

Evaluating the Effect of PMBOK Standard and Software Development Methodology on Software Development Teams' Success (Case Study: Software Companies in Iran)

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Abstract

Creativity, which is considered as a special tool in entrepreneurship and economic growth today, has become one of the most determinant variables in organizations growth and durability. In addition to creativity, project management and the used methodology (especially in project-based organizations) have a significant effect on the success of individuals, teams and organizations. Nowadays, there are various methods for developing software. This paper tries to study the impact of familiarity with PMBOK standard in software companies that use software development methodologies. Also, this paper attempts to investigate the role of software methodologies in more success of software teams based on classification. This survey used questionnaires, and statistical samples information obtained from different software roles in different software companies were analyzed by using a statistical approach and SPSS software. It was revealed after analysis that familiarity with PMBOK has a positive effect on projects. Also, it was in this study that agile methodologies along with PMBOK provide more suitable conditions for organizational success.

Keywords

Software Development Methodology; Factors and Project Management; PMBOK, Software Team

I. Introduction

Standardization and standards are the foundations of science and technology which have a significant role in industry and economic growth, and we should try to improve the quality level in order to reach the advanced technology of products development.

One of the main problems that Iranian software companies are dealing with in the global markets is the unfamiliarity with software standard and project management. Unfortunately, software standard is not developed and/or defined yet, and there has been no coherent action in Iran in order to determine software development standard and its management and there has been no obligations to represent software identification[1].

Since there is a wide variety in performance area, this industry cannot be survived without the presence of coherent and unified standards. Since each software developer chooses a specific development method and different methodologies are used in development steps, the outcome of different companies will be different in terms of qualitative and executive processes[12].

This is where the presence of software standards and project management is necessary. Software experts believe that strong support from products and also documentation and estimation of quality is only possible through an orderly standard and methodology. When an appropriate standard is present, teamwork finds much more meaning. Different methods are used all around the world to develop software. Also, there are different standards for project management and software development. This study tries to examine the effects of standards and methodologies of software

development on the success level of Iranian companies.

II. Project Management Standards

Nowadays, due to the development of commercial scope of companies and the globalization of projects, using standards for unifying the individuals involved in projects and assuring the accurate implementation of projects is necessary. These standards, in addition to specifying the project and determining the accurate way of executing the operations, are considered as a reference for people involved in projects in case of disagreements. These standards are strengthened by comprehensiveness, simplicity, public accessibility for users and the guarantee of accurate implementation of project. Due to the globalization of manufacturing and developing companies and improvement of labor markets, project managers should be familiar with project management standards. Utilizing these standards can help them to execute project plans [4-5].

Different organizations and countries have started to develop their specific standards in the field of project management; however, PMBOK has more importance and acceptance among others. PMBOK (Project Management Body of Knowledge) is the very known and famous name which was developed in the US project management institution (PMI) and it is widely used. After development of PMBOK, the US National Standard Institution confirmed and registered it as the US national standard in the field of project management. In this standard, project management knowledge is stated in 9 parts. However, there are some differences between PMI Institution's version and Standard Institution's version. PMBOK has a theoretical point of view and ANSI 99-001-2000 has more practical approach. PMBOK, just like other standards, is reviewed every year by a selected board from PMI, and in case of need for change, a new version is introduced to the members of PMI [4].

III. Software Development Methodologies

Software development methodology includes a set of processes, guidelines, formal technique, and documents patterns and the relations governing the software development which are used and referenced to at different steps of software life cycle. In general, one can divide software development methodologies into 2 groups of old methodologies and agile methodologies. SSAADM (Structured Systems Analysis and Design Method), which is the oldest and the most famous one, is based on waterfall approach in software engineering. Waterfall approach is representative of serial and irreversible characteristics of software development steps including analysis, design, programming, and system establishment. This method is rarely used today due to the lack of project phasing and the high risk of the process, and it is only appropriate for small systems[13]. RAD (Rapid Application Development) is another commonly used method in this group which has focused mainly on time and does not pay much attention

to programming and documents development (McConnell,1996). In these methods, software data and maintaining them is very important, but not sufficient attention is paid to behavioral characteristics of the software which is due to the simultaneity of the software development and increasing growth of databases[11]. RUB methodology is the most detailed and the most official methodology for developing software and it is innovated and documented by a set of developed processes, and some of these processes used for IBM according to the nature of the project. This method can be used by the company for most of the projects. Developmental programming and the possibility of phasing projects are among the advantages of this method, and this method is formal in a way that in case of need for statements and analysis agenda, the documentations of this method can be used directly in the project. In this method, the description of the roles and duties of individuals are completely determined and they are available in IBM website as guidelines. RUP (Rational UnifiedProcess) creates documentations in order to reduce the formality and complex rules. RUP is a new methodology which emphasize on teamwork, eliminating all redundant documents which are not used in most projects, reducing the number of roles and simplifying and developing them horizontally instead, reducing the management levels, and process flexibility[12]. In these methodologies, the rules are developed in a practical form and are not based on documents, for instance in these methodologies, much attention is paid to developing XP (Extreme Programming) testable versions of the software in short times, e.g. one day, or it is suggested in this methodology that programmers sit at the computer in groups of two in order to perform programming and troubleshooting at the same time, and also, the opinions of two people will be applied in the software (McBreen, 2003). These three groups of methodologies have differences in important organizational structure parameters such as team size, the level of formality, and focus, and they are usually selected based on the type of the project and the team members' knowledge. In this paper, the effect of using these parameters on the organizational success will be studied, so that in addition to above-mentioned factors, the required success in software development team will be considered as a determining factor in choosing software development methodology.

IV. Research Question

The project management in software development industries targets both software products and produced modules which will be used in developing software. The research method is causal or explanatory and it tries to see whether the familiarity with PMBOK in software development companies using software development methods will lead to more success for team or not. Many studies have been performed in the fields of organizational success and software development methodologies, and project management, and the relation between these two fields will be examined in this paper. The factors affecting organizational success are classified as mental, cognitive, practical, and social factors (Mayer, 1999), and a list of driving and inhibiting factors can be prepared in each classification, for instance, organizational growth can be placed in both groups. Improvement by increasing knowledge and organization set of hypotheses will support creativity, but on the other hand, the amount of beliefs and the red lines of individuals' linguistic characteristics and flexibility will increase along with the growth of the organization, and this will have a destructive effect on the organization success. Due to the relative separation of methodologies from employing labor force and creating software team, it seems that selecting

a software development method will have no direct impact on presence or absence of creative members in team, although some engineers may only participate in teams with certain methodologies, but this issue is less important than organizational parameters and a methodology affects the organizational atmosphere governing the software development the most.

The research question in each case includes: does the familiarity with PMBOK affect the success of software companies that are familiar with this standard and use software development methodologies? Is there any significant difference between various software development methodologies and their relation with organizational success? Designing such problems is consistent with fixing problems based on the lack of contents for researches in the field of organizational success, and also consistent with practicality of research results.

This research has 2 hypotheses:

Hypothesis one (H0): the familiarity with PMBOK does not affect the success of software companies that are familiar with this standard and use software development methodologies.

Hypothesis two (H1): the familiarity with PMBOK effect the success of software companies that are familiar with this standard and use software development methodologies.

V. Research Methodology

Since the statistical population of software developers is in Iran, the sample participants included 105 companies and programmers, and Morgan table was used in order to find an answer for the research problem. In order to increase the validity of the research, 110 companies were selected by random sampling.

Data collection tool is a researcher-made questionnaire and to evaluate its stability, 30 members from the statistical society that were not samples were chosen and given the questionnaire. After collecting the questionnaires, data were typed into the SPSS software and validity of questionnaire was calculated using Cronbach's method. Since the calculated alpha coefficient was more than %60, no question was removed.

The questionnaires were emailed to organizations, analyzed by them, and 105 questionnaires were accepted. The coded questions were typed into the SPSS17 software.

Data normality test was done using the Kolmogorov–Smirnov test in order to choose appropriate testing statistics for confirming or rejecting hypotheses about the impact of methods on company success, result was that data are normal. Therefore, descriptive statistics was used to test the hypotheses.

The output results of SPSS for variables are as follows:

Table 1. Central Indexes and Dispersal Distribution

One-sample Statistics				
	Quantity	Mean	Standard deviation	Mean standard deviation
Success cpmany by Methods and pmbok	105	69.0667	12.50559	1.22042

Fig. 1: Distribution Data

To test the hypothesis, we assume that if the mean value of questionnaire data is equal to, or greater than, three the hypothesis is accepted.

- Hypothesis one (H₀): $\mu - 3 = 0$
- Hypothesis two (H₁): $\mu - 3 \neq 0$

Table 2. One-Sample Test

	Test Value = 50					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Success companies by Methods and pmbok	15.623	104	.000	19.06667	16.6465	21.4868

The result shows in table 1 and table 2. By the result H₁ is accepted. By the Hypothesis 2 the familiarity with PMBOK affects the success of software companies that are familiar with this standard and use software development methodologies.

VI. Conclusion and Suggestions

According to the appropriate researches performed on project management standards and the available information about software development methods, a research question was raised: does the familiarity with PMBOK when using software development methodologies affect organizational success? Which methods of software development provide a more appropriate context for organizational success? In order to find an answer for this question, group and organizational parameters involved in success were listed, and these parameters were evaluated in the statistical population of software engineers working in software companies in Iran by using questionnaires. After the evaluation, it was revealed that teams that were familiar with PMBOK and use software development methodologies are more successful compared to other teams. And this has a positive effect on organization. One of the results obtained from this study includes that agile methodologies, which are less formal, create better team spirit, freedom of actions, and vulnerability to risks, and on the other hand, due to the total plurality caused by these methodologies, the software development teams using agile methodologies had less opportunity to think and less freedom of actions.

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