The Relationship between Competencies of Project Managers and Effectiveness in Project Management: A Competency Model

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Abstract

This paper uses a persuaded and sound method to analyze the relationship between project managers' competencies and effectiveness in project management. It introduces an easy path to develop a model for tooling competencies of project managers. Project manager competency base model is IPMA Competence Baseline (ICB) and Project Manager Competency Development Framework (PMCDF) includes knowledge, skill, personality, and industry & organization competence. The competency model is designed for project managers in Iranian electricity industry. The final model illustrates results of measurements between the effectiveness of project management and the five elements project manager competency model. The results are significant because they confirm importance of project managers' competencies. In addition, the study results are so stable and reliable because we use confident instrument to measure indicators.

Keywords: Competencies; Project Managers; Effectiveness; Competency Model; Project Management, electricity industry.

1. Introduction

What makes project effective and successful has always been one of the issues discussed in academic and industrial environments. No one would claim that every project that fails is the result of poor management. A poorly funded or ill-conceived project will fail regardless of the skills of the project manager or project team. But project mismanagement plays a significant role in many project failures (Mark Gould and Rick Freeman, 2004). Project management (PM) is a discipline that is dependent upon a number of interrelated management skills. These skills have been variously defined (Brown, Adams, 2007). PM competencies are the capabilities to manage projects professionally, by applying best practices regarding the design of the PM process, and the application of PM methods. PM competencies require knowledge and experience in the subject, which enables the project to meet its deadlines and objectives (Gareis and Huemann, 1999).

This paper has two goals. First our research shows the necessary competencies for project managers in shape of competency model. Secondly, our research measures the relationship between Competencies of Project Managers and effectiveness in project management. Case study in this research is considered two hundred project managers in Iran's electricity power industry. Accordance to statistics in these areas, project delivery latency is high. One of the reasons could be mismanagement of the project. We think competency models[1] can help industries align their initiatives to their overall business strategy. By aligning competencies to business strategies, organizations can better recruit and select employees for their organizations (Mulder, M., 2001). It is important to choose the right people to manage projects (Mark Gould and Rick Freeman, 2004)

[1] Competency Model: A framework that describes the full range of competencies required to be successful in a particular occupation.

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2. Competencies & Project Management Competency Model

Competence is a term which is widely used but which has come to mean different things to different people. It is generally accepted, however, as encompassing knowledge, skills, attitudes and behaviors that are causally related to superior job performance (Boyatzis 1982). According to Scottish Community Development Centre (2007) **competencies** are the knowledge, understanding, practical and thinking skills needed to perform effectively to the standards required in employment. They are identified and demonstrated through sets of behaviors that encompass the skills, knowledge, abilities and personal attributes that are critical to successful role accomplishment (Salajegheh, 2014). National park service U.S department of the interior (2010) describes "competency" is an observable set of skills, knowledge, abilities, and other characteristics an individual needs to successfully perform work duties or occupational functions

To understand competency requirements of a job role, they are often represented pictorially and competencies are mapped, with competencies existing on a hierarchy (Sandwith, 1993). **A competency model** is a descriptive tool that identifies the competencies needed to operate in a specific role within a(n) job, occupation, organization, or industry. Simply stated, a competency model is a behavioral job description that must be defined by each occupational function and each job. Depending on the work and organizational environment, a group of 7 to 9 total competencies are usually required of a particular job and depicted in a competency model (Shipman, et. al., 2000).

Project Manager Competency Model develops necessary parameters like knowledge, skills, personal characteristics' project managers and important processes of project management. Competence-based approach in education and training provides the opportunity to identify and develop people with the competencies required for performing the job. There are lots of competency models for project managers. In this research, PMCDF (Project Manager Competency Development Framework) and PMBOK (Project Management Body of Knowledge) standards and IPMA competence baseline (ICB) were considered as main models, but only structure and elements of the PMCDF standard is adapted to the research because it is not classified to the different classification of the projects. Also beyond PMBOK standard, the three areas of change management, difficulties & barriers project management and metrics management are created. The main three dimensions of the PMCDF model follows:

Knowledge– what a project manager knows about the application of processes, tools, and techniques in project activities.

Performance –how a project manager applies project management knowledge to meet project requirements.

Personal –how a project manager behaves when performing activities in a project environment.

Knowledge Competency demonstrates an understanding of knowledge specific to a technical, professional, or administrative field of work through the application of related procedures, principles, theories or concepts (PMI, 2007). **Performance competency** is what the project manager is able to do or accomplish by applying their project management knowledge. Individuals will demonstrate their Performance Competence by applying their knowledge to a project and delivering the planned outcomes. Each individual skill that reflects project management good practice needs to be assessed. **Personal Competencies** are those behaviors, attitudes, and core personality characteristics that contribute to a person's ability to manage projects.

In ICB model knowledge and performance competencies are considered as technical competence. Behavioral competencies in ICB model are synonymous with personal competencies in PMCDF model. ICB model has another dimension as shown in figure1 named **contextual competencies** which describe the concepts of project, programme and portfolio and the linkage between these concepts and the organization or organizations that are involved in the project and elements describe what the different support functions in line organizations need to know about projects, and what project teams need to know about the support functions. We consider contextual competencies as Industrial & Organizational Competencies in our model.

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Industrial and organizational competences are considered as the Contextual Competence range to describe the project management competence elements related to the context of the project. This range covers the project manager's competence in managing relations with the line management organization and the ability to function in a project focused organization.

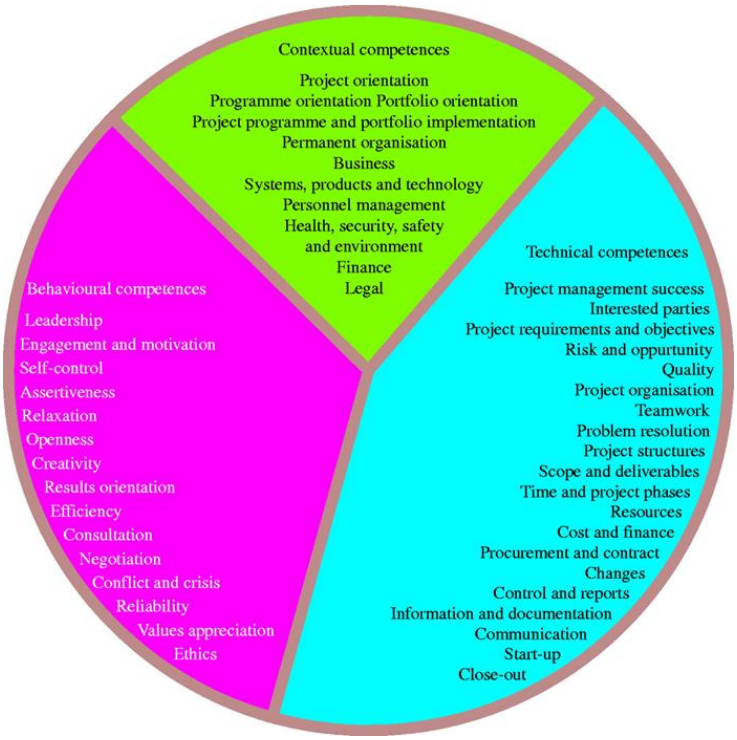

Figure1. IPMA competence baseline (ICB) model, 2006

3.

Method

There are lots of methods to identify competencies. For example, the job competence assessment method (JCAM), the competency menu method, the modified DACUM method, Generic Model Overlay Method, Customized Generic Model Method, Flexible Job Competency Model Method, Systems Method, Accelerated Competency Systems Method, sources and experience are the main ways to identify competencies. After analysis these methods by experts, we choose the competency menu method to reconnoiter the competencies. The competency menu method is becoming increasingly popular as a means of identifying competencies. It relies on competency lists obtained from sources in the private and public domains. Practitioners create menus from the lists and then use the menus to identify the competencies necessary for a work role or traditional job in an organization. As a starting point for developing an organization-specific competency model, competency menus tend to be less costly than the Job Competence Assessment Method (Dubois, Rothwell, 2004).

The research followed a survey design where the structured and unstructured exams were used to evaluate the competencies of project managers. Assess the effectiveness of project managers is based on PMCDF model. According to experts and Karan Prakash (2013) model parameters are summarized to18 indicators to assess the effectiveness of project managers. To measure the effectiveness of each component, the questions are designed by top executives will comment on each person. Overview of Project Management, Schedule and Cost Management, Problems and

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Obstacles Management, Change Management, Communication Management, Stakeholder Expectations Management, Document Management, Risk Management, Quality Management, Procurement Management, Human Resource Management, Measures and Metrics Management, Leadership, Management (management skills and ability to execute), Cognitive skills, Be effective, Professionalism and HSE management are the main indicators to evaluate effectiveness of project managers.

After reviewing relevant studies, a number of items were developed to measure the research constructs and their respective dimensions (See figure 2). Project managers competencies dimensions were measured through developing items by referring to PMCDF model (for knowledge, performance and personal competencies) and opinions of experts using the Delphi technique and the competency menu method (for organizational and industrial competencies), as follows: twelve items for knowledge competency, twelve items for performance competency, six items for personal competency, ten items for organizational competency and three items for industrial competency. Our research hypothesis:

H1: There is a positive and significant relationship between competencies of project managers (knowledge, performance, personal, Industrial and Organizational Competencies) and effectiveness in PM.

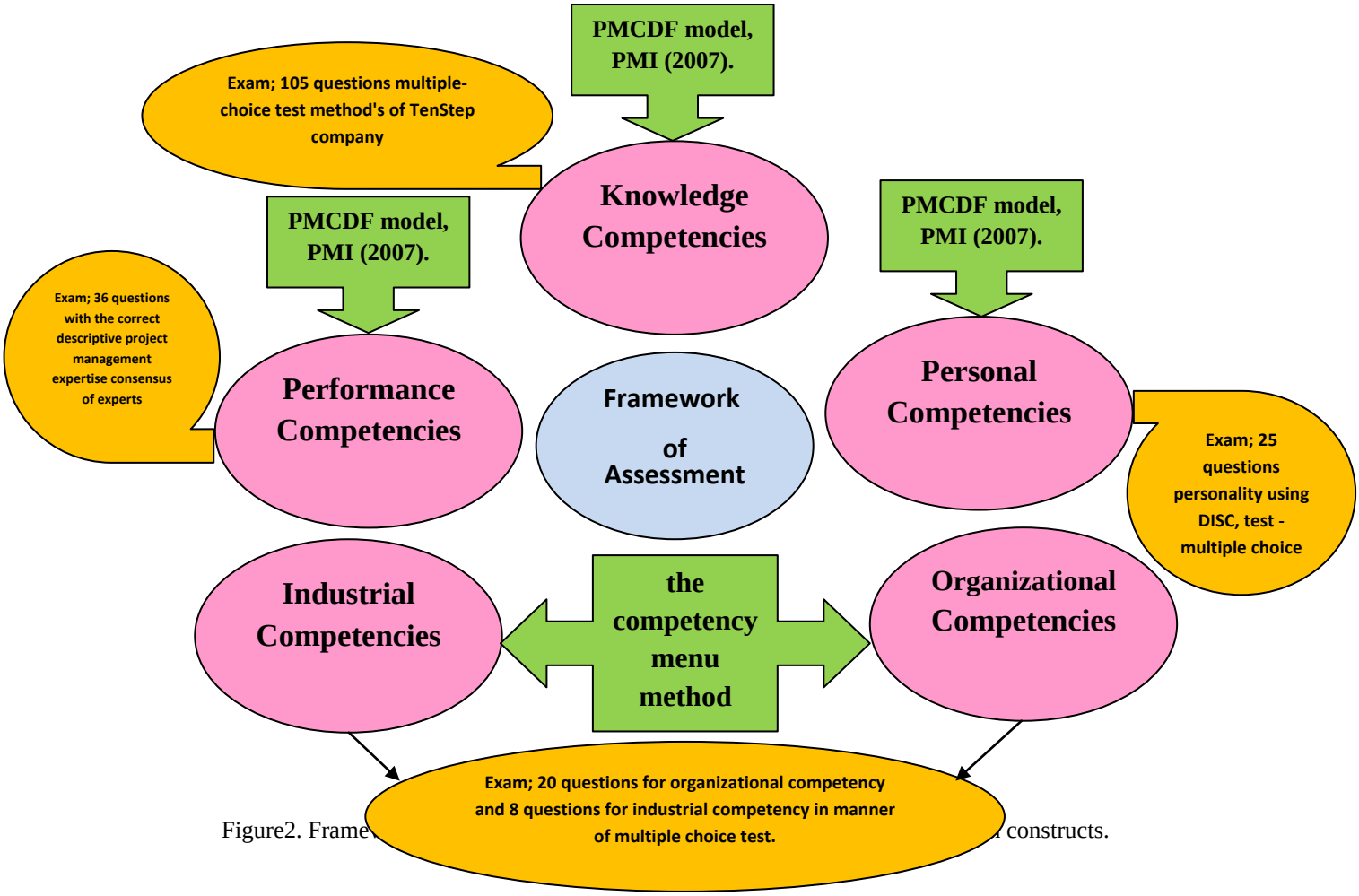

Figure2. Frame constructs.

4. Analysis and Result

With regard to construct validity, Exploratory Factor Analysis (EFA) was performed to test the components of the project manager competency model, in terms of identifying the dimensions that exists measurement items. To conduct the EFA,

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four assumptions were followed (Hair et al., 1998; Field, 2000): (1) sampling adequacy; (2) the minimum Eigen value for each factor to be one; (3) a factor loading of 0.40 for each item as the threshold for item retention, and (4) varimax rotation was used. To conduct the EFA, the variables of study should be normally distributed; this makes it possible to generalize the results of the analysis beyond the sample collected (Field, 2000). Therefore, a Kolmogorov-Smirnov (K-S) test was performed. The result of the test indicated that the data are not normally distributed. To accommodate this non-normality, the research constructs were transformed by taking the square root transformation and logarithm transformation. Data transformation is an acceptable way to reduce the variability of data, as long as the same mathematical application is performed on every observation. According to Stevens (2009), data transformation is allowed because it simply involves applying a mathematical process to the data to reduce the variability.

The reliability of constructs was measured by calculating Cronbach's alpha coefficient for the factors that resulted from EFA. The closer the value of Cronbach's alpha is to one, the higher the degree of internal consistency among items (Hair et al., 1998; Field, 2000). Table 1 shows all constructs were highly reliable, ranging from 0.837 to 0.975.

Table 1. Reliability of research constructs

Construct	***Number of items***	***Cronbach's alpha***
Knowledge Competency	12	0.975
Performance Competency	12	0.946
Personal Competency	6	0.894
Organizational Competency	10	0.922
Industrial Competency	3	0.837

Competency test results show that the project manager's competency characteristics are desired. Proportion test are used to investigate this hypothesis by comparing scores of administrators competency model components. In this test, the null hypothesis and alternative hypothesis are as follows:

- Null hypothesis: the characteristics of project manager's competencies are not in good condition. (More than half of project managers competencies based on component scores have not achieved a satisfactory score.)
- Alternative hypothesis the characteristics of project manager's competencies are in good condition. (More than half of project managers competencies based on component scores are getting a good score.)

As shown in Table 2, the results obtained from 200 subjects, the proportion of managers with appropriate competency scores 0.98 and the p-value is less than 0.001, so the null hypothesis at the 0.05 is rejected. The project managers' competencies characteristics are desired.

Table2. Project Managers Competency Characteristics

Sample	200
Number of favorable	196
Compared with a sample	0.98
P-value	Less than 0.001

Also, based on the results of the effectiveness questionnaires, effectiveness of project managers are suitable for project-based Electricity institutes. Proportion test are used to investigate this hypothesis by comparing scores of administrators effectiveness components. In this test, the null hypothesis and alternative hypothesis are as follows:

- Null hypothesis: the effectiveness of the samples is not desirable. (More than half of managers have not achieved a satisfactory score based on scores in effectiveness components.)
- Alternative hypothesis: the effectiveness of the samples is desirable. (More than half of managers have achieved a

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satisfactory score based on scores in effectiveness components.)

As shown in Table 3, the results obtained from 200 subjects, the proportion of respondents with optimal effectiveness is 0.87 and the p-value is less than 0.001, so the null hypothesis at the level of 0.05 is rejected. The effectiveness of the samples is desirable.

Table3. Effectiveness Characteristics at Electronic Institutes

Sample	200
Number of favorable	174
Compared with a sample	0.87
P-value	Less than 0.001

The research main hypothesis was tested by regressing between components of project managers' competencies and effectiveness (E) of project managers which are direct relationships as shown in Table 4. According to the significance of regression equations coefficients and significant P-values are less than 0.001, the regression models are significant at 0.05. This again confirms that there are the significant relationship between the project managers' competencies components and effectiveness of project managers. Regression equations are;

- Effectiveness= 150.071 + 0.543 * Knowledge Competency (KC)
- Effectiveness= 10.801 + 1.364 * Performance Competency (PC)
- Effectiveness= 28.033 + 1.899 * Personal Competency (PerC)
- Effectiveness= 158.254 + 4.138 * Industrial Competency (InC)
- Effectiveness= 150.246 + 2.159 * Organizational Competency (OC)

Table4. Relationships between the project managers' competencies components and effectiveness of project managers

Components' Relationships		**The correlation coefficient**	**P-value**	**Determination coefficient of the regression equation**
(KC) & (E)	Pearson's correlation coefficient	0.317	Less than 0.001	0.100
	Spearman's correlation coefficient	0.258	Less than 0.001	
	Kendall's correlation coefficient	0.176	Less than 0.001	
(PC) & (E)	Pearson's correlation coefficient	0.844	Less than 0.001	0.712
	Spearman's correlation coefficient	0.872	Less than 0.001	
	Kendall's correlation coefficient	0.744	Less than 0.001	
(PerC) & (E)	Pearson's correlation coefficient	0.674	Less than 0.001	0.454
	Spearman's correlation coefficient	0.590	Less than 0.001	
	Kendall's correlation coefficient	0.395	Less than 0.001	
(InC) & (E)	Pearson's correlation coefficient	0.246	Less than 0.001	0.060
	Spearman's correlation coefficient	0.267	Less than 0.001	
	Kendall's correlation coefficient	0.199	Less than 0.001	
(OC) & (E)	Pearson's correlation coefficient	0.276	Less than 0.001	0.076
	Spearman's correlation coefficient	0.256	Less than 0.001	
	Kendall's correlation coefficient	0.181	Less than 0.001	

6. Discussion and Conclusion

The analysis undertaken in this paper verifies the main research hypothesis presented. Relationships between competencies of project managers and effectiveness in project management have been verified in other industries and this research confirms the existence of a similar positive

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relationship in the case of PM competency model and effectiveness in project management. The result presented here suggest that investment in training and develop human resource competencies will produce a return in terms of improved effectiveness. It means knowledge, performance, personal characteristics, industrial & organizational knowledge directly affects on achievement of organizational goals in Electronic industries, as effectiveness.

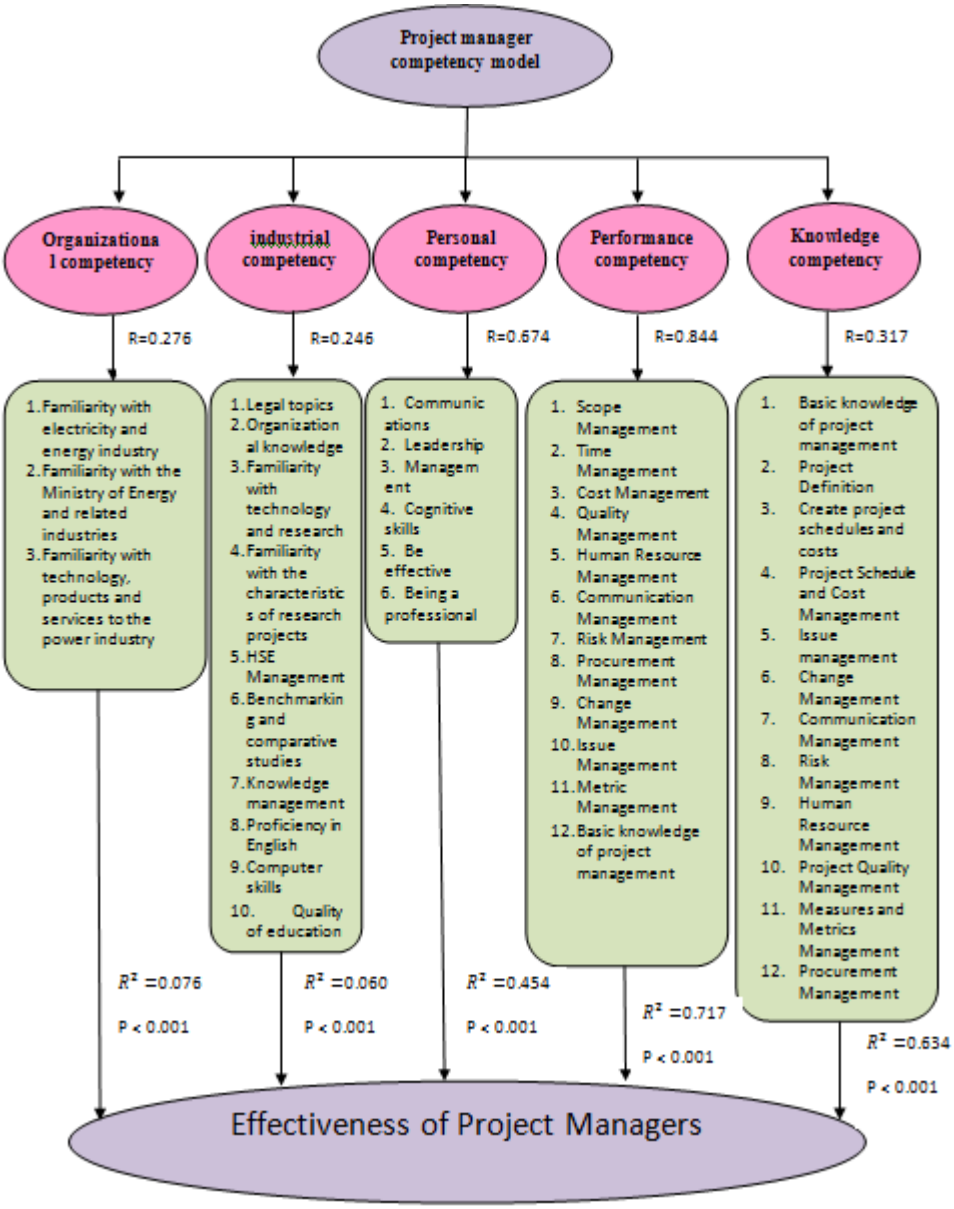

Figure3. Research conceptual model

R-squared (coefficient of determination) of performance competency, as shown in figure3, is about 71 percentages. It means 71 percentages of the response variable variation (effectiveness) is explained by a linear model. In general, the higher the R-squared, the better the model fits our data. Also, knowledge and personal competencies respectively explain that 63 and 45 percentages of variable variation (effectiveness). It means that these competencies have main influence on effectiveness in project management. These findings indicate an investment on the human resources play an important role to organization success. The ways of research show how

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organizations can measure some intangible assets like knowledge of employees or effectiveness of them.

The study results are so stable and reliable because we use confident instrument to measure indicators like standard and detailed exams. We have five standard exams to evaluate project managers' competencies that it is not regular in human resource studies in level of thesis. And also we use valid and reliable questionnaires to evaluate effectiveness of project managers. However, there are some important limitations in this work and the findings presented. First, we have considered effectiveness only in terms of project managers' competencies. As we acknowledge, competencies of project managers (or performance of them) are one of the three interlinked project effectiveness criteria, as shown in figure4, the other are not assessed here (Adams and Brown, 2002). Second, there are some measurements limitations that need to be considered, most specifically in connection with the assessment of individuals. We must acknowledge that projects are not managed by individuals, but by team. These limitations should be remembered in interpreting the result. It is recommended that future research in this area investigates relationships between effectiveness of projects and other factors like individuals. Therefore, the finding of this research are presented as preliminary rather than conclusive.

Figure4. Three key responsibilities of PM discipline.

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