

Quantitative Analysis of SPI in Pakistan

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Abstract—This study scrutinizes the trends of adoption of CMMI as a standard around the world specially Pakistan. The focus of the study is to find out factors that influence the standardization trends and where is software industry of Pakistan heading to. With Pakistan's fast-paced IT industry, it is emerging as a powerhouse in the South Asian region due to the availability of a large pool of English-proficient skilled professionals, affordable connectivity rates, competitive infrastructure and operational costs are some of the other benefits that Pakistan enjoys. On the downside, the country has an image problem. There is this perception abroad that Pakistan is politically unstable. However, these problems have not scared away customers. The implication of the study is that it enhances our knowledge of cross-cultural standardization, which may be useful to practitioners and academics.

Index Terms—Capability maturity model (CMM), capability maturity model integration (CMMI), software engineering institute (SEI), software process improvement (SPI), Pakistan software exchange board (PSEB).

I. INTRODUCTION

The IT and IT-enabled Services (ITeS) marketplace offers lucrative opportunities for developing countries to join the ranks of the developed world. The scale and pace of growth in this sector is faster than in any other industry, and a number of developing countries are attempting to emulate the success enjoyed by countries such as China, Thailand and India [1].

The Government of Pakistan has been proactively developing the IT sector in Pakistan since the last few years. A few of the incentives offered include tax exemption till 2016, establishment of IT Parks with low rent, foreign ownership of equity invested in IT and 100% repatriation of profit allowed to IT companies[2].

The capability maturity model[®] (CMM[®]) IntegrationSM (CMMISM) in its current form is a set of best practices for the development and maintenance of both services and product [3]-[5]. Four different CMMs have been integrated to develop this model--the source models, the CMM for software, for systems engineering, for integrated product development (IPD), and for acquisition. Many organizations are using this model as a guide for enhancing their ability to develop (or maintain) products (and services) on time, within budget, and with desired quality [3]. Since many years organizations have used CMM and CMM-like concepts to bring order to their software development processes.

Philosophically there are two different approaches to process improvement staged and continuous [3], [6]. One

focuses on the organization as a whole and provides a road map of successive stages aimed at improving the organization's ability to understand and control its processes. This approach is the basis for the staged representation.

The other approach focuses on individual processes, allowing the organization to choose which process or a set of processes need to have more capability. This is the approach of the continuous representation.

In theory the choice of processes is unconstrained, but in reality increasing the capability of a particular process necessitates that other processes have certain capabilities. So the continuous representation provides a few more routes on the process improvement map [3], [7].

II. MATURITY VS CAPABILITY

Let's take an example to clear the confusion between concepts of maturity and capability. Pak Motor Car Garage – a capability (level 3 garage ###), we are a capability level 3 garage. We take great pride in specializing in performing and managing our defined car tune up process by using the standard car tune up process from our parent company located in Islamabad (Pakistan). We customized this process just for the Specific Roads area. This gives us a 3 star capability rating. This guarantees our customers a consistently efficient car tune up. Our car tune up process is so efficient that we open our customer feedback surveys to any customer who may want to check our service stats. On the other hand tune up car garage – a maturity (level 3 garage ###), we are a maturity level 3 garage. We take great pride in specializing in performing and managing not only our tune up process, but we do all of the other required checks and fixes to be a 3 star mature place of business. We perform brake diagnostic, tire pressure checks, emission system diagnostics, exhaust system level checks. Our defined 3 star car maintenance processes comes from our parent company located in Islamabad (Pakistan). We customized Islamabad's standard processes just for the Islamabad roads area. This guarantees our customers a consistently efficient overall car care. Our car maintenance process is so efficient that we open our customer feedback surveys to any customer who may want to check our service stats.

III. ROLE OF CMM/CMMI IN PROJECT SUCCESS

Almost less than 25% of software development projects ever meet their objectives [2]. Factors like time and cost that play major role in success or failure of the project can be monitored and controlled. To do so Carnegie Mellon University's Software Engineering Institute has developed the CMM to assess a vendor's ability to complete developmental projects within a specified budget and timeframe. The CMM is a collection of best practices to measured improvements in

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their systems and project management capabilities [8].

CMM is a model-based software process improvement approach which guides and addresses certain fundamental business decisions not supported by other existing standards like ISO [3]. The primary aim of CMM or CMMI (CMM-Integration) is continuous process improvement, from the individual task level to the corporate level. [6], [9] To be ISO 9001 certified, a third-party auditor assesses an organization, and certification is typically good for about 3 years, after which a complete reassessment is required. In other way we can say that we require regular audits for ISO but in case of CMM or CMMI there is no regular auditing, it's get and forget. Some critiques define ISO 9000 as dirty water purified only when audit comes, again will become dirty, it will be purified few days before audit and CMM is dirty water purified only once, wait until client gets a feel that we are using dirty water, again purification starts.

IV. CMMI IN PAKISTAN

Knowing the importance of CMM and its need in the global market many Pakistani companies are opting for this certification. By the support of PSEB many companies has achieved different levels of CMM and even two of them was able to achieve the maximum. Table I shows the list of Pakistani companies along with their CMMI level [2].

TABLE I: LIST OF CMMI RATED COMPANIES IN PAKISTAN [10]

SNo	Company Name	Level
1	NetSol Technologies (Pvt.) Ltd.	Level 5
2	NCR Pakistan	Level 5
3	Kalsoft (Pvt.) Ltd.	Level 3
4	Systems (Pvt.) Ltd.	Level 3
5	Digital Processing Systems	Level 3
6	ZTE Pakistan, Software R & D Center	Level 2
7	Eworx Intl (Pvt.) Ltd.	Level 2
8	Techlogix Pakistan (Pvt.) Ltd.	Level 2
9	Si3 - System Innovations (Pvt.) Ltd.	Level 2
10	Abacus Consulting (Pvt.) Ltd.	Level 2
11	Descon Information Systems	Level 2
12	E-Dev Technologies	Level 2
13	Prosol Technologies	Level 2
14	Avanza Solutions	Level 2
15	Shaukat Khanum Cancer Research Hospital (IT DIV)	Level 2

V. PSEB'S CMMI INITIATIVE

In May 2004, PSEB launched the first phase of the program, aiming to assist 5 companies in achieving CMMI level 3 or above [2], [10], [11]. Following Pakistani IT companies were selected by PSEB and support was provided to achieve certain level of CMMI. Companies include:

- NetSol Technologies (Pvt.) Ltd.
- Xavor Pakistan (Pvt.) Ltd.
- Systems (Pvt.) Ltd.
- KalSoft (Pvt.) Ltd.
- Digital Processing Systems

Mean while knowing the role and importance of appraisal in standardization PSEB selected the following companies to

provide CMMI consultancy and appraiser services to the above-mentioned IT companies:

- Moody's International/Quality Assurance Institute, Middle East, Africa & Pakistan
- NetSol Consulting Services (Pvt.) Ltd.

VI. SURVEY METHODOLOGY

This section describes the sampling method, data collection procedure and analysis used in the study [12], [13].

A. We Use the Following Sample Method for Our Survey

The questionnaire was floated and information was gathered from different location of Pakistan through email, telephone and interviews. Following questions were asked to know the existing trend of companies opting for CMM and CMMI. Naturally unique answers should guide us CMMI adoption strategy.

Sample of Study:

Name: xxxxxx

Organization: **** Pakistan

Location: Islamabad, Pakistan

Appointment: System Engineer

Q1. Basic aim behind going for CMM levels is:

- Reduction in development cost
- Reduction in rework costs
- Reduction in average schedule length
- Post-release defects reduction
- Weighted risk likelihood reduction
- Return on investment

Q2. Did your company get the expected creativity and ingenuity encouragement from staff?

To Some extent, but we expected more.

Q3. Does Staff appreciate formal inspection process?

NO, not really, it adds to the job.

Q4. Did you reduce post-delivery defect. What percent?

Yes, may be around 25%

Q5. Overall influence on working environment?

More time compressed.

Q6. How did it affect the quality of software; overtime and unhappy customer's reduction.

Customers are more satisfied than ever.

Q7. How much in your view it provided better management control over the project?

Much better management control, things seems to be streamed line.

Q8. How communication among the team has improved by adopting CMMI.

We talk on same grounds, easy to communicate among ourselves and others.

Q9. Did you get increased competitive advantage in market?

Yes we do, CMM ratings does affect the company's reputation.

Q10. How much process improvement experience do the various units within the organization have?

Everybody seems quite confident and hoping for better results.

B. DATA Collection

In first phase target audience were small companies, students working in small firms. The result was compiled and

analyzed from total of 15 samples collected from the focused areas. In next phase study will be conducted within Pakistan and some European and African countries.

VII. FINDINGS OF THE STUDY

Some results of the survey carried out are reflected in the charts below.

A. Aim behind Going for CMM Levels?

Fig. 1 shows that reduction in rework cost is undoubtedly the most favored reason for choosing CMMI. Development cost and ROI are also among the preferred reasons for opting CMM.

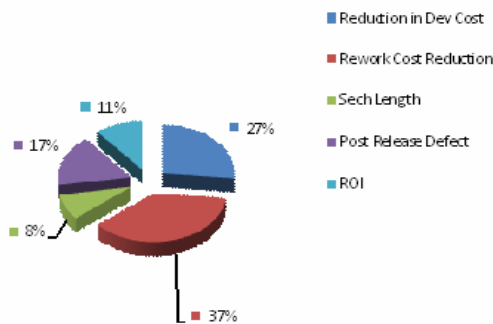


Fig. 1. Basic aim behind going for CMM levels.

B. Does Staff Appreciate Formal Inspection Process?

Fig. 2 shows the adoption rate in general. People around resist adopting for any formal inspection methods and Standardization techniques. Reason could be waste of time or it highlights the ineffectiveness in work of the employee.

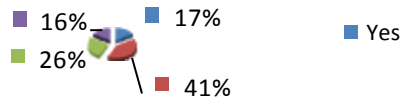


Fig. 2. Staff appreciation for formal inspection process.

C. Did You Get Increased Competitive Advantage in Market?

Fig. 3 shows the most of the employees and managers in Pakistani companies believe that getting CMM or CMMI rating is just another way to attract customers. It gives you certain competitive edge over non rated companies and type of relationship client and vendor would like to have.

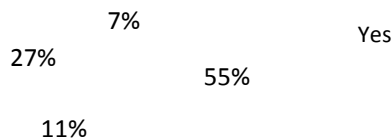


Fig. 3. Competitive advantages in the market.

D. How Much in Your View it Provided Better Management Control over the Project?

Fig. 4 shows that around 45% percent of the time it provided better management control over the project. There is no line separating the two. The managers are more comfort-

able with formal methods rather than hit and trial game.

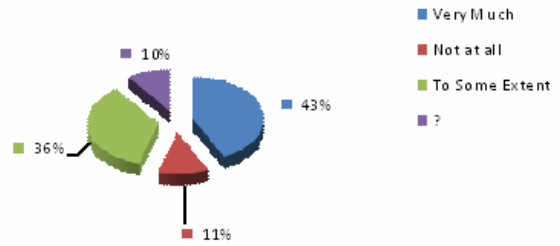


Fig. 4. Better management controls over the project

VIII. WHAT WE NEED TO DO

Open trade opportunities by continuing to maintain an open border with the neighbor ring countries, playing a leadership role internationally in trade negotiations, including a focus on facilitating movement of skilled personnel. Promote education and IT culture by devoting appropriate resources to meet the needs of the future labor market, supporting research and working with universities to increase the level of research commercialization [5], [13]. Promote Pakistan as an excellent near shore destination for international firms, with an internationally competitive business climate.

IX. CONCLUSION

The data collected from the study illustrates several interesting findings that can be used for practical and research purposes especially in terms of the future standardization practices or trends among Pakistani companies. The study found that concept of standardization is not new in Pakistan although the new orientation of the culture has changed to focus more on the smooth processes and good quality product. But at the same time the current situation, economic crisis and lack of awareness in terms of quality (CMM and CMMI) is affecting Pakistan's image and has slowed down the pace of growth.

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