

# Mapping Project Management Competencies with Different Complexities for Improving Performance

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## Abstract

*The complexity has turn into a severe issue for successful completion of projects. Hence, it is vital to spot levels of relevant project management competencies for different complexities. Thirty two experts from academia and field were interviewed through semi-structured pre tested questionnaire. In first part of study, essential elements of complexities were identified along with required dimensions of competencies to counter these complexities and to get improved performance. In second part, required levels of competencies for different complexities were identified. The paper is mainly presenting results of second part of study. All questionnaires were based on PMCD and IPMA framework for competencies while TOE model was adopted for complexities. Leadership, management skill and good communication competencies were identified as top qualities required to deal with technical, organizational, environmental and overall complexities and to achieve project objectives.*

**Keywords:** Project Management Competencies, Project Complexities, Project Performance, Public Sector Infrastructure Projects of Pakistan.

## Introduction

Despite of the reality that interest in project management is increased, but still projects have maintained their failure at large and also their complexity and uncertainty continue to grow (Dias *et al.*, 2014). This is increasing as the time passes due to the projects implementation in dynamic environments, having multiple stakeholders with different perspectives and rapid technological challenges added with uncertainties (Shah *et al.*, 2011). These complexities have resulted difficulties in managing these projects properly (Ejaz *et al.*, 2013). Hence, the conventional approaches of project management are not appropriate in current circumstances (Shah *et al.*, 2011).

However, adoption of project management competencies leads to project success (Ejaz *et al.*, 2013; Dias *et al.*, 2014). An appropriate manager as per the type, context, nature and complexity of project is

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required to get good performance and to make a project successful (Bosch-Rekvelde et al., 2011). Projects of different natures required to be managed in different approaches (Dias et al., 2014). Therefore, more pragmatic research is needed to develop a project management framework and/or model for public sector and technologically advanced projects based on widespread studies of best-practices across the world (Shah et al., 2011). It means that the project management approach should be adapted accordingly to the distinctive characteristics of projects. Similarly different Project Management techniques, approaches and competencies would be required to deal with different elements of complexity and to improve performance.

The project management practices, skills and its competencies levels are very low in developing countries like Pakistan (Othman, 2013). Here, a lot of projects are getting delay because of improper planning and many other management related problems (Pasha et al., 2012; Ejaz et al., 2013) and lack of competencies hindered development of projects in developing countries (Othman, 2013). Also, lack of suitable human resources, poor planning and management skills has led to time and cost overruns of projects in Pakistan (Pasha et al., 2012; Ahmed et al., 2013). One example of such projects is New Islamabad International Airport Project which is facing lot of problems due to several reasons related to project management (Ejaz et al., 2013). Therefore, the higher challenges related to construction projects in Pakistan demand application of latest project management philosophy, tools and techniques to manage performance (Nawaz et al., 2013).

Applications of standardized and internationally recognized project management methodologies can contribute in successful delivery of project objectives (Shah et al., 2011). And appointment of competent and qualified project manager / project director can improve project performance in public sector development projects in Pakistan (Pasha et al., 2012). The new explored issues must be addressed with latest skills, technology and standards. Complexity is one of the issues in management of projects not only in Pakistan but also around the globe which requires to be countered through high level of competencies to improve project performance.

It is required to know different elements of project management complexities present in engineering infrastructure projects and to discover different project management competencies adopted and required to exercise for successful delivery of projects. It is also required to spot relevant project management competencies of appropriate levels needed to exercise for different complexities, to overcome these complexities and also to improve project performance (Khattak & Mustafa, 2014).

In literature, there is lack of mapping of competencies with elements of complexity i.e. the relevant competence required to be exercised for specific element of project complexity for improved performance. This study contributes to existing body of knowledge by showing relevant project management competencies required for technical, organizational, environmental and overall / total complexities calculated from levels of competencies required for different elements of complexities.

### **Research Objectives**

This research study is focused on Pakistan. In Pakistan only Public Sector Engineering Infrastructure Projects (i.e. construction projects of roads/buildings), their complexities and the Project Management Competencies of their Project Managers/ Project Directors involved in implementation are considered. Projects like rail and road, water supply, sewerage, waste disposal, oil & gas and transportation network are usually infrastructure projects, which are normally owned and financed by federal/provincial governments (Mubin & Ghaffar, 2008). Project Management being the main area of study, this research is not considering the nature / sector of a project for analysis instead only Project Management aspects are considered. The main objective of the research is to identify and assess levels of different management competencies required to counter technical, organizational, environmental and overall complexities for improved performance.

### **Methodology**

The research method adopted in this study is interviews of Key Informants / Experts about public sector infrastructure projects of Pakistan. All questionnaires were based on PMCD (2007) and IPMA (2006) frameworks for competencies while TOE model of Bosch-Rekveldt et al. (2011) was adopted for complexities.

Thirty two experts from academia and field have been interviewed through semi-structured pre tested questionnaire at their premises for this research to identify different elements of complexities contributing in public sector engineering infrastructure projects and different project management competencies required to deal with these complexities. The experts were given questionnaires having all the elements of project complexities and dimensions of project management competencies along with their definitions and explanations. After having complete understanding of all the elements of complexities and dimensions of project management competencies the experts were asked questions about existence of elements of complexity and requirement of dimensions of competence. The intensity of each element of complexity and importance of each dimension of competence was also measured through 1 to 5 scale (1 =lowest, 5 = highest). Open ended questions were

also included to find additional elements of complexity and dimensions of competence. To get mapping results, the required level of relevant competencies for specific element of complexity was measured by asking the interviewees to mention the relevant competency with required level i.e. from 1 to 5 (1= little important, 2 = somewhat important, 3 = important, 4 = very important, 5 = extremely important) needed to deal with specific elements of project complexity so that project performance could be improved with respect to cost, time and scope.

#### *Complexities in Projects*

In interviews, the Interviewees were asked to rate elements of project complexity. These elements of project complexity were selected on the basis of past researches i.e. using TOE Framework of complexity of Bosch-Rekveltdt et al. (2011). The total cost of uncertainty in Pakistan was about US\$ 0.07 billion during the year 2013-14 (Pakistan, 2015). Therefore, the experts confirmed the existence of all elements of complexity of TOE Framework in public sector infrastructure projects of Pakistan up to some level. However, five additional elements i.e. law & order Situation, Political Instability, Weak Authorization of Project Managers, Land Issues and Energy Crises were also identified during interviews which contribute greatly in creating complexities in public sector infrastructure projects in Pakistan. With the identification of five additional dimensions of complexities, the total number of project complexities for this study became 55.

#### *Project Management Competencies*

Management plays vital role in a project successful, flawless and timely completion by keeping all the resources, cost, quality and time in spot light. Project Management competencies regarding a project are in general divided in more than 20 dimensions based on PMCD (2007) and IPMA (2006) models. Though these dimensions were based on past research, three new dimensions i.e. Honesty, Dedication and Enthusiasm were also identified in interviews. With the identification of three additional dimensions of competencies, the total number of project management competencies for this study becomes 23.

#### *Required Levels of Project Management Competencies for Different Complexities*

Total 55 elements contributing to project complexity were identified in three main areas i.e. technical complexity, organizational complexity and environmental complexity and thus constituting TOE Framework. The TOE Framework is also divided into 12 groups of complexities. The 55 elements of complexities are distributed accordingly in these groups.

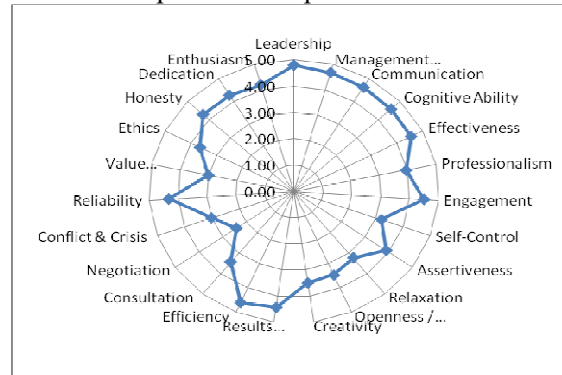
Although mapping of 23 dimensions of project management competencies to deal with all 55 elements of complexities has been done, however this paper shows only results of mapping with technical, organizational, environmental and overall / total complexities of projects. Total of 22 complete interviews with experts were carried out for mapping section of study. The importance of any competency was ranked through structured question by respondents from 1 to 5 (1= little important, 2 = somewhat important, 3 = important, 4 = very important, 5 = extremely important) for dealing with element of complexity. The mean of all the respondents was calculated for each specific competence dimensions against each element of complexity. The original data was received in 23 x 55 matrix. However in this paper, mean values of 23 dimensions of competencies are shown against technical, organizational, environmental and total complexities by taking mean of all dimensions of competencies for all concerned elements of complexities. First the mean of all 22 responses are taken to have mean value of each dimension of competence against each element of complexity. In second stage mean of all mean values of all dimensions of competence for all elements of technical complexities, organizational complexities, environmental complexities and overall complexities were taken to get required levels of all dimensions of competencies for concerned complexities. The overall complexities of projects take cumulative effect of all 55 elements of complexities.

To make easy in understanding the analysis in mapping table, the competencies against complexity are divided into five different categories on the basis of their importance in countering the complexities in projects. Competencies with mean value 4.6 to 5 fall in 1st category that is "Extremely Important". Competencies with mean value 3.6 to 4.5 fall in 2<sup>nd</sup> category that is "Very Important". Competencies with mean value 2.6 to 3.5 fall in 3rd category that is "Important". Competencies with mean value 1.6 to 2.5 fall in 4<sup>th</sup> category that is "Somewhat Important". And the competencies with mean value 1.5 and below fall in 5<sup>th</sup> category that is "Little Important".

Technical Complexities are composed of four groups of complexities i.e. goal, scope, tasks and experience plus one dimension of complexity i.e. technical risks. It has total of 15 elements of complexities. It takes cumulative effect of all these complexities. The mapping of dimensions of competencies with technical complexities for improved performance is shown in Figure 1. Six dimensions of project management competencies i.e. leadership, management skills, good communication, cognitive ability, effectiveness and efficiency fall in category of "Extremely Important" to deal with technical complexities for improved performance. Six dimensions of competencies i.e. self control, relaxation, openness, consultation, conflict & crisis and value

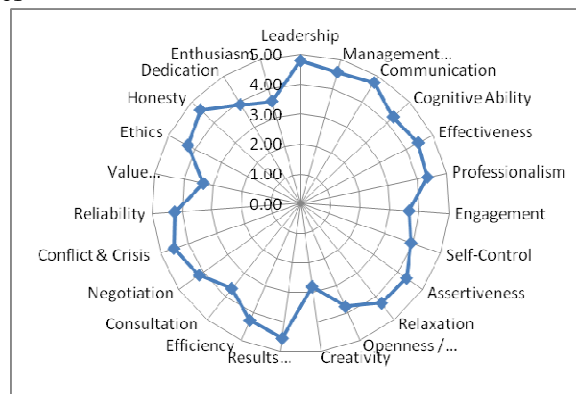
appreciation fall in category of “Important” and one dimension falls in category of “Somewhat Important”. Rests of the all dimensions of project management competencies fall in category of “Very Important”.

Figure 1: Levels of Competencies required for Technical Complexities



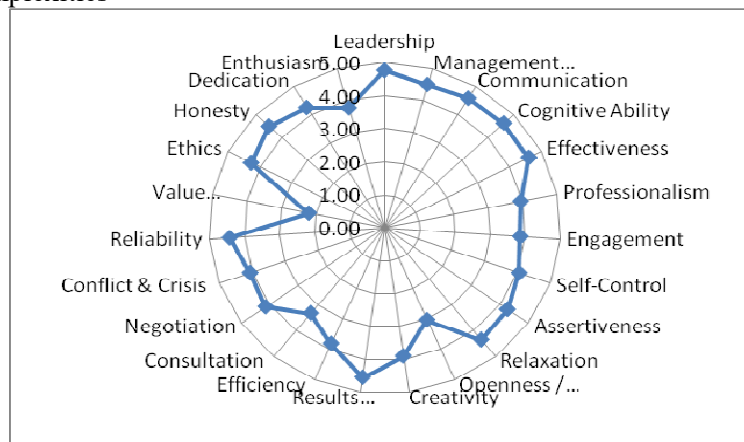
Organizational Complexities are also composed of four groups of complexities i.e. size, resources, project team and trust plus one dimension of complexity i.e. organizational risks. It has total of 23 elements of complexities. It takes cumulative effect of all these complexities. Six dimensions of project management competencies i.e. leadership, management skills, good communication, result orientation, conflict & crisis and honesty fall in category of “Extremely Important” to deal with organizational complexities for improved performance. Two dimensions of competencies i.e. creativity and value appreciation fall in category of “Important”. Rests of the all dimensions of project management competencies fall in category of “Very Important”. The mapping of dimensions of competencies with organizational complexities for improved performance is shown in Figure 2.

Figure 2: Levels of Competencies required for Organizational Complexities



Environmental Complexities are composed of 3 groups of complexities i.e. stakeholders, locations and market conditions plus one dimension of complexity i.e. environmental risks. It has total of 17 elements of complexities. It takes cumulative effect of all these complexities. Seven dimensions of project management competencies i.e. leadership, management skills, good communication, cognitive ability, effectiveness, result orientation and honesty fall in category of “Extremely Important” to deal with environmental complexities for improved performance. Two dimensions of competencies i.e. openness and consultation fall in category of “Important”. One dimension of competence i.e. value appreciation fall in category “Somewhat Important”. Rests of the all dimensions of project management competencies fall in category of “Very Important”. The mapping of dimensions of competencies with environmental complexities for improved performance is shown in figure 3.

Figure 3 Levels of Competencies required for Environmental Complexities



The total complexity shows the combined effect of TOE (Technical, Organizational, and Environmental) complexities. When considering overall complexities of projects, five dimensions of project management competencies fall in category of “Extremely Important” to deal with their complexities for improved performance. These dimensions are leadership, management skills, good communication, effectiveness and result orientation. Three dimensions of competencies i.e. openness, creativity and value appreciation fall in category “Important”. And rests of the all dimensions of project management competencies fall in category “Very Important” for dealing with total complexities. The mapping of dimensions of competencies with overall complexities for improved performance is shown in Table 1.

Table 1: Level of Competencies required for Overall Complexities

S. No	Competence Dimensions	Required Levels	Remarks
1	Leadership	4.78	Extremely Important
2	Management Skills	4.59	Extremely Important
3	Communication	4.67	Extremely Important
4	Cognitive Ability	4.47	Very Important
5	Effectiveness	4.53	Extremely Important
6	Professionalism	4.11	Very Important
7	Engagement	3.95	Very Important
8	Self Control	3.77	Very Important
9	Assertiveness	4.20	Very Important
10	Relaxation	4.03	Very Important
11	Openness / Participatory	3.46	Important
12	Creativity	3.34	Important
13	Results Orientation	4.53	Extremely Important
14	Efficiency	4.22	Very Important
15	Consultation	3.50	Very Important
16	Negotiation	3.68	Very Important
17	Conflict & Crisis	3.96	Very Important
18	Reliability	4.31	Very Important
19	Value Appreciation	2.89	Important
20	Ethics	4.09	Very Important
21	Honesty	4.48	Very Important
22	Dedication	4.11	Very Important
23	Enthusiasm	3.81	Very Important

### Discussion

The paper mainly shows results of second part of study. In this part, it was asked from the interviewees to mention the relevant competency with required level i.e. from 1 to 5 needed to deal with specific elements of project complexity so that project performance could be improved with respect to cost, time and scope. Technical Complexities are composed of four groups of complexities i.e. goal, scope, tasks and experience plus one dimension of complexity i.e. technical risks. It takes cumulative effect of all these complexities. From the results it is concluded that six dimensions of project management competences i.e. leadership, management skills, good communication, cognitive ability, effectiveness and efficiency fall in category of "Extremely Important" to deal with technical complexities for improved performance. Six dimensions of competencies i.e. self control, relaxation, openness, consultation, conflict & crisis and value appreciation fall in category of "Important". One dimension fall in category of "Somewhat Important". Rests of the all dimensions of project management competencies fall in category of "Very Important".



Organizational Complexities are also composed of four groups of complexities i.e. size, resources, project team and trust plus one dimension of complexity i.e. organizational risks. It takes cumulative effect of all these complexities. From the results, it is derived that six dimensions of project management competences i.e. leadership, management skills, good communication, result orientation, conflict & crisis and honesty fall in category of “Extremely Important” to deal with organizational complexities for improved performance. Two dimensions of competencies i.e. creativity and value appreciation fall in category of “Important”. Rests of the all dimensions of project management competencies fall in category of “Very Important”.

Environmental Complexities are composed of three groups of complexities i.e. stakeholders, locations and market conditions plus one dimension of complexity i.e. environmental risks. It takes cumulative effect of all these complexities. From the results, it is came to known that seven dimensions of project management competences i.e. leadership, management skills, good communication, cognitive ability, effectiveness, result orientation and honesty fall in category of “Extremely Important” to deal with environmental complexities for improved performance. Two dimensions of competencies i.e. openness and consultation fall in category of “Important”. One dimension of competence i.e. value appreciation fall in category “Somewhat Important”. Rests of the all dimensions of project management competencies fall in category of “Very Important”.

The total complexity shows the combined effect of TOE (Technical, Organizational, and Environmental) complexities. When considering results of overall complexities of projects, five dimensions of project management competencies fall in category of “Extremely Important” to deal with their complexities for improved performance. These dimensions are leadership, management skills, good communication, and effectiveness and result orientation. Three dimensions of competencies i.e. openness, creativity and value appreciation fall in category “Important”. And rests of the all dimensions of project management competencies fall in category “Very Important” for dealing with total complexities.

From the results it is cleared that three dimensions of competencies i.e. leadership, good management skills and good communication skills are always required highly. The successful project managers are bright leaders because they have vision, they motivate, they bring people together, and, most of all, they do great things and this explicit distinctiveness is found every time in successful projects of every sector (Verzuh, 2008). And there is a strong association between project success and the leadership competencies of project managers (Muller and Turner, 2007).

The results of this research have got similarities with some earlier research as Muller & Turner (2007) found that communication competencies have positive relation with project success and also derived from qualitative study that managers of project managers, responsible for assigning managers to projects, consider the manager's leadership style particularly in complex projects. Muller et al. (2007) in their study found that in successful projects having high intensity of complexity, the project managers score high in multiple dimensions of leadership. Likewise, Bosch-Rekvelde et al. (2009) concluded that the projects having technical, organizational or environmental complexities required high level of leadership competence. Vonk-Noordegraaf (2011) studied four elements of complexity of TOE Framework i.e. Uncertainties in scope, Lack of resources and skill availability, Variety of stakeholder perspectives and Dependencies on stakeholders. It was found in the research that usually the competence of managing process is required for *uncertainties of scope*. The competence of managing team performance is required for a *lack of resources and skill availability*. And the competencies of social and communication skills and managing process are vital for a *variety of stakeholder perspectives* and *dependencies on stakeholders*. Dias et al. (2014) derived that behavioral competences like ethics, reliability, engagement, openness, leadership and communication are more important to make the projects successful.

### Conclusion & Recommendation

From the exercise of mapping, it is concluded that almost all dimensions of project management competencies are considered important for dealing different complexities. This is evidence as the most of the dimensions of competencies fall in group of "Very Important" having cumulative score from 3.6 to 4.5 out of 5. It is worth mentioning to understand that the complexities itself has multidimensional effects, therefore, in order to cope this it is essential that a manager should have multiple attributes. However, in detail examination slight variations in required levels of different competencies as per nature and dimensions of project complexities were observed. Each dimension has comparatively different importance level. Competencies of leadership, management skills, and communication skills are required highly when dealing with technical, organizational, environmental or complexities in general. Beside these, dimensions required on top are:

- Cognitive ability, effectiveness and efficiency for technical complexities
- Conflict & Crisis, honesty and result orientation for organizational complexities
- Cognitive ability, effectiveness, result orientation and honesty for environmental complexities

- Effectiveness and result orientation for overall complexities

A project manager dealing with technical, organizational, environmental and overall complexities of public sector engineering infrastructure projects of Pakistan should have competencies of leadership, good management skills, good communication skills, cognitive ability, effectiveness, efficiency, honesty and result orientation. Project performance can be improved by adopting identified relevant project management competencies required for different complexities. Therefore, it is recommended that suitable project manager should be appointed.

The study is limited to public sector engineering infrastructure projects of Pakistan. Such type of study can be undertaken for other sector of projects and in other geographical region. Also comparison of developed and developing region is also valuable.

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