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ROUTE TO CMMI IN TURKISH SOFTWARE COMPANIES

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ABSTRACT
Software Process Improvement is a long-standing approach which is developed by software researchers to support organizations on improving software quality and reducing risk. There are variously designed software process improvement standards and models such as Capability Maturity Model (CMM), and more recently Capability Maturity Model Integration (CMMI). CMMI is shortly a model to support process improvement which is accomodated multiple disciplines such as software engineering, system engineering, integrated product and process development, supply sourcing to give the benefits of an integrated model. CMMI is used to assign existing resources to the best advantages which is also adopted all over the world including South America, North America, Africa, Europe, Asian and Australia. Precisely, CMMI improvements are completed by big-scaled companies in Turkey yet most of them achieved to the third level. In this paper, according to the previous studies and experiences related with the CMMI model, a survey is prepared and experimented by the software development experts selected from eight different Turkish software companies to find out the perception and the motivation for the CMMI in Turkey. The outcome of the survey is positive on CMMI despite its expensive service costs and time constraints.
Keywords: Software process improvement, capability maturity model integration, CMMI

1. INTRODUCTION
Software companies in all over the world must establish the practices which are implemented to increase quality and promote to the process management to remain competitive in the sector [1]. Most of the companies recently started to run software process improvement (SPI) methodologies. The strategies used by software companies are changed to improve the quality of their products. Instead of trying to find out quick solutions by using some specially developed packages or approaches, it has been seen that implementing any SPI methodology would provide better outcomes and benefits [1]. The most important factors for the success of the project are meeting the quality standards, user satisfaction, time pressure, and budget limitations [2]. Software Process Improvement interests in the determination of changes to the development and management activities or functions in order to improve the productivity and efficiency of the organizations [3]. It is suggested four phases of SPI which are categorized as 1) assessment, 2) model selection, 3) design of implementation and 4) the implementation [2].
An efficient software development process can be very critical to the software companies in the meaning of improving quality and reducing the risk of project development processes [4]. There are many software process improvement standards and models such as CMM (Capability Maturity Model), the successor to CMM; CMMI (Capability Maturity Model Integration) and ISO's SPICE [5]. CMMI is a process model which is used to evaluate the maturity of organizational software processes such as plan, develop, maintenance, and configuration [6]. It is widely accepted approach by the software companies. There are totally 25 process areas belongs to CMMI, and each process area is assigned to a number of goals to be met and outcomes a significant improvement in the area [7].
There are many previously studied papers about CMM and CMMI. It is shown and reported the benefits and costs of using CMM for the organizations [8-9]. Also various CMM based case studies were introduced about the difficulties of experiencing CMM and CMMI [10], [6]. In (Staples, 2007),

it is insisted that the reasons given by the organizations about not adopting CMMI are their small sized structures, expensive services, and time constraints. Similarly, a survey is completed to find out the problems of organizations which are experienced CMM and it is resulted that small sized organizations feel that they are not ready to implement SPI methodologies [11]. In this paper, CMMI is discussed by the perception and motivation of the software developers working in Turkish companies. A survey is prepared including twelve proposals by considering the previous studies and experiences about CMMI. The survey is completed by face to face surveying with twenty software developers from randomly selected eight software companies in Istanbul which are currently using CMMI methodology. The participants are all familiar with CMMI.

2. CAPABİLİTY MATURİTY MODEL INTEGRATİON (CMMI)

2.1. What is CMMI?

CMMI is quickly became a powerful international tool to guide process improvement initiatives in many fields such as software development, system engineering, team management and etc. It has been proved to reduce the risks related with the development projects and increase the efficiency and improve the overall quality of products in an organization [4]. CMMI based process improvement benefits includes true prediction of the budget and schedule efficiently; cycle time improvement, increase in productivity and user satisfaction, return on investment; improved quality, employee motivation; and reduce in the cost of quality [12]. CMMI consists of five maturity levels as it is shown in Figure 1.

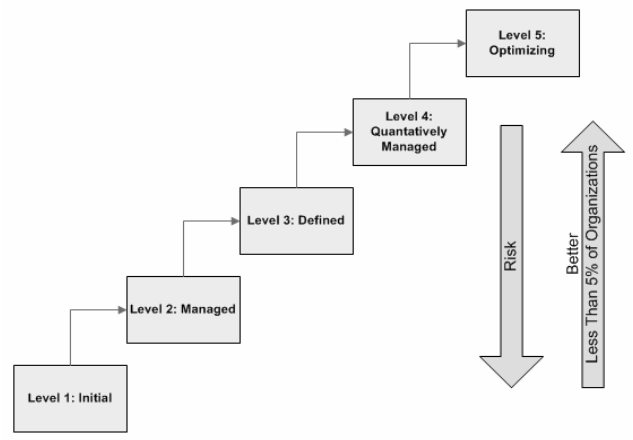

Figure 1: Five levels of CMMI [4]

2.2. CMMI Performance Measures

The performance results about CMMI are divided into six categories which are collected from thirty companies. The categories are cost, schedule, productivity, quality, customer satisfaction and return in investment [12]. The performance parameters and median improvement values for each are shown in Table 1 below.

Table 1: Performance Measures – CMMI[12]

Performance Category	Median Improvement
Cost	34%
Schedule	50%
Productivity	61%
Quality	48%
Customer Satisfaction	14%
Return on Investment	4:1

3. METHOD

3.1. Subjects

Twenty subjects were assigned from eight different Turkish software companies to complete the survey. Fifteen subjects are male and five are female with an age range between 25 and 50. All

subjects used in this experiment have BS degrees and additionally 11 of them have MS degrees. The subjects are software developers from the majors of computer engineering, software engineering, and mathematical engineering. All of the participants are familiar with CMMI.

3.2. CMMI in Turkey

The studies in Turkey about CMM were started in 1995, and with the evaluation of the methodology, it is continued by the implementation of CMMI in software companies. Now, CMMI is one of the well known software improvement methodologies in Turkey. Table 2 shows the major companies which are implemented CMMI in recent years.

Table 2: CMM(I) in Turkey

Year	Activity on Maturity Models
1995	First academic paper is published.
2003	- AYDIN YAZILIM CMM 3. Level - MILSOFT CMM 3. Level - HAVELSAN CMM 3. Level
2005	- MILSOFT CMMI 5. Level
2006	- KOÇ SİSTEM CMMI 3. Level - METEKSAN SİSTEM CMMI 3.Level

3.3. Survey

A survey is prepared including twelve items according to the previous studies to evaluate the perception of the software experts on CMMI. The survey is completed online by the subjects. The data collection process is concluded in two days. A brief explanation is given to the subject before starting the experiment by email. 5-points likert scale is used to evaluate each item in the survey from "1" as "strongly disagree" up to "5" which is "strongly agree". The survey includes the followings;

1. CMMI is related with the organizational strategic plans, business targets, technology, and culture.
2. CMMI provides guidance about how to improve processes, manage risks, and analyze perfection.
3. CMMI is about the identifying and evaluating internal business processes of the organization.
4. CMMI is efficient in maturing the human resources, processes, technologies, and performance in terms of organizational operational capabilities.
5. CMMI levels are useful at defining the weakness and strength of the organization.
6. CMMI is efficient at determining the development processes of the organization.
7. CMMI is efficient in defining the current maturity level, finding defects before reaching to upper levels, putting them in hierarchy, dealing with the errors, applying sources correctly and cycling again.
8. The most significant disadvantages of CMMI are expensive service and time constraints for Turkish companies.
9. CMMI is easy to implement for small-sized companies in Turkey.
10. The implementation of CMMI with the organizational activities let us to define a referential value on defining the priorities, being a guide for quality process and existing process.
11. A software company should lead at least in the 3rd level of CMMI to remain competitive in sector.
12. Any software company which reached the 3rd level of CMMI made a successful achievement about protecting existing skills, and completing the process of product engineering.

4. TEST RESULTS

In this section, the experiment results are listed into two disticnt tables. Table 3 represents the average and standard deviation values for each question asked in the survey and Table 4 presents the total value that the question is gathered from the participants.

According to the data given in Table 3 and Table 4, it is seen that the perception of the software developers are positive on implementing and experiencing CMMI approach.

According to the Table 4, the perceived scores for ten proposals are over 80. If it is considered the survey items one by one again, ten of them are positive and shows the effectiveness and efficiency of CMMI in improving the quality of production, organizing the business operations and reducing the risk by participant's perceptions. As it is shown in Table 4, survey item number nine got the lowest score and it is believed that it is not easy to implement CMMI for small sized companies similarly as

it is insisted in previous studies. According to the number eight, the most significant disadvantages of CMMI are expensive services and time constraints for Turkish software companies.

Table 3: The mean scores & standard deviation for each

Item	Mean Value	Std. Deviation
#1	4.30	.58
#2	4.35	.67
#3	4.40	.68
#4	4.20	.76
#5	4.15	.74
#6	4.15	.58
#7	4.10	.78
#8	4.30	.92
#9	3.45	1.17
#10	4.20	.69
#11	4.10	.96
#12	3.75	.85

Table 4: Total given scores for each

Item	Total Score (max 100)
#1	86
#2	87
#3	88
#4	84
#5	83
#6	83
#7	82
#8	86
#9	69
#10	84
#11	82
#12	74

5. CONCLUSION

Implementation of any software process improvement efficiently is a crucial target for software organizations to increase the quality of product within the budget and time. Many software companies in the world are seeking the way of adopting the functional CMMI model. This study shows that CMMI approach has many benefits in the organizational process development. The outcome of the survey is positive about CMMI despite of its expensive service costs and time constraints. On the other hand, it should be noticed that the expensive service costs and time constraints can be reported as the significant barriers for the implementation of CMMI approach especially for small sized organizations in Turkey.

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