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Syed Ahsan Mustaqeem
Institute of Business Administration, Karachi, Pakistan

Rameez Khalid
Institute of Business Administration, Karachi, Pakistan

Syed Irfan Nabi
Institute of Business Administration, Karachi, Pakistan

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Project management maturity in Pakistan: An empirical investigation

Syed Ahsan Mustaqeem ·
Rameez Khalid · Syed Irfan Nabi

Abstract This research assesses the current level of PMM in Pakistan, evaluates the gaps in the prevalent project management practices and formulates a framework to improve PMM level in Pakistan. 123 Pakistani organizations were assessed for their levels of PMM and project performance using standard project management maturity models. The average PMM level in Pakistan was found to be 2.32 (on the scale of 1 to 5) and only 24% of the projects carried out were found to be successful. This means that the prevalent project management practices are not yet fully institutionalized. Furthermore, project management training, use of project management software and establishment of PMO were also found to be positively influencing project performance and PMM level. The findings of this research can be useful to all stakeholders of projects being carried out in Pakistan especially under foreign direct investments. Global PMM level can be improved, if more similar studies are conducted with customized recommendations to improve the PMM level.

Keywords Project performance · Project management maturity model · Project management software

1 Introduction

Project management has evolved over the years as a profession and is now considered a core competency to achieve strategic competitiveness (Crawford et al 1999). Following rapid industrialization and globalization, project management practices have grown as an organizational enabler, equally important

Syed Ahsan Mustaqeem
Institute of Business Administration Karachi, Pakistan
E-mail: ingenieur.ahsan@gmail.com

Rameez Khalid
Institute of Business Administration Karachi, Pakistan

Syed Irfan Nabi
Institute of Business Administration Karachi, Pakistan
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as marketing or financial management practices and has enabled organizations to increase their productivity. It has spread out from its traditional frontiers of aerospace and construction industries to multibillion dollar communication, pharmaceutical, banking and other industries. In pursuit of strategic competitiveness, organizations implement project management practices, not only as a means to carry out projects successfully but also to improve their overall business (Cooke-Davies 2004). “Management of projects” has transformed into the broader perspective of “management by projects”, which provides organizations with strategic competitiveness by managing projects as a means to manage the organization itself (Kenny 2003). However, this can only happen, if organizations mature their project management practices.

Project Management Maturity (PMM) is a criterion to measure and predict an organization’s ability to pursue projects successfully. “Maturity” by definition is the state of being fully developed and having attained excellence in the process (ODE 2013). Andersen and Jessen (2003) have defined PMM as the state of perfectly conditioned capability to carry out projects successfully. PMM is also defined as the criterion to measure an organization’s efficiency in completing projects (Kerzner 2002). PMM aims at integrating, assessing and improving project management practices adopted by an organization (Papke-Shields et al 2010). It identifies the specific level of maturity on the basis of adopted project management practices (Ibbs and Kwak 2001). Kerzner (2019) suggests that a mature organization will have higher probability of success in managing projects, because as the organization matures, its processes that are repetitive in nature become more well developed.

Price Waterhouse Coopers (PwC) conducted a research in 2004 to evaluate the association between project performance and the level of PMM. It was found that a higher PMM level translates into superior project performance (Evrard and Nieto-Rodriguez 2004). It was also found that project managers having formal training or certification in project management outperform those who are not trained. Role of formal Project Management Office (PMO) in increasing the overall project performance was also highlighted in research. The report further emphasized the use of project management software in improving project performance. PwC continued to assess these factors and the results of their surveys conducted in 2007 and 2012 further strengthened the previous findings (Coopers 2007, 2012).

Project management is especially important for a developing economy like Pakistan, where traditional infrastructure projects are expected to rise in the near future under the China-Pakistan Economic Corridor (CPEC) and similar initiatives. The CPEC is a multiyear investment agreement, comprising of numerous infrastructure development (highways, railways and special economic zones), power generation, fiber-optic and agricultural projects. Early harvest projects have been completed and CPEC is now in its second phase of development with 22 projects in-progress (MoPD&R 2019). With so many projects to work upon, it is essential to know the existing capability of Pakistani organizations in managing projects, their shortcomings and a framework to improve their PMM, so as to make full use of the CPEC’s potential.

The literature review revealed that studies on PMM and project perfor-

mance assessment for organizations in Pakistan are a rarity. [Muhammad \(2018\)](#) found the PMM level of 100 Pakistani construction industries at 2.83 on the scale of 1 to 5, using a model similar to [Crawford \(2007\)](#). [Bredillet et al \(2010\)](#) defined a Project Management Deployment Index (PMDI), where total number of certified project management professionals were divided by a country's population. On PMDI, Pakistan only scored 1.8; whereas, United States scored 430.2 on data of 2007. With only these studies, comprehensive conclusions cannot be achieved regarding Pakistan's PMM. Thus, the primary aim of this research is to assess the level of PMM, using multiple comparative models, in Pakistan and to specifically answer the following research questions:

1. What is the current level of PMM in Pakistani organizations (overall and under certain classifications: public vs. private sector organizations; industrial sectors)?
2. What is the current project performance level in Pakistani organizations?
3. What are the gaps in the project management practices in Pakistan?

Following research hypotheses were also developed to test as they pertain to various dimensions or inputs to project performance:

- H01: There exists a significant positive correlation between project performance, PMM and the formal training or certification of project management staff in Pakistan.
- H02: There exists a significant positive correlation of project management software with project performance and PMM level in Pakistan.
- H03: There exists a significant positive correlation of the establishment of formal PMO in organizations with project performance and PMM level in Pakistan.

The rest of the paper is divided into six sections, introduction and literature review are followed by research methodology and findings. Subsequently, recommendations and conclusions are presented. The primary audience of this research are the Pakistani organizations that are exposed to Foreign Direct Investment (FDI) under CPEC and similar initiatives, so that they can enhance the opportunities by investing their efforts in right areas to uplift their PMM. The secondary audience are the investors who with a fair understanding of Pakistan's PMM can expect and enhance the realistic returns of their investments.

2 Literature review

This section presents the literature reviewed on project performance and project management maturity (PMM), PMM models and PMM level of various industries.

2.1 Project performance

The foremost goal of project management is to ensure the success of the project - making it a key issue for project managers. Traditionally, conformance to iron

triangle constraints has been the criterion for measurement of project success (Papke-Shields et al 2010). Factors, such as time, cost and scope, comprise the iron triangle, and a project is generally considered successful if it delivers the project scope as outlined in the project scope baseline, within the stipulated time and budget. This is the reason why during project execution, and monitoring and control phases, the project manager uses performance measurement tools like earned value analysis to check the status of the project against the scope, schedule and cost baselines. Despite phenomenal advancement in project management tools and techniques, projects do fail.

The Standish Group in 1995 reported that only 16.2% of the surveyed projects were completed on time and within budget (Standish 1995). While this percentage substantially increased to 28% over fifteen years till 2010, yet in the past five years this number has hardly improved by 1% to 29% (Standish 2010, 2015). Another research with a sample size of over 14,000 IT organizations reported that 80-90% of the projects did not complete the scope, more than 80% were behind schedule and over budget and only 10-20% of the projects met all constraints successfully (Ali et al 2001).

Although time, cost and scope are the basic parameters to gauge the success of a project, yet, it can be argued if these are enough or others may be included? Some researchers have included satisfaction of key stakeholders particularly the customer as another vital criterion for project success (Tukel and Rom 2001; Anantatmula and Rad 2018). Consequently, the iron triangle criteria are not exclusive and each organization can define the project performance parameters according to its strategic goals (Pillai et al 2002). Subsequently, organizations with higher PMM generally have higher project performance, irrespective of the project performance measurement parameters applied (Simangunsong and Da Silva 2013).

The hypothesis that “there exists a significant positive correlation between level of PMM, organizational culture and project performance”, was earlier proved by Muhammad (2018) for construction industries in Pakistan.

2.2 Project management maturity (PMM) and models

One of the issues of interest to researchers and practitioners is the ability of an organization to deliver successful projects time and again. PMM level describes how successfully and consistently an organization can complete projects. PMM traces its roots to Total Quality Management (TQM) practices and serves as a point of reference for organizations regarding adoption of project management practices. Various models have been developed and are used to assess the PMM level in an organization. Like other TQM deliverables, all the PMM models provide a basis of assessment of current PMM level and recommend a framework for improvement (Kania et al 2011). The significance of a PMM model lies in its use as an analysis and positioning tool (Duffy 2001).

Over the past two decades, researchers have developed various PMM models. All the PMM models use a multitier assessment ladder to evaluate the level of maturity and highlights specific project management practices that need to

be improved to move to a higher level of maturity. PMM models are focused on organization-wide understanding and implementation of project management processes, which are defined, established, applied, controlled and continuously improved (Bushuyev and Wagner 2014). However, the models differ in the concept of maturity and the actions suggested to attain maturity.

The concept of PMM model dates back to 1980's when Humphrey at IBM identified levels of PMM for IT projects. The first formal PMM model was "Software Engineering Institute's Capability Maturity Model (SEI CMM)", which the US Department of Defense used to evaluate its software suppliers' maturity. This model was developed by SEI at Carnegie Mellon University (Paulk et al 1991). The process of software development is reported to have significantly improved by adopting SEI CMM (Grant and Pennypacker 2006).

The pursuit for improvement in organizational performance by achieving high levels of maturity have inspired the development of several models following the five level (Demir and Kocaba 2010) SEI CMM, e.g.: Demir and Kocaba (2010); Crawford et al (1999); Axelos (2016); Galli (2018); Gan and Chin (2018). Even, SEI CMM itself evolved into a more generic model "Capability Maturity Model Integration (CMMI)"- which can be applied to any organization in any sector (Jiang et al 2004). Seelhofer and Graf (2018) defined a model, having four levels, to gauge PMM of a nation. Some models only gauge PMM level; however, others can gauge program and portfolio management maturity as well, e.g. Axelos (2016) and PMI (2013).

It can also be concluded after observing most of the PMM models, that they encompass the best practices defined in Project Management Body of Knowledge (PMBok) (PMI 2017). There are currently over 50 PMM models in practice (Levin 2016). Some of the models are exclusive to particular industries like software, whereas, a vast majority of models are generic. With this situation, no single PMM model can claim to have such dimensions or definition of levels that all industrial sectors unanimously agree to (Gan and Chin 2018).

Various attributes of the three models, used in the current study, are presented in table 1. The research methodology section presents the justification for this selection. For a detailed comparison of PMM models, Galli (2018) and Seelhofer and Graf (2018) can be referred.

2.3 PMM level

Grant and Pennypacker (2006) conducted a survey of 126 organizations across four industries: finance, manufacturing, IT and technical services, and assessed a median maturity level of 2 (on the scale of 1 to 5) with no significant difference in maturity level among different industries.

Price Waterhouse Coopers (PwC) conducted a survey of 200 organizations (globally and belonging to various industrial sectors) in 2004 and assessed the overall average PMM level to be 2.5 (Evrard and Nieto-Rodriguez 2004). A significant improvement in PMM was seen over the span of eight years in a subsequent survey conducted in 2012 (Coopers 2012). In 2004 a vast majority (78%) of the organizations were operating within the low maturity levels 1, 2

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Table 1: Comparison of project management maturity models (PMMM)

Characteristics	Kerzner's PMMM	Crawford's PMMM	ESI International Project Framework
Publisher	International Institute for Learning	PM Solutions	ESI International
Year	2006	2007	2007
Scope	Project management	Project management	Project management
Primary ind	Project driven	Project driven	Project driven
Maturity levels	5	5	5
Detail	High	High	High
Reference	PMBoK	PMBoK	PMBoK
Assessment difficulty	Medium	Low	Low
Quant results	Yes	Yes	Yes
Identification of weakness and strengths	Yes	Yes	Yes
Maturity levels nomenclature	Common language, Common processes, Singular methodology, Benchmarking, Continuous improvement	Initial process, Structured process and standards, Organizational standards and institutionalized Process, managed process, Optimizing process	Ad-hoc, Consistent, Integrative, Comprehensive, Optimizing

Adapted from [Man \(2007\)](#); [Khoshgoftar and Osman \(2009\)](#); [Morris and Pinto \(2010\)](#)

and 3; whereas, in 2012 majority of the organizations (62%) were operating within the high maturity levels 4 and 5 ([Coopers 2012](#)).

[Ibbs and Kwak \(2001\)](#) conducted a survey of 38 organizations across 4 industries: construction, telecommunication, IT and manufacturing, and assessed the average level of maturity to be 3.26, with manufacturing and construction industry having a better level of maturity as compared to IT and telecommunication. [Cooke-Davies and Arzymanow \(2003\)](#) conducted a survey of 21 organizations across six industries and assessed an average maturity level of 3.56. A survey of 120 organizations in Morocco revealed that 76% of the organizations were at maturity level 1; whereas, 24% of the organizations were on maturity level 2 ([Matrane et al 2014](#)). Similarly, upon assessment of 127 organizations, the PMM level of Indonesia came out to be 2.88 ([Simangunsong and Da Silva 2013](#)), while, Pakistan's 100 construction industries have average PMM standing at 2.83 ([Muhammad 2018](#)). In a survey of 202 construction industries in South Africa, the overall PMM level came out to be 3.06 ([Labuschagne et al 2013](#)). [Abdul Rasid et al \(2014\)](#) documented a case study of one public sector organization in Malaysia, the PMM level of which was found to be 2.

3 Research methodology

To answer the research questions posed in the introduction section, structured questionnaire based survey was conducted. The questionnaire was sent via email; however, some have been filled face to face. The participating organizations were

chosen using snowball sampling with a strict inclusion criteria of continuously carrying out projects in the last three years.

3.1 Research sample

Sample for this research consisted of 134 respondents each representing an organization operating in Pakistan. 11 questionnaires were discarded due to incomplete or incorrect information, making the total sample size 123. The primary roles of the respondents are given in figure 1.

More than 60% of the respondents had an experience of three years or more

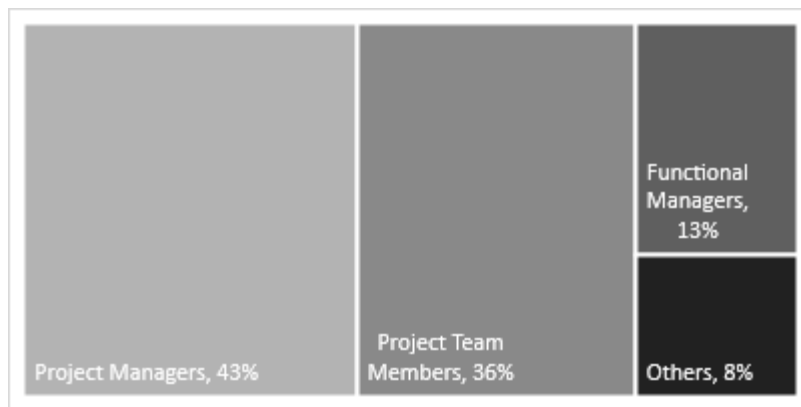


Fig. 1: Role of respondents in 123 organizations

in project management, while the average experience of the respondents was five years. A majority (64%) either had a postgraduate degree or were actively pursuing one. A little less than half (40%) of the respondents had undergone some formal training or certification in project management prior to participation in this study. An overwhelming majority (84%) of respondents were males. Respondents had a diverse background, though a huge majority (79%) were engineers and IT professionals, followed by finance professionals (14%), and the rest were from varied backgrounds (academia, medicine, and marketing etc.).

To make a comparative analysis, the respondents were selected to represent both public and private sectors as well as four industries: communication and technology; manufacturing (automotive, energy and FMCG); finance, and; services. The industrial representation is shown in figure 2.

3.2 Data collection

Data were collected over eight months in 2017-18 and two persons, both PMP certified, were involved in data collection. The PMM level of organizations was

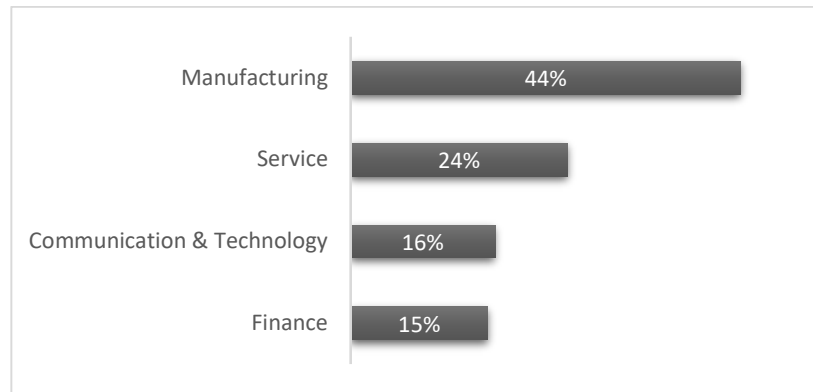


Fig. 2: Industries of respondents

assessed using the standard questionnaires developed for assessment of PMM by Kerzner (2002); Crawford (2007) and ESI International (Levin and Green 2016). As compared to other studies, where only one model is used, we used three models to compensate for the model specific errors. These PMM models were selected on the basis of the following criteria: (1) should be generic; (2) should be aligned to PMBoK (PMI 2017) for comparability; (3) should have five levels of maturity; (4) should be simple and easy to execute; (5) should highlight the strengths and weaknesses of prevalent Project Management Practices, and; (6) results of assessment obtained from the PMM model should be quantitative.

One section regarding the project performance on iron triangle, trained staff

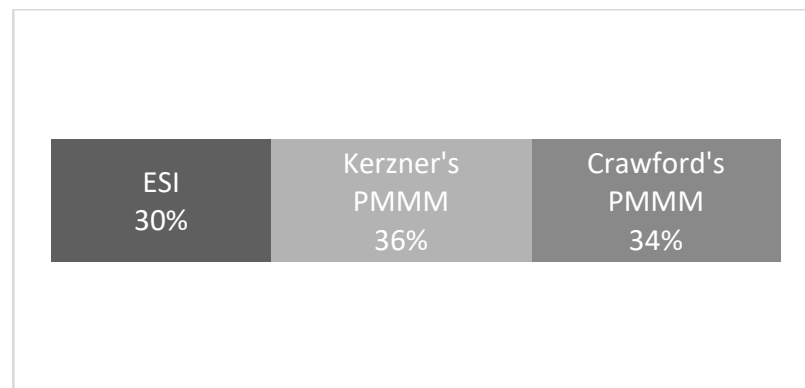


Fig. 3: PMM models used for research

in project management, use of project management software and establishment of PMO was added to the standard PMM model based questionnaires. To check the comparability of results from the three chosen PMM models, a pilot study was conducted. Three organizations were chosen for the pilot study. Five respondents from each organization were given the three standard questionnaires as per PMM models, and they were asked to assess the maturity level of their

respective organizations. The maturity levels assessed, during the pilot, using different models were found comparable. Once convinced, the formal study was initiated. The sample size of 123 was distributed among the three models as per figure 3.

3.3 Data analysis

First, the data were scrutinized for completeness and correctness. 11 responses were discarded based on expert judgment. Secondly, the data were analyzed using SPSS Version 16. Two indices were used for data analysis: PMM level and project performance. Finally, the results obtained from SPSS were analyzed to reach the conclusions and give recommendations.

4 Findings and analysis

4.1 Project management maturity (PMM) level

It was found that a vast majority of Pakistani organizations almost 9 out of 10 (87%) lie at the low maturity levels 1, 2 and 3; while, one in ten Pakistani organizations have managed to achieve level 4, whereas a few have reached the top of the maturity thresholds (see figure 4).

The overall average PMM of Pakistan came out to be 2.32, which signifies

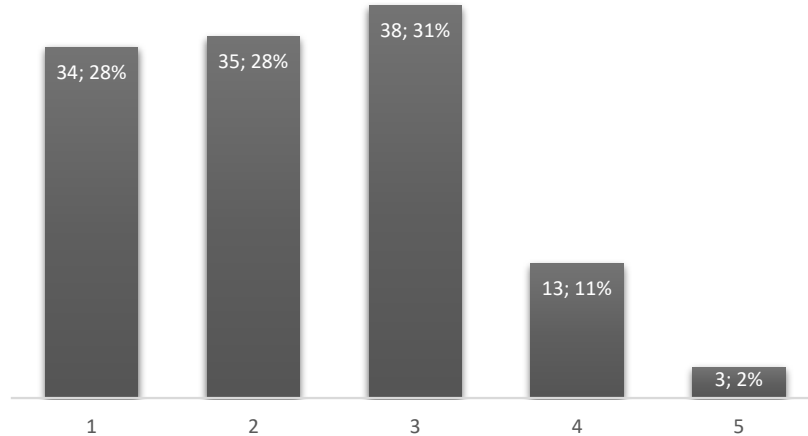


Fig. 4: PMM levels in Pakistani organizations

that project management practices are being adopted in Pakistani organizations as a measure to improve project performance but are not yet fully institutionalized. The basic gap found was in knowledge areas of Project Risk Management and Project Procurement Management. Table 2 shows a comparison of PMM level of Pakistan with various others.

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Table 2: Comparison of PMM levels

Pakistan	Global	USA	EU	Morocco	Indonesia	South Africa
Current study	(Coopers 2012)	(Ibbs and Kwak 2001)	(Cooke-Davies and Arzymanow 2003)	(Matrane et al 2014)	(Simangunsong and Da Silva 2013)	(Labuschagne et al 2013)
2.32	3.59	3.26	3.56	1.16	2.88	3.06

A further study of maturity at industry level reveals that communication and technology has outperformed all the other industries with an average maturity level of 2.7 as shown in figure 5, including 1 in 5 (20%) of the organizations at levels 4 and 5. This score seems in line with [Ul Hassan et al \(2014\)](#) who found that out of 1500 software industries in Pakistan, only 22 implement CMMI. Finance industry has the lowest average maturity level of 1.68 and only 5.3% of the organizations in this industry have managed to achieve a maturity level of 4, while no organization is at level 5. Construction industry was not included in this study; however, the PMM level of this industry was found by [Muhammad \(2018\)](#) as 2.83.

On a sector level, the private sector presents a better level of maturity with

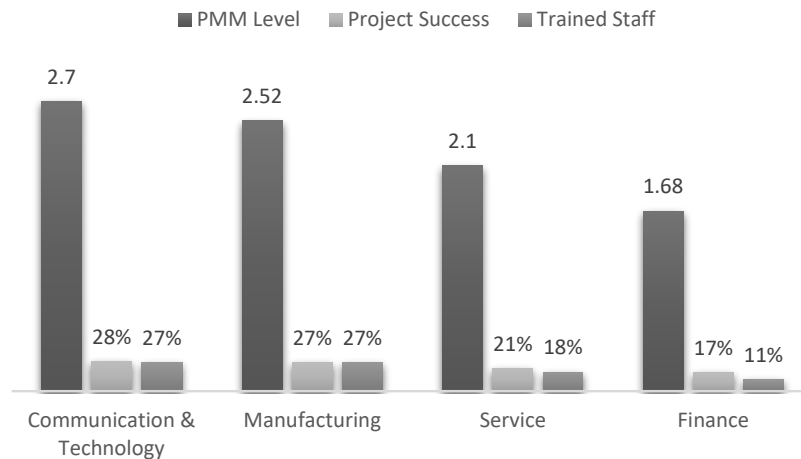


Fig. 5: PMM levels, project success rate and trained staff in Pakistani industries

an average of 2.44, as compared to public sector which is at 2.09.

4.2 Project performance

Respondents were asked about the percentage of successful projects in their organization. On average, 1 out of 4 (24.1%) projects in Pakistan conforms to all the iron triangle constraints and is termed successful. Only 2.4% of the organizations termed 60% of their projects to be successful; whereas, 39% of the

organizations designated only 10% of their projects to be successful.

On further investigation, it was found that on average, 10.3% of the projects were successful in organizations at a Project management maturity level of 1, which is 43.3% for organizations at level 4 and 60% for organizations at level 5. Average percentages of project success with respect to industries is shown in figure 5. It further hints towards the point that the higher the PMM level, the higher the project success. At sectoral level, public sector organizations had project success rate of 22.8% as compared to 24.8% of the private sector.

4.3 Project management training

Formal project management training or certification was found to be a contributing factor in enhancing project performance. On average, 22.4% of the project management staff in the organizations surveyed was found to be formally trained or certified in the domain. 24.4% of the organizations surveyed did not have any formally trained or certified project management staff, whereas, 21.1% had only 10% formally trained or certified project management staff. Only 8.2% of the organizations had 60% or more formally trained or certified project management staff.

Globally, organizations have 4 out of 5 (80%) of the project management staff formally trained or certified. Similarly, organizations at lower PMM levels have at least 3 out of 5 (61%) trained project management staff (Coopers 2007).

A strong correlation was found between PMM level and formal project man-

Table 3: Correlation of project management training with PMM level and project performance

		PMM level	Project performance
PM training /certification	Pearson correlation	0.794	0.893
	Sig. (2-tailed)	0.000	0.000
	N	123	123

agement training or certification, as can be seen in table 3. 79.1% of the project management staff of organizations at level 1 of PMM were not formally trained or certified in project management; whereas, 70% of the staff in organizations at level 5 of PMM were found to be formally trained or certified in project management. Moreover, a strong correlation was also found between project performance and formal project management training or certification, as shown in table 3. For example, 58.3% of the project management staff in organizations with 10% or less project performance, were not formally trained. Therefore, H01 stands accepted.

Average percentages of trained staff with respect to industries is shown in figure 5. It further hints towards the point that higher the trained staff, the higher the PMM level and project performance. At sectoral level, the private sector had 23.9% formally trained staff; whereas, the public sector held 19.5% of trained staff.

4.4 Use of project management software

57.7% of the Pakistani organizations surveyed use some project management software. Global average is of 4 out of 5 (77%) (Coopers 2007). The use of such software was found to be the highest in the manufacturing industry i.e. 61.1%; while, the lowest i.e. 5.3% finance industries are using some project management software. On sectoral level, 37.2% of the public sector organizations use some project management software as compared to 27% in the private sector.

On comparison of means (see table 4), it was found that the organizations

Table 4: Comparison of means of PMM level and project performance w.r.t. use of PM software

	PM software	Project performance	PMM level
No	Mean	0.155	1.770
	N	71	71
	Std. Dev	0.081	0.848
Yes	Mean	0.358	3.060
	N	52	52
	Std. Dev	0.123	0.873
Total	Mean	0.241	2.320
	N	123	123
	Std. Dev	0.142	1.066

using a project management software generally had a higher PMM level i.e. 3.06 and a higher project performance i.e.; 35.8%. Therefore, H02 stands accepted as well.

4.5 Establishment of project management office (PMO)

Only 23.6% of the surveyed organizations had established a formal PMO to support, control or direct project management activities. Global average is of 4 out of 5 (80%) (Coopers 2007). On industry level, manufacturing industry had the highest i.e. 29.6% PMOs established. On sectoral level, 25% private sector organizations had a formal PMO; whereas, it is 20% in the public sector.

On comparison of means (see table 5), it was found that the organizations having formal PMOs generally have a higher PMM level i.e. 3.31 and a higher project performance i.e. 39.7%. Therefore, H03 also stands accepted.

5 Recommendations

Based on the gaps in the project performance of Pakistani organizations, a framework, which is in line with Sargent and Ferreira (2018), is proposed for Pakistani organizations to improve the current PMM level.

Table 5: Comparison of means of PMM level and project performance w.r.t. established PMO

	Formal PMO	Project performance	PMM level
No	Mean	0.193	2.010
	N	94	94
	Std. Dev	0.113	0.945
Yes	Mean	0.397	3.310
	N	29	29
	Std. Dev	0.112	0.806
Total	Mean	0.241	2.320
	N	123	123
	Std. Dev	0.142	1.066

5.1 Framework for improving PMM level

With a record foreign direct investment based projects in hand, Pakistani organizations have all the motivation to improve their current level of project management maturity. A framework to fill the gaps in the current project management practices is recommended. The framework (see figure 6) is divided into two strategies; immediate strategy is to elevate the PMM to next level i.e. “Level 3”, and long term strategy is to further improve PMM level. Immediate strategy should be to invest in training or certification programs, especially in project risk management, project procurement management and project management software. These training programs should be based on a standardized project management approach, such as: PMBoK (PMI 2017) or ICB (Association et al 2015) or PRINCE2 (Axelos 2017). In this way, trained or certified staff will be readily available to uplift the current PMM level and project performance in Pakistan. This human resource can be expected to become future project leaders, as required for effective project talent management.

Long term strategy is to implement Project Management Information System (PMIS) in spirit, as currently a vast majority is not able to use project management software beyond a reporting tool. Concurrently, establishment of PMO should be part of this strategy as it is a long term investment. With PMO, it is easier to develop databases of enterprise environmental factors and organizational process assets. These will ensure that organizational project management knowledge and lessons learnt are safeguarded and readily available for improved project risk management.

6 Conclusions

Project management practices currently used in an organization can predict a project’s performance or success. Subsequently, these can also define its project management maturity (PMM) level. This discussion is especially important in the context of a developing country like Pakistan. This study aimed at defining the overall PMM level of Pakistani industries (sample size was 123), which was found to be 2.32 on the scale of 1 to 5. Three standard PMM models were used to gauge this level. It was further concluded that 3 out of 4 projects fail to

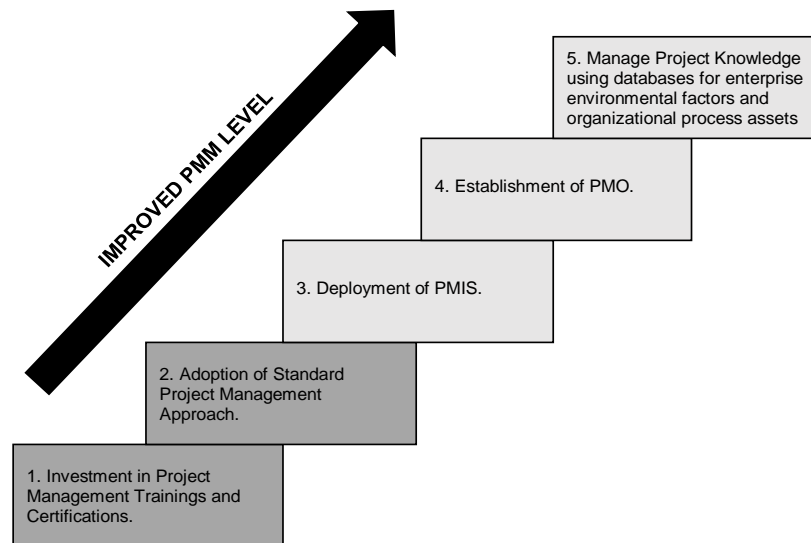


Fig. 6: Framework for improvement of PMM level in Pakistan

deliver the iron triangle.

On average, only 1 out of 5 (22%) of the project management staff in Pakistani organizations is formally trained or certified in project management. About 3 out of 5 (57.7%) of Pakistani organizations use some sort of Project Management Software. Similarly, about 1 out of 5 (23.6%) of Pakistani organizations have established a formal PMO. To improve the PMM level, a customized framework (based on short and long term strategies) is also proposed which can be useful for others facing similar challenges.

Each industry and nation has its own PMM level, which is not frequently reported in literature. Future researchers can gauge the PMM levels of individual industries with appropriate sample sizes and propose customized recommendations to improve the found PMM level. Similarly, this can be replicated for other nations as well. These efforts are expected to raise the global PMM level.

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