adj R^2	ΔR^2	*F*	Δ*F*
1	Define Roles and Responsibilities	.453****	8.817	0.267	0.261	0.252	51.981****	98.444****
2	Communicate Expectations	.389****	7.196	0.407	0.159	0.151	28.315****	51.782****
3	Employ Consistent Processes	.524***	10.504	0.289	0.284	0.274	58.015****	110.342****
4	Clarity in Communication	.537****	10.845	0.301	0.297	0.287	61.707****	117.621****
5	Establish Trust	.392****	7.265	0.168	0.162	0.154	28.823****	52.783****

*$p < .05$, **$p < .01$, ***$p < .005$, ****$p < .001$.

The practical implications of this work are targeted toward engineering managers, project managers, and project directors working in different organizations. The study can help practitioners learn leadership competencies to improve project performance. In agreement with Ahmed, Azmi, Masood, Tahir, and Ahmad (2013), project managers should possess essential leadership competencies to ensure successful completion of projects. Leadership competencies tested in this study, along with the adoption of project management methodologies driven by international bodies of knowledge (i.e., the Project Management Body of Knowledge (PMBOK), Engineering Management Body of Knowledge (EMBOK), International Project Management Association (IPMA) Competence Baseline, and the Project Management Competency Development (PMCD) Framework), can help engineering and project managers to accomplish success in projects. Although engineering managers and project managers tend to use leadership competence as a tool to improve project performance, senior management may take the lead role in selecting, developing, and training competent engineering managers and project managers.

Limitations and Future Research Directions

This study formulated hypotheses to examine the effect of project manager leadership competencies on project performance following guidelines of Hair et al. (2010) and Humaidi et al. (2010). We investigated the influence of each project manager leadership competence separately on project performance, however, investigation of each dimension of leadership competence against each dimension of project performance can be investigated in future research. The respondents of the study were limited to project directors or project managers; future research should collect data on overall project performance from other project stakeholders (i.e., top management, engineering managers, sponsors, contractors, suppliers, organizations, and sectors). Future research may also include other leadership elements such as competency profiles, leadership skills, and leadership roles of project managers. In this study, a cross-sectional design was employed such that results are confined to a single point in time. Therefore, the model may represent the static nature of leadership competence displayed by project managers. Thus, a longitudinal study in the future may be fruitful to gain an in-depth understanding of project manager leadership competence over a period of time.

The survey data were dependent upon only one group of respondents (self-reported responses) for both independent and dependent variables. In agreement with Mir and Pinnington (2014), self-report responses are often known to be affected by the participants' biases due to their retrospective assessments, which cannot, or do not, always accurately recall a past situation's attributes. Thus, there may be a possibility of response bias and common method variance as the survey data were gathered from a single type of respondents and a single point in time (Podsakoff, MacKenzie, Podsakoff, & Lee, 2003). We checked the response bias by comparing means of early responses with late respondents but no significant differences were found, though no sensitivity analysis was performed to

check the robustness of results, which is a limitation of this study. The sample data collected from public sector projects of Pakistan was sufficient to test the model (N = 289), however, a larger sample from a specific industry or different sectors could be obtained in future research in order to produce more comprehensive and sophisticated results to further improve the model.

This study was limited to survey data on projects from different industries of a developing country. It is unclear if the leadership competencies required in a developing country are the same as those required in developed countries due to differences of culture and environment. In the future, this study could be replicated worldwide across the industry, sector, or country level by adding organizational culture, national culture, and work environment variables. In addition, a comparative study on developing and developed countries would be interesting for future research. Finally, this study was limited to project performance in terms of schedule performance, cost performance, quality performance, and stakeholder satisfaction. However, the paradigm is shifting toward a more holistic perspective, encompassing meeting customer needs, contractor or supplier satisfaction, and team satisfaction, which should be addressed through future research.

Conclusions

The purpose of this study was to develop a model of project manager leadership competence and examine the relationship between various competencies and project performance. This study identified a set of variables significantly related to project performance and tested a research model by collecting quantitative subjective survey data on projects (N = 289), and employing a hierarchical regression model and structural equation modeling. This study found direct links between the project manager leadership competencies and project performance. Moreover, earlier leadership competencies models have critically been discussed to provide a theoretical justification for developing and testing this model. This study also addressed the limitations of Anantatmula's (2010) model tested through ISM with a small sample of data from 69 project managers.

The findings from this work demonstrate that people-related factors of leadership competence are positively and significantly associated with project performance, indicating that a project manager or engineering manager focusing on people-related leadership significantly improves project performance (i.e., schedule performance, cost performance, quality performance, and stakeholder satisfaction). The results provide critical insights to engineering and project managers on people-related leadership competencies for improving project performance. The findings substantiate the positive influence of project manager leadership competencies on project performance that helps to improve project performance. For greater generalizability of the study findings, further research should be conducted in other developing and developed countries that span different sectors or industries, exploring additional dimensions related to project manager leadership competence.

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