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A Progressive Software Project Management Maturity Model (PSPM³) for GCC countries

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Abstract: Software project management is a field of paramount importance as billions of dollars are lost each year due to project failure. It plays a vital role in any IT company. Many universal project management methodologies and procedures are in place. It has been noted that there are some developing countries where traditional software project management aspects are irrelevant. The scope of this research is an instance of the Gulf Cooperation Council (GCC) countries. A customized software project management maturity model has been proposed to provide a complete solution for all the problems faced by the IT projects in these countries. A couple of surveys conducted in GCC evaluate the need for an indigenous software project management methodology as well as lead to finalization of the key process areas (KPAs) that need to be incorporated in the proposed project management model (PSPM³). PSPM³ is an outcome of the response received by software professionals and project managers. PSPM³ provides us with a basic, flexible and significant approach for the management of software projects across GCC. In particular, PSPM³ emphasizes on the key aspects of economic, cultural, social, legal, political impacts those are of huge significance while rating the success factors for the software projects. The model is simple, robust and easy to follow.

Keywords: Software Project Management; Maturity Model; Key Process Areas, Gulf Cooperation Council, PSPM³- Progressive Software Project Management Maturity Model

I. Introduction

The concept of projects is not new. History has proven records that the projects like The Egyptian Pyramids, The Great Wall of China are very successful deliverables showcasing the highest level of intricacy and meticulous project management methodology. According to Jason (2003), "A Project management methodology can also be defined as a process that documents a series of steps and procedures to bring about the successful completion of a project [1]". Many universal project management methodologies and procedures are in place. The concepts of project management put forward by western world are not universally applicable.

It has been noted that there is another part of the globe where traditional software project management aspects are irrelevant. One such instance is the Gulf Cooperation Council (GCC). GCC is a political and economic union of the Arab states bordering the Persian Gulf and located on or near the Arabian Peninsula, namely Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates [2].

The software industry in GCC is growing rapidly. Many foreign software companies like Infosys and Accenture have opened branches in different GCC countries. These companies have expertise in software project development and management. Common project management methodologies like Capability Maturity Model Integration (CMMI), Project Management Body of Knowledge (PMBOK®), Projects integrating Sustainable Methods (PRiSM), PRINCE 2® have not been widely accepted by GCC software development companies. In fact, some of these companies lack in following any of the formal project management methodologies.

The solution to all the problems mentioned above is to develop a customized software project management methodology / model that can cater the challenges faced by the software projects in GCC countries. The proposed research is significant in terms of its usability in the project management in these countries. The successful implementation of the proposed model can help the software project success rate to improve tremendously. This can work as a catalyst to improve the country's economy, hence adding value to the overall world economy.

II. Traditional project management methodologies/models/standards

The evidence of project management dates back to the Egyptian Pyramids (2500 B.C.) and [3] Great Wall of China (221 - 206 B.C.). The software industry saw a major boom in 1980. The various existing project management methodologies are explained below:

- **PMBOK** is a simple process model for project management. It takes care of the procurement management aspects of the project. It also identifies the need for human resource management and acquisition of team members with adequate soft skills [6]. However, PMBOK does not cater the features of configuration management and change control.

- **Euro method** focuses majorly at the contractual level of the project management. It provides a realistic approach towards decision making. However, the voluminous size of the documentation is a pitfall. Also, the name itself discourages the companies outside the European Countries to use it. The name in itself sounds that it has been developed keeping in mind the European standards of project management [7]. Due to this reason, the name has been changed to Information Services Procurement Library.
- **BS6079:1996** guidelines have been developed to suffice the requirements of small to medium sized companies. Finance Management and control has been the focal point under these guidelines [8]. However, it is intended to help the engineering companies in general rather than the IT companies in particular.
- **ISO 12207** is an international standard for software lifecycle processes, their development and maintenance. The standard constitutes of 23 Processes, 95 Activities, 325 Tasks and 224 Outcomes [9]. However, it does not specify how to perform the activities and the tasks related to the processes. Moreover, the sheer size of the documentation in itself is a drawback. This standard is useful in the larger arenas where project management activities play a vital role during the overall costing of the project. For smaller projects, to implement this standard in itself is a tedious task.

III. Evaluation of Software Project Management Maturity in GCC countries

A software project management maturity model is a good perspective from which one can determine the process framework. If an organization adopts the framework with conviction and implements it appropriately, then the organization can achieve highest level of maturity in no time. It has been proven that there is a direct connection between software project management maturity and the success/ failure of an organization [10]. Also, a relation between maturity and success was proven by Sonnekus and Labuschagne (2004). That is why, it is advisable to maintain the maturity level of an organization and strive for the improvement of the same as that will directly impact the success rate of that sector.

An exercise was carried out by Sonnekus and Labuschagne (2004) in the South Africa [10] by distributing questionnaires to IT companies to evaluate their project management maturity level. Similar survey has been carried out in GCC countries to understand the level of project management maturity.

A. Research Methodology

Data collection was carried out during 2014 by issuing questionnaires to companies involved in software development in GCC. The companies were selected as per list of companies registered in GCC and published on the Website of directory of gulf network [11].

B. Analysis of Survey Data

The following twelve knowledge areas were framed for software development projects:

- Integration management.
- Scope management.
- Time management.
- Cost management.
- Quality management.
- Human resource management.
- Communications management.
- Risk management.
- Procurement management.
- Configuration management.
- Defect Prevention
- Security management.

The above knowledge areas were mapped onto five maturity levels based on the trend in most of the globally recognized project management maturity models.

The description of all the maturity levels was provided in the first section of the questionnaire and the respondents were requested to judge the overall maturity of the organizations based on that. An average value was calculated to acquire the maturity level of GCC software development organizations. Also, the maturity level of each knowledge area was calculated individually to analyse the strong and weak areas in the field of software development. An average value was computed from the results. It was observed that there was a minor overestimation by companies/individuals in the assessment of maturity levels.

C. Maturity Level by Process Groups

Each knowledge area was subdivided into a number of processes and was mapped onto the basic five process groups:

- Initiating
- Planning
- Executing

- Controlling
- Closing

The data so collected were further analysed and the results are summarized below:

Table I Average maturity levels by process groups

Knowledge areas and processes	Initiating	Planning	Executing	Controlling	Closing
Integration Management					
Plan Development		2.85			
Plan Execution			2.75		
Integrated Change Control				2.13	
Scope Management					
Initiation	3.29				
Scope Planning		3.29			
Scope Definition		2.96			
Scope Verification				2.79	
Scope Change Control				2.21	
Time Management					
Activity Definition		3.13			
Activity Sequencing		2.75			
Activity Duration Estimating		2.96			
Schedule Development		2.58			
Schedule Control				2.06	
Cost Management					
Resource Planning		3.48			
Cost Estimating		3.46			
Cost Budgeting		3.29			
Cost Control				2.54	
Quality Management					
Quality Planning		2.92			
Quality Assurance			2.46		
Quality Control				2.50	
Human Resource Management					
Organizational Planning		3.38			
Staff Acquisition		3.00			
Team Development			2.88		
Communications Management					
Communications Planning		3.33			
Information Distribution			3.13		
Performance Reporting				3.00	
Administrative Closure					2.96
Risk Management					
Risk Identification		2.46			
Risk Quantification			2.42		
Risk Response Development			1.75		
Risk Response Control				1.79	
Procurement Management					
Procurement Planning		3.17			
Solicitation Planning		2.88			
Solicitation			3.13		
Source Selection			2.63		
Contract Administration				3.04	
Contract Closeout					2.54
Configuration Management					
Configuration Planning		2.67			
Quantitative Configuration Analysis			2.50		
Configuration Control				2.13	
Project Defect Prevention					
Plan Defect Prevention		2.46			
Causal Analysis			1.92		
Defect Elimination and Control				1.79	
Project Security Management					
Plan Security Management		2.46			
Security Response Development			1.96		
Security Response Control				1.67	
Average for each process group	3.29	2.97	2.50	2.30	2.75

Almost all the process groups attained an average maturity level between 2 and 3 (last row of table I), other than initiation process group that achieved maturity level closer to initial range of 3. Therefore, it can be stated that GCC software development companies emphasize the most on the Initiation phase, which involves formal

announcement of the project, nomination of the project manager and kick off for the project.

The survey result show that the GCC software development companies deal with factors like culture, politics, gender, climate, legal and economy at maturity level 2. Progress to the next level (Level 3) would certainly be desirable.

D. Ladder towards the development of PSPM³

It was identified that the proposed maturity model should be framed with a maximum of three (1 to 3) maturity levels. A set of continuous improvement process areas were also identified. All the key process areas were categorized into various maturity levels.

Table II Classification of Key Process Areas for PSPM³

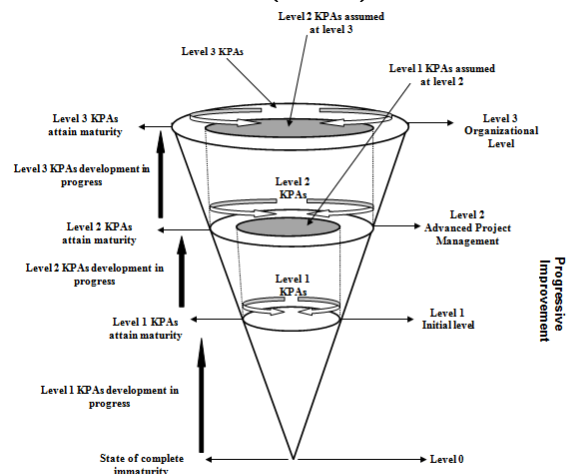
	Respondents classification of KPAs at the different levels				Total no of respondents	Percentage response
	Level 1	Level 2	Level 3	Progressive		
Integration Management	3	2	4	5	1	100%
Scope Management	7	1	1	5	1	100%
Time Management	8	2	0	4	1	100%
Cost Management	9	2	0	3	1	100%
Quality Management	4	6	2	1	1	93%
Human resource Management	3	2	2	7	1	100%
Communication Management	3	5	2	3	1	93%
Risk Management	3	6	2	3	1	100%
Procurement Management	2	3	7	1	1	93%
Configuration Management	3	4	6	1	1	100%
Defect Prevention	2	2	6	4	1	100%
Security Management	4	3	1	6	1	100%
Environmental Management	11 out of 14 respondents mentioned that a KPA is essential that can take care of economic, cultural, political aspects of project management.					79%

IV. Progressive Software Project Management Maturity Model (PSPM³)– The Model
PSPM³- the name in itself suggests that the proposed model strives to progress continuously to attain the project management maturity. Based on the combined survey and interviews conducted by Koul et al, and considering the preference of the companies in developing countries like GCC, it seems to be appropriate to have a maturity model with three levels.

The conceptual framework of the proposed model adopts the structure of a cone. At the apex of the cone, lies the level 0. This is the initial level where the organizations are considered to be immature with no processes or key process areas in place. Software development is carried out in ad-hoc manner at this level. The level 1, level 2 and level 3 KPAs are represented as sectors on the concentric base of the cone structure.

The progressive key process area group spans over all the maturity levels of PSPM³. Since, many key process areas are identified that have a relevance at all the three maturity levels, they are placed together and represented as progressive key process area group.

Fig I Conceptual Representation of Progressive Software Project Management Maturity Model (PSPM³)



V. Conclusion

The main focus of this chapter was to find out the problems faced by the GCC nations in the field of information technology and also various obstacles that come across in delivering successful software solutions. GCC nations are steadily rising up global ICT rankings that indicate how well each country's economy is positioned to grow and benefit from the oncoming wave of the knowledge economy, 'Smart City' initiatives and tech innovations. Therefore, software project management is believed to play a key role in the development of the software deliverables. A detailed research done earlier has confirmed time and again that the traditional software project management maturity models that exist are not suitable for developing countries in general [4]. This was reconfirmed by the survey that was conducted by Koul et al (2014). The response of the survey affirmed that there is a need to develop a native software project management maturity model for GCC countries. PSPM³ is an outcome of the response received by software professionals and project managers.

PSPM³ provides us with a basic, flexible and significant approach for the management of software projects across GCC. It demonstrates a progressive improvement structure that is required to result in successful IT projects. The strengths and weaknesses of software projects have been kept in mind while framing the various KPAs. It consists of a total of 9 KPAs at three different levels and a set of progressive key process area group. In particular, PSPM³ emphasizes on the key aspects of economic, cultural, social, legal, political impacts that are of huge significance while rating the success factors for the software projects. The model is simple, robust and easy to follow.

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