An Assessment of Software Process Optimization Compared to International Best Practice in Bangladesh

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Abstract—The challenge for software development house in Bangladesh is to find a path of using minimum process rather than CMMI or ISO type gigantic practice and process area. The small and medium size organization in Bangladesh wants to ensure minimum basic Software Process Improvement (SPI) in day to day operational activities. Perhaps, the basic practices will ensure to realize their company's improvement goals. This paper focuses on the key issues in basic software practices for small and medium size software organizations, who are unable to effort the CMMI, ISO, ITIL etc. compliance certifications. This research also suggests a basic software process practices model for Bangladesh and it will show the mapping of our suggestions with international best practice. In this IT competitive world for software process improvement, Small and medium size software companies that require collaboration and strengthening to transform their current perspective into inseparable global IT scenario. This research performed some investigations and analysis on some projects' life cycle, current good practice, effective approach, reality and pain area of practitioners, etc. We did some reasoning, root cause analysis, comparative analysis of various approach, method, practice and justifications of CMMI and real life. We did avoid reinventing the wheel, where our focus is for minimal practice, which will ensure a dignified satisfaction between organizations and software customer.

I. INTRODUCTION

NOWADAYS, the software industries in Bangladesh play a prominent role in the economy. Over 30,000+ IT engineers are working in over 800+ software and IT service companies around 150 of these companies are specialized in serving overseas clients [1]. There are another few hundreds of unregistered small and home-based software and IT ventures doing business for both local and international markets. The total industry size is estimated to be around Tk. 1,800 crore (US$ 250 million).

The research is mainly addressed to the Small and Medium size of Software organizations of Dhaka, Bangladesh. Similarly to other Software organizations, those cannot bear CMMI [2], ISO [3] or other process improvement, which will improve their performance.

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The ideas of software process improvements, quality models, and improvement strategies were used during the fieldwork to understand how the studied company is doing software process improvements. The Company has neither any knowledge of CMMI [2], ISO [3], nor any quality vision. Nonetheless they are trying to improve the way they produce their software products and services.

A possible solution is to define, manage, and optimize the software production processes. This is generally the aim of software process improvements.

Building software is a design-intensive, creative activity. While the discipline of process is an important factor of success, the objective is to solve a problem, and this requires creativity. We found that competency of company personnel was a critical strength of the companies and therefore the personnel changes are a great risk for a small organization.

Identified weaknesses were, for example, systematic project's work load and time estimation practices that were lacking, requirements change management was poorly organized. The organizations were not largely aware about software quality aspects and there were no formal procedures for quality or configuration management. Moreover functional requirements of the software system were often defined, but version control tool for code was not in practice..

We believe that after this assessment the organizations will be now more aware of software process improvement topics and the work towards culture of quality will begin.

To build up a software product or system, it is necessary to step forward through some predictable steps, which helps to create timely, high quality results. More formally, a software process is a framework for the tasks that are required to build high quality software [17]

II. LITERATURE REVIEW

In order to understand the current assessment techniques which are adopted by the Bangladeshi IT Industry, a survey was conducted with preliminary results obtained from Bangladeshi software market. The survey showed that the companies adopt assessment methods based on:

A. Capability Maturity Model Integration

The Capability Maturity Model Integration (CMMI) is one of the leading models and based on best practice. Independent assessments grade organizations on how well they follow their defined processes, not on the quality of those processes or the software produced. CMMI has replaced CMM [4].

CMMI-DEV contains 22 process areas up to level 5 of those process areas, 16 are core process areas, 1 is a shared process area, and 5 are development specific process areas.

All CMMI-DEV model practices focus on the activities of the developer organization. Five process areas focus on practices specific to development: addressing requirements development, technical solution, product integration, verification, and validation. [15]

Level 1 is for process done to achieve specific objectives, though there is no appraisal or certifications for Level 0 or 1. This type means organization running is business but without policy or based on crisis management.

Level 2 means the organization can manage their activity but not in structured or define way, or not focused on organization goal and focus area. It consist of 7 process area

Level 3 is Organization is managed and defines in such a way they can measure their improvement and continue his business in a standard approach. It consist of 11 Process area

For this research, we have tried to understand up to level 3. We have identified there are 18 Process (7 + 11) in CMMI ML 3 for Stage Representation, which leads an organization based on their capability in all process area[5],[6].

The Table I showing the process area and practices under each process area for organization and Project level for CMMI ML3.

TABLE I
SHOWING PROCESS AREA AND PRACTICE – ORGANIZATION AND PROJECT LEVEL

Process Area	Organization Level # of Practices	Project Level # of Practices
PP- Project Planning	26	8
PMC- Project Monitoring and Control	22	7
MA-Measurement and Analysis	20	18
IPM- Integrated Project Management	22	10
RSKM- Risk Management	19	10
TS- Technical Solutions	20	6
PI- Product Integration	21	8
DAR- Decision Analysis and Resolution	18	17
REQM- Requirement Management	17	6
CM- Configuration Management	19	9
RD- Requirement Development	22	6
PPQA- Product and Process Quality Assurance	16	13
Ver- Verification	20	13
Val- Validation	17	15
OPF- Organization Process Focus	21	21
OPD- Organization Process Definition	19	19
OT- Organization Training	19	19
SAM- Subcontract and Acquisition Management	18	17
Sub Total	288	172
Grand Total	460	

CMMI Level 3 consists of 460 process area organizations and project need to ensure the practice to be appraised for CMMI Level 3.

B. ISO 9001

ISO 9001 describes standards for a formally organized process to manufacture a product and the methods of managing and monitoring progress. Although the standard was originally created for the manufacturing sector, ISO 9001 standards have been applied to software development as well. Like CMMI, certification with ISO 9001 does not guarantee the quality of the end result, only that formalized business processes have been followed.

C. ISO/IEC 15504

ISO/IEC 15504 Information technology — Process assessment also known as Software Process Improvement Capability Determination (SPICE), is a "framework for the assessment of software processes". This standard is aimed at setting out a clear model for process comparison. SPICE is used much like CMMI. It models processes to manage, control, guide and monitor software development. This model is then used to measure what a development organization or project team actually does during software development. This information is analyzed to identify weaknesses and drive improvement. It also identifies strengths that can be continued or integrated into common practice for that organization or team.

D.ITIL

Recent trend in Bangladesh is ITIL. It is the most widely accepted approach to IT service management in the world. ITIL provides a cohesive set of best practice, drawn from the public and private sectors internationally [11]. ITIL is the most widely adopted approach for IT Service Management in the world. It provides a practical, no-nonsense framework for identifying, planning, delivering and supporting IT services to the business.

ITIL advocates that IT services must be aligned to the needs of the business and underpin the core business processes. It provides guidance to organizations on how to use IT as a tool to facilitate business change, transformation and growth. The ITIL best practices are currently detailed within five core publications which provide a systematic and professional approach to the management of IT services, enabling organizations to deliver appropriate services and continually ensure they are meeting business goals and delivering benefits.

The five core guides map the entire ITIL Service Lifecycle, beginning with the identification of customer needs and drivers of IT requirements, through to the design and implementation of the service into operation and finally, on to the monitoring and improvement phase of the service.

Adopting ITIL can offer users a huge range of benefits that include:

• improved IT services
• reduced costs
• improved customer satisfaction through a more professional approach to service delivery
• improved productivity
• improved use of skills and experience
• improved delivery of third party service

ITIL has been adopted by thousands of organizations worldwide, such as NASA, the UK National Health Service (NHS), HSBC bank and Disney™. ITIL is also supported by quality services from a wide range of providers including examination institutes, accredited training providers and consultancies, software and tool vendors and well known service providers such as IBM, HP and British telecom (BT) etc.

A comprehensive qualifications scheme offering a variety of training courses and certifications has been developed against the guidance. This scheme can help organizations to effectively implement ITIL, achieving success by ensuring that employees have the relevant knowledge, skills and techniques, but most importantly, ensuring the entire organization is using a common language and are fully invested in the process.

ITIL Best Practices also underpin the foundations of ISO/IEC 20000 (previously BS15000), the International Service Management Standard for organizational certification and compliance. Organizations can therefore implement ITIL to achieve organizational certification.[12]

E. Issues involving Process Improvement

A small company, wanting to implement process improvement program, becomes less competitive in terms of overhead rate, not only with other small companies that may not be paying for process improvement programs, but also with large companies whose overhead rates are not substantially affected by their software process improvement programs. Small companies are now frequently competing with large businesses for small contracts, and they fear that their competitive advantage of lower overhead rates will be lost when paying for software process improvement programs [2],[4]. Further compounding the problems of small businesses trying to implement a CMMI-based process improvement program is the fact that many of the practices within the CMMI are not applicable to small projects, which are prevalent in small businesses. The businesses fear that the money spent on software process improvement will not enable them to satisfy contract maturity requirements

The research work carried out on software process improvement activities for Bangladeshi's typical Software house environment is not enough. . Hence our work took an initiative to fill the gap in this area.

III. ASSESSMENT AND RESEARCH METHODOLOGY

Considering the aspects of the problem argued within Large, Medium and small software organizations in process industry, in this work it is followed the steps to perform an assessment of process Optimizations and comparative study on the typical software house in Bangladesh inclusion of software process engineering and typical practice used in our country and Standardize organization like CMMI, ISO, ITIL etc.

The Procedures are:

1) Initial approach Questionnaires using likert Scale
2) User story writing on projects
3) Finding demonstrate by PMI– Plus, Minus, Interesting technique[10]

The Interview sessions and Project selected from local small and medium size software house in Dhaka, Bangladesh. Based on 5(five) organizations information and practitioners' opinion, It has analyzed and assess the process optimization findings. Which supposed to be more in next milestone?

As, mentioned that the data for this survey was collected from 4 to 5 small and medium software companies of Dhaka cities by arranging interview sessions with questionnaires and writing user story and validating the text of user story with the project managers and senior software development professionals. It was also arranged interview sessions over telephone with surveyed company's personnel to know the actual process capability of the company. A set of open-ended questions and likerts scale questions were initially prepared and later a set of specific questions on software process were prepared as data gathering techniques. Due to difference experience from the interview sessions, we did change the strategy of asking questions rather than writing user story. Researcher verified and confirmed the same set of questions during the writing of the user story and interview sessions.

Question sets were related to software process familiarity, organizational structure and Project Management, Requirement Analysis, Design, Coding Testing & QA matters in adherence to a software process and their intension for future process improvement etc.

SI #	Affirmation	Score	Percentage
A	Strongly Agree - Fully Practiced	5	80-90%
B	Partially Agree - Partially Practiced	4	60-79%
C	Agree – Averagely Practiced	3	40-59%
D	Neither agree nor disagree- Not Sure	2	30-40%
E	Disagree – Not Practiced	1	Below 30%

Fig. 1 Likerts Scale affirmation types and score

Based on the Fig. 1 and scale data, we did prepare the Questionnaires, which help us to experience the way of collection of data and information's.

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a. Organization related                        : 22 Questions
b. Project Management & Requirement Analysis   : 24 Questions
c. Software Quality Assurance & Design         : 10 Questions
d. Coding                                      : 13 Questions
e. Testing                                     : 20 Questions
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Fig. 2 Questions focus in various areas

Some time, It was not limited to short questions but move to story, what they are actually doing by collecting the story of work in projects.

We have tried to use the following steps during the research work and conclude:

Step 1: Collecting data using User story

Step 2: Focus process areas for characterizations

1) Project Management
2) Analysis & Design
3) Quality Assurance
4) Testing

Step 3: Identify Plus, Minus, Interesting areas with data analysis

Step 4: Identify possible salient key success factor with benefits

Step 5: Summary of focus area and findings identifications.

IV. INFORMATION EXTRACTION AND CASE STUDY

We have tried to collect various aspect of project from the practitioners. In this paper, we have only highlighted one of the organizations facts detail and findings to focus the salient result. One of the Organization's, we have visited has crossed its arduous journey of being an industry leader as a Total IT Solution Provider. During this journey it has crossed several landmarks and left behind some challenging and crucial projects, which has enabled this organization to introduce itself to our prospective clients as a trusted IT Service Provider. This organization is reflecting IT services in terms of they are not only providing software solutions, but also giving managed service to reduce the risk of the projects. Beside Software solutions, they are ensuring hardware, network, and server infrastructure by their own effort and they are charging for these services. This site satisfies the informational needs of their prospective clients regarding the strengths and achievements of this organization and its qualifications as an IT Service Provider. We have identified through discussion that the organization has always believed in something. They make more with less. Clients are in the heart of their system and they are the one who makes them to continue their service towards the new dimension and Arena. We did discuss on lots of project issue, the highlighted are in public sector. One of the projects' of this organization is computerized seat reservation and Ticketing System of a Transport Service provider. The project environment was in their development environment and Transport Service providers itself. It was a project of 60 Months, no of staff involved was 25. They did the project without any association with external consultant.

A. Project Details in terms of functionality and specification

The project was based on contract for the Operations and Maintenance of the Computerized Seat Reservation and Ticketing System for Transport Service provider (TSP). Transport Service provider required to Up-Grade the existing system based on Oracle 9i technology and develop, implement and use the online ticketing system provided by the organization we have visited, with contemporary RDBMS like Oracle 10g. The organization developed a new system for Computerized Seat Reservation and Ticketing System which used Oracle 10g RDBMS implemented on n-Tier Architecture ensuring OLTP (Online Transaction Processing) and high availability of data at terminal ends.

The main scope of work also includes maintenance, support and phasing out the hardware in 28 places across country and implementing the system in 53 Stations. Organization was deploying necessary Manpower to carry out the day-to-day operations and maintenance of the system.

The Project has successfully passed the milestones marking Development, Implementation and Training Phase of the Software as well as Phasing out the Hardware and Networking and implementation of a robust Hardware and Network system in all the stations under the project's jurisdiction, The New software system is up and running in all the stations and tickets are being issued and controlled from the same. Currently the organization is providing operation and maintenance services under the contract. Another aspect of the project is Development, Implementation and maintenance of the SMS Ticket issuing System where the customer can be able to reserve and obtain the tickets right from their cell phones also Information System vide Short Messaging System (SMS) where the customers can obtain information about the arrival, departure fare and real-time seat availability status from their cell phones.

B. Detailed Description of actual services provided by the organization

System Requirement Study, System Analysis, Design, Development and up-gradation True On-Line Web-Based Software Development & Up-gradation, Nationwide Networking (Internet & Intranet) and Hardware Infrastructure Development, Deploying Necessary Manpower, Hardware and Network Maintenance, Data Entry, Operation, Processing, Printing. Implementation in 62 places across country, Supply and Installation of all required Hardware and Networking peripherals, Internet and Intranet, Supply of Equipment like Power Generators, Display Screens etc. LAN and WAN Networking and reengineering of existing Fiber Optic Network of TSP to accommodate high speed data transfer, Training to the Booking Clerks and Administration. Deploy necessary manpower for smooth operation and maintenance of the system. Mobile ticketing and Information System and Depositing of Collected Money of Ticket Selling through Mobile Phone.

Beside this project, the organization has done lots of other project based on setting deadline and target.

Basically, we did find some of the important practice which can be categorize under plus minus Interesting technique. Based on, three important focus areas as supported by practitioners.

1) Project Management & Requirement Management
2) Coding Phase
3) Quality and Testing

V. ASSESSMENT FINDINGS

After studying the details of the story, we tried to convert the data in PMI-Plus minus Interesting format.

PMI stands for 'Plus/Minus/Interesting'. It is a valuable improvement to the 'weighing pros and cons' technique used for centuries.[10]

We tried to use this technique on a particular project to identify the best choice or practice that may refer to success in project. We discussed with a Chief Technical Officer, Project Manager, Quality Assurance Team Member based on Real life Project, which was estimated with their existing project and

skilled resource, but utilized resources and finish the projects within schedule. Using PMI technique and decide the key success factor. It is obvious that there were some plus, minus, interesting things for the project to find out the project management Positive practice or Negative practice and based on that to identify Best Practice in real life.

TABLE II
PMI FOCUS ON PROJECT MANAGEMENT AND REQUIREMENT MANAGEMENT

PMI- Plus, Minus, Interesting	PMI findings, Focus on Project Management and Requirement Management		
	Plus	Minus	Interesting
	Whatever the deadline given by customer was tried to meet without Estimation or expert judgment based on business value proportion for deployment	No record kept or evidence for justifications and no standard estimation was considered rather than assumption	Team cohesion and deadline meet by developer and team was very cohesive (+)
	Team took the accountability based on Real Life Experience and reusable concepts and monitor was target date	Project Monitoring was not recorded for seeing the effectiveness of team performance rather than project complete	Due to absence of evidence client has seen project done in due time rather than plan. But report was verbal and email (+)
	Risk Identification was continue from their previous project experience and shared in team meeting	Risk tracking was absent in terms of record as no record kept for future projects. People dependency was high	Project close on time with basic requirements as target date was the main focus (+)
	In table discussion they were trying to develop architecture , freeze the requirements, database design, etc.	To do this work sometime they have to stay late night , after office hour	Domain Knowledge retention Policy through Document was partially absent as the senior management are technical. They kept all the things with their memory (-)
	Basic and prioritize Requirements cover 1st and take	No standard prioritize method	Client reference creation through dynamic and light weight

PMI- Plus, Minus, Interesting	PMI findings, Focus on Project Management and Requirement Management		
	Plus	Minus	Interesting
	validation and Sign off done with little effort.	used for identify and record it	reliable software and support services (+)
Impacted Score range ± (1 to 3)	Team work as User and give manage support	As it is managed service no effort tracked	No resource swapping done as this manage service (+)
	Team Motivation for extra work and extra Mileage was great	Sr. Team member need to support the team as no previous record kept	Sr. Management working with the junior to encourage team as tech people (+)
	Client Handling through identify the client needs	Visualization or Requirements and Interface are not that much clear in initial stage	Brief client what to do and what not do through domain expert (+)
	Standardize platform, Previous database design used for the success of project	No Design document and or requirement freezing document kept in terms of standard template	Managing clients through discussion board (-)

TABLE III
PMI FOCUS ON CODING PHASE

PMI- Plus, Minus, Interesting	PMI findings, Focus on Coding Phase		
	Plus	Minus	Interesting
	Full ERD design completed before implementation start.	No record or description of ERD exist	ERD design was un change due to standardize of Database design (+)
Impacted Score range ± (1 to 3)	Follow peer programming guideline standards. (sometimes use .txt file for code documentation)	Change request by phone and no effort tracked for change request	
	Make dynamic component for re-use	Need to ensure same Team lead from beginning to end	No project management software or bug tracking tools used (-)
	Code change-management handled by the Team lead	No record kept for change management	

PMI- Plus, Minus, Interesting	PMI findings, Focus on Coding Phase		
	Plus	Minus	Interesting
	Software Reliability is considering about developer's own working experience. (sometimes refactoring their code)	Software Reliability issue didn't follow any formal standards	Developer takes some built in facilities from Oracle engine about Reliability issue. (-)
	Software Efficiency is considering about developer's own working experience	Software Efficiency issue didn't follow any formal standards	Developer takes some re usable features from their own previous architecture about Efficiency issue. (+)
	Software Security is considering about developer's own working experience. Module and user base access permission considered seriously	Software Security issue didn't follow any formal standards	Developer takes some re usable features from their own previous architecture about Security issue. (+)
	Software Maintainability is considering about developer's own working experience	Software Maintainability issue didn't follow any formal standards	Developer takes some re usable features from their own previous architecture about Maintainability issue. (+)
	Relationship among the development team is good	No Formal Skill development training recoded	

TABLE IV
PMI FOCUS ON QUALITY AND TESTING PHASE

PMI- Plus, Minus, Interesting	PMI findings, Focus on Quality and Testing Phase		
	Plus	Minus	Interesting
Impacted Score range ± (1 to 3)	Acceptance testing done for this project	But, requirement analysis record was not done formally, future team has to depend on senior resources due to lack of experience of analyst and end users Domain	

PMI- Plus, Minus, Interesting	PMI findings, Focus on Quality and Testing Phase		
	Plus	Minus	Interesting
		Knowledge	
	5 to 10% documents prepare to support maintenance and enhancement (ex. Flow chart, use case, requirement specification, UML design, database design, UI design etc.)	Basically project team is working as an user, no formal record was produced	
	Developer done unit testing	There was no standard documentation on it, to enhance it.	
	There is a senior team of the organization monitoring the software and development process and ensuring the compliance with standards and procedures for software and process	No record for self learning and shortly handover session for new team member	Senior Management sharing the domain knowledge (+)
	Bug tracking manages by developers own method. (Keeps track in their personal dairy).	There was version control or bug tracking system but not adequate	
	Follow their own process based on clients demand	The project deadline is too short to follow QA processes which are sometime impossible	Still meeting target date(+)
	During Discussion it was informally test	There were no independent testing team and testing plan	According to peer programming they are overcoming the problem of massive bug(+)

The findings of the PMI technique are illustrated in the results and discussion, keeping in mind the following limitations of the research works:

- As we have visited limited number of organizations for this Research and only 4 to 5 Companies we have visited. Hence, there would be chance of missing some important aspects

- Lesson Learn from this research yet to incorporate in our questionnaires and user story for the next publications

-Only SME local Organization selected but not categorized based on Practitioners and expert in terms of definitions based on Bangladeshi culture.

VI. OVER ALL SUMMARY ANALYSIS OF RESEARCH AND DISCUSSION

As we have planned and conducted a survey of small and medium software companies or house of Dhaka city in Bangladesh to know about their software process implementation and process improvement program using a set of questionnaires as a data gathering technique over a period of Five Months using likert scale initially but based on lesson learned we have converted into user story and findings through plus minus interesting technique. Due to our strict inclusion criteria, the number of relevant studies found was very small but the overall findings process was very comprehensive and it was performed by following the salient's guidelines according in [13], to the best of our knowledge. Similarly data extraction and synthesis phase is also performed as prescribed by the practitioners with proper validation and quality assurance. Main objective of the research was to investigate specific software Process Improvements models or techniques for small and medium software Bangladeshi companies.

The systematic review did not identify any specific Process Improvement model for small and medium software Bangladeshi companies; therefore there is a clear research gap on the assessment of typical software process Improvement model for small and medium software companies keeping in view the constraints and challenges. This can be achieved by extending some existing model [14] or by proposing one from scratch. The assessment or research also revealed the characteristics of some small and medium software companies and suggested that they have tight budget constraints, have tight deadlines and they have a short term strategy. Investigated measures of success for small and medium software companies include development team and client satisfaction, increase in productivity, compliance with standards and overall operational excellence. In our survey out of 4 companies, 2 companies respond to lack of management commitment. Management commitment to software process improvement also affects the morale and dedication of people who are working to advance the cause of better processes in the organization. When management objectives change with the wind and the staff devoted to facilitating process improvement is downsized, those affected may be embittered at having months or years of their technical careers sidetracked for nothing. Once burned in such a fashion, they may be reluctant to step forward the next time the organization is looking for people to enable change. However our findings indicate that large (approx.) 64 % of companies had a good understanding of the human factors associated with software process. Most companies involved developers in software process and understood the value of communicating to developers about process. Furthermore companies also seemed to understand the importance of management commitment to process centric practice and most seemed to be successfully demonstrating such commitment. Overall our findings show that developers were responding relatively positively to process simplifications and improvements and that developers were most positive about SPI when they received plenty of feedback on process improvement for the knowledge share, process dependent and most of the software companies showed their eagerness for achieving a ISO, ITIL, CMMI etc. as their primary goal of process improvement rather than as one mechanism to help achieve the organization's real business goals. Software process improvement energy may be focused on a race to the level N rating, when some energy should perhaps be devoted to other problem areas that can contribute quickly to the quality, productivity, people, and management issues facing the organization. Sometimes, a company is in such a rush to reach the next maturity level that the recently implemented process improvements have not yet become well established and habitual. In such cases, the organization might actually progress back to the previous maturity level, rather than continue to climb the maturity ladder as it is attempting to do. Such regression is a surefire way to demoralize practitioners who are eager to move steadily toward a superior software engineering culture.

It has been suggested from present study that such small software companies aiming at the next ISO, ITIL, CMM level, make sure their software process effort is aligned with corporate business and technical objectives. Perhaps, they will fail to invest such amount for compliance of the reference Model. Mesh the process improvement activities with any other improvement initiatives that are underway, such as ISO 9001 registration, CMMI level or with an established software development framework already in use. Recognize that advancing to the next CMM maturity level can take one to three years. It is not feasible to leap from an initial ad hoc development process to a super-sophisticated engineering environment in one fell swoop. Such company's goal is not to be able to proudly say that they are CMMI certified organizations. Goal is to develop improved software processes and more capable development engineers so that your company can prosper by offering higher quality products to your customers more efficiently than before. In a question regarding ISO/ CMMI's process maturity, there are 6 companies in Bangladesh having CMMI ML 3 and their representatives replied, that their company have years of experience in software development and they have developed their own process that matches with their culture. They do not bother about the costly CMM/CMMI process maturity and capability certification as they have long list of corporate clients, which includes many Government institutions, Asian Development Bank (ADB), local United Nations (UN) offices, multinational companies.[16]

Our Bangladeshi small software companies are only focusing on serving local software markets are not facing any problems regarding CMM/CMMI or other certification issues; however, that outside market focus will not be a factor for them because they have long time experience in this field. Gaining some levels in CMM/CMMI does not always mean that a software company would always produce high quality software within time and budget. In this survey, most of small software companies agreed that the cost of manpower is not

very high in Bangladesh, and a typical software company might be spending about 1/3rd of its expenditure on manpower. This makes dedicating a team for SPI for long term benefits cheaper. A Survey and case study on Bangladesh by KPMG[6] indicated that most companies had dedicated manpower for process improvement with less cost equal to about 1-2% of their engineering manpower [8] and the following diagram shows as the scale of operations increases, Bangladesh's competitive cost advantage gets further enhanced. The graphic below indicates the cost arbitrage Bangladesh offers for a small software development center with 25 people. [6], [7], [9]
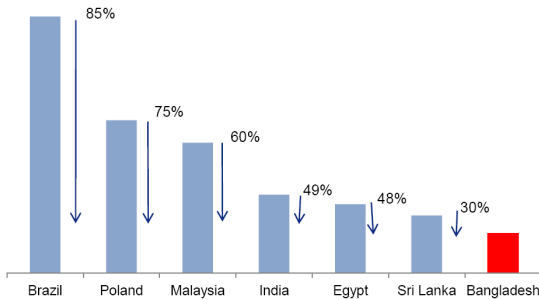

Fig. 3 Showing global positioning of Bangladesh

Hence, lots of Small and Medium Software house will think for investment on CMMI or other process certifications. Our effort highlights on those industry and help to initiate to implement practice in their daily operations and practice.

In our research, we have selected PMI technique instead of Questionnaires, as we have found that, the PMI is more convenient to find out the real scenario and fact. Based on Experience practitioners and previous study, we did find it's more useful and have some minimum standard to identify the Salient Suggestions.

After doing the PMI-Plus, Minus, Interesting approach, Discussion and Brain Storming sessions, Our Opinion and Minimum suggestions for Practitioners and Organization sponsors are highlighted and hopefully it will be the minimum practice that helps project in a success.

A. Summary Result of Case study

The PMI findings showing, the project selected for case study was a successful project in terms of deadline meets for the customers and completion with satisfactory level, due to following reason:

1) In Table discussion they are involving all project stakeholders and finalize it within that discussion. Validations of requirements are visualized through drawing and chart.
2) Project assignment was based on target date and time rather than deliverables
3) Extra work to meet the target
4) Senior Management commitment and involvement in each phase
5) Good and reusable Architecture for all projects
6) Same and common platform for each and every project

giving confident to team member
7) Client centric requirements basically focusing for lower level user

B. Weakness that hamper project or cause for risk

1) Facing client requirements , which are mostly impossible
2) Client doesn't understand their requirements, but no arrangement for formal training on standard domain practice
3) Modified Life cycle used but not recorded
4) No knowledge transfer through documents
5) Involvement of Sr. Management are huge due to unstructured practice or team building facility
6) Manage most of the requirements in Support period
7) Assessment of Team skill was not structured though retention policy is high
8) Teams are not that much communicative and documentation oriented
9) Manage crisis in different way and not recorded for future leader
10) Transparency in knowledge sharing was not validated, i.e. whether its cover all or not, as no checklist maintained.
11) Guideline was people dependent rather than system

VII. CONCLUSION AND RESULT

This case research output as mentioned as views of the root cause and key factor to complete software developments successfully are as follows:

1) Successful discussion in terms of Reused previous Architecture and Clarifications and re-Clarifications during the meeting for Freezing Requirements
2) Milestone set based on client deadline and track to complete the work involving senior and top management in field work
3) Tracked what to do and what not do to meet the mile stone through discussion

In Parallel, this research converting the story in positive and negative practice beside the "interesting" approach use the PMI technique. This may help Small and medium size organizations to follow and get a feedback on it and can compare, which are the minimum best practice that can reduce project risk, increase project success in terms of Time, Money, People. Though the analysis of the project practice based on Bangladesh and project practice utilized elsewhere has shown very little difference, it is understand that the outcome of the analysis is not so similar. A study based on plus minus Interesting –PMI was conducted and we found out that our Project Manager, Analyst, Architect, software engineer and Testers are capable enough to self-estimate themselves, but with a little weakness and unstructured practice.

Therefore, in order to prepare themselves to a successful and get an improved quality project, a few more measures need to analyze. The PMI and strengths of those measures need to assess continuously to do a better project and to achieve a quality outcome.

As an optimization of minimum process for organization, it may consolidate and focus on better requirements management only, Monitoring task at micro level, Risk identifications, create some formal document and review on it to reduce future risk, use simplified work breakdown structure and tracked down. Different small and medium software companies of Bangladeshi local market appreciate with an *optimized* approach for process improvement rather than unstructured approach to manage project. In order to institutionalize the *optimize practice* in Small and Medium, the project team members and management need to have *influence* on it. More focus on devising a better and practical approach methodology will enable practitioners to learn and practice more but within the stipulated period of project deadline.

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