

**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY****A FRAMEWORK FOR RISK ASSESSMENT IN SOFTWARE PROJECT
MANAGEMENT IN GCC COUNTRIES****Dr. Akрати Koul**

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DOI: 10.5281/zenodo.1202145

ABSTRACT

The past decade has been marked by rapid growth in the use of project management. Leading organizations across sectors and geographic borders have been steadily embracing project management as a way to control spending and improve project results. Software Project Management covers the total life cycle process involved in creating and managing a software system. It has been noticed that the international models are not of much significance to other parts of the planet like Middle East, in particular GCC countries. Hence the lack of customized project management and tools affects the quality of the end product and results to low client satisfaction. This leads to increase in the failure rate of the software projects in these countries. The software project management techniques / tools and metrics play an essential role to automate and accelerate the achievement of various project management elements applicable in planning, monitoring and controlling the projects.

KEYWORDS: Software Project Management, Risk Management, Key Process Areas. Risk Control**I. INTRODUCTION**

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. Project Management principles; in general, have been developed under the assumption of social, economic, cultural and political rationality. 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 region is continuing its economic reform program, focusing to attract domestic, regional and foreign private sector investment into oil & gas, power generation, telecommunications, real-estate and information technology. 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), Projects in Controlled Environment (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.

II. PROBLEMS FACED BY SOFTWARE COMPANIES IN GCC

Subsequent paragraph mentions some of the common problems faced by the GCC software development companies for using the popular project management methodologies:

1. GCC software companies often face the problem of inadequate skilled staff. The local population earns their living either from business or from Oil and Gas industry. The government is keen to bring lot of development in the IT sector. Many tie ups with International IT companies are constantly ongoing and

professionals have been hired who can bring more IT culture in these countries. There is a scarcity of local employees who have sufficient skill set required to take up an IT project. This averts the development of voluminous documentation which is required to implement most of the traditional project management methodologies.

2. The economic rationalities are assumed in the common project management models/standards.
3. Cultural, legal, political and social deviations occur across nations but these are often overlooked in the popular project management models.
4. GCC software companies face the obstacle of lack of sufficient funds. Extensive training, consultancy is required to adapt any of the project management methodologies/ standards.
5. Adopting any of the standard project management methodologies with insufficient staff may incur a lot of pressure on the software development staff in terms of project deadlines, cost, and effort.
6. 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.

The Standish Group Chaos Report shows the trend results for the year 2011 till 2015 in which very few IT projects are successful, however majority of the projects have either failed or are challenged due to many loopholes such as cost overrun, time management, effort over run, poor resource management, work pressure imposed due to project deadlines and so on [3].

Figure:

MODERN RESOLUTION FOR ALL PROJECTS					
	2011	2012	2013	2014	2015
SUCCESSFUL	29%	27%	31%	28%	29%
CHALLENGED	49%	56%	50%	55%	52%
FAILED	22%	17%	19%	17%	19%

The Modern Resolution (OnTime, OnBudget, with a satisfactory result) of all software projects from FY2011-2015 within the new CHAOS database. Please note that for the rest of this report CHAOS Resolution will refer to the Modern Resolution definition not the Traditional Resolution definition.

Fig 1: The Standish Chaos Report 2016

III. CURRENT STATUS OF PROJECT MANAGEMENT IN GCC

Project Management has developed as a profession in its own right since the last decade [4]. This development is illustrated by the establishment of Project Management Institute (PMI) in 1969. PMI has specified set standards for project management in the form of PMBOK Guide in 2000. The software project management has spread its wings in many nations all across the world. In Australia, Australian Institute of Project Management (AIPM) was formed in 1976. It is a peak body of Project Management in Australia [5]. United Kingdom has established a government agency, the Office of Government Commerce (OGC) to be a support for various organizations “to achieve efficiency, value for money in commercial activities and improved success in the delivery of programs and projects” [6]. However, the project management methods used in developed countries are not of much significance to other parts of the planet like Middle East, in particular GCC countries.

In the current scenario, the success rate of IT projects in GCC countries is very low. Since the IT world is not completely developed in these countries, the IT projects are small in terms of cost, productivity and effort. That is

[Koul* *et al.*, 7(3): March, 2018]
ICTM Value: 3.00

why; the IT companies here do not follow any particular Project management model (e.g. PMBOK, Prince2, CMM, CMMI) to the core. The project manager finds that the international models are too extensive and exhaustive for the IT projects that they work on here.

A survey was carried out in the GCC countries to find out the current status of the software project management methods being used and whether there is a need of a customized, uniform, benchmark solution for project management related activities. Many GCC countries like Oman, UAE, Saudi Arabia and Qatar participated in the survey. The data analysis shows that 53 % responses were from Oman, 27% from UAE, 16% from Qatar and around 4% from Saudi Arabia since there are very few IT companies in Saudi Arabia. Also, it was noticed that the majority (50%) of the IT organizations across GCC are local private companies, followed by joint venture of local and foreign companies (23.3%). However, the results show only 6.7% foreign IT companies participated in the survey since very few multinational organizations exist in the Middle East. Hence, this further reassures the essence of having a native software project management maturity model.

Based on the data analysis results, it was noticed that around 60% organizations across GCC are ISO certified, 34% are in process of getting a certification. However, majority of respondents (60%) did not receive any training on software project management. It was further noticed that around 37% companies use Gantt chart as an application / program for software project management, 27% use Work breakdown Structure (WBS) and approximately 23% use Microsoft Project Management. These are basic techniques that can primarily measure effort and schedule. They don't track the other important aspects of project management such as risk, quality, defects, security and overall health of the project.

70% respondents affirm that around 50% of the projects in GCC software organizations suffer from budget over run, poor planning, failure to meet deadlines, lack of customer satisfaction, and lack of skilled human resource. The main reason for these weaknesses can be traced back to poor software project management approach across GCC.

It was noticed that 25.5% of participants are currently using CMM and 20% are using CMMI and PMBoK as project management methodology in their organizations. Approximately 83% of the respondents agree that Project Management Methodologies developed by Western countries (e.g. CMM, PMBOK, CMMI) are not appropriate for GCC. Further to this, around 94% of the participants believe that some form of original / native project management methodology should prevail in GCC countries.

IV. EXISTING KEY PROCESS AREAS

The existing project management techniques are more focused on planning (20.3%) followed by Quality Management (16.9%), Cost Management and Risk Management (12.7%). However, communication management, configuration management, human resource management aspects of software project management is given less importance. This is a weak link in the field of Information Technology as communication gap can convert a very successful project into a failure. Also, good human resource planning is essential as there is a scarcity of skilled resources in the field of software development, especially in developing countries like GCC.

Table 1: Existing project management methodology in gcc

Project Management Methodology	Responses		Percent of Cases
	N	Percent	
PMBOK	11	20.0%	36.7%
BS6079	4	7.3%	13.3%
PRINCE2	10	18.2%	33.3%
CMM	14	25.5%	46.7%
ISO12207	5	9.1%	16.7%
CMMI	11	20.0%	36.7%
Total	55	100.0%	183.3%

43% respondents strongly agree that the major factors that contribute to generate a deviation in overall project achievement is the lack of using a formal methodology, 70% agree that it is due to unsatisfactory project management methodology being used, 40% agree that the reason is poor project planning, 43% blame it on inadequate or improper communication between project team and customer, around 47% believe that it is due to lack of good project team, 63% due to lack of support from various stakeholders, 57% due to failure of project team to understand user needs.

Table 2: Existing key process areas

Key Process Areas	Responses		Percent of Cases
	N	Percent	
Risk Management	15	12.7%	50.0%
Quality Management	20	16.9%	66.7%
Planning	24	20.3%	80.0%
Human Resource Management	11	9.3%	36.7%
Procurement Management	14	11.9%	46.7%
Communication Management	8	6.8%	26.7%
Cost Management	15	12.7%	50.0%
Configuration Management	9	7.6%	30.0%
None	2	1.7%	6.7%
Total	118	100.0%	393.3%

Also, these models are inadequate in terms of catering the economic, cultural, social rationalities that exist in these countries. Past studies (Murithi and Crawford, 2003) [7] have revealed that the concepts of project management are not universally pertinent since all the nations have different ability to cope with economic situation. There may be a deprivation in the quality of the software deliverable or lack of highly skilled human resources due to the bad economic condition of a nation. Turner (1993) [8] also explained that software project management techniques of western origin are not straightforward procedures that can be learnt and implemented due to cross-cultural problems and human behavior. Hence the lack of customized project management methodology affects the quality of the end product and results to low client satisfaction. This leads to growth in the failure rate of the software projects in these countries.

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 present 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.

This paper is focusing on the Risk Management activities of a software project as a large number of cases have been reported based on the survey conducted in GCC countries where risk management KPA plays a vital role and has a huge impact on the cost, effort, schedule and quality of the software.

V. Risk ASSESMENT and CONTROL

A risk can be identified as a realistic approximation and probability of occurrence of a harmful effect. The risk identified for the project indicate the possible events that can hinder the project in meetings its goal. The risk management activities are essential in assessment of the project risks and finding the various mitigation strategies to control the harmful impact of the risks in the project. The actual risks that are encountered during project execution and their impact on schedule/effort need to be measured. The mitigation strategies shall be recorded and monitored throughout the Project life cycle. Major risks with high impact are shared/escalated to senior management periodically.

The approach towards Risk management activities such as risk assessment and risk control shall be carried out. The risks shall be analyzed and the priority of the risks shall be calculated. A Risk Severity matrix shall be generated based on the Impact and the Likelihood of the occurrence of the risk. Based on the Risk Severity matrix, the risks shall be categorized as Major, Medium and Minor.

5.1 Risk Management

The risk management activities carried out at various phases of the project are divided into two categories:

1. Risk Assessment
2. Risk control

5.2 Risk Assessment

Risk Assessment consist of two components

- Risk identification
- Risk analysis & prioritization

Risk identification focuses on enumerating possible risks to projects. The basic activity is to try to envision all situations that might go wrong in the project execution

Risk analysis and prioritization activity considers all the aspects of the risks and prioritizes them for purpose of risk management.

5.2.1 Risk Identification

Risks from various sources are identified under different categories listed below:

- Business Risk
- Technology Risk
- Process Risk
- Resource Risk
- Customer Risk
- Schedule Risk
- Others

These risks are identified along with the category to which that belongs.

Some examples of Risks under different categories are-

Table 3: Categorization of Risk

Category of Risk	Classification of Risk
Business Risk	Competitor may introduce the product early Loss of Market opportunities if project is delayed
Technology Risk	Technology is new and not proven Project is complex

Process Risk	Process needs to be defined for the project/Lack of process compliance
Resource Risk	Required skills not available. Manpower attrition
Customer Risk	Delay in customer feedback, Changes to requirements

5.2.2 Risk Analysis and Prioritization

The consequences of different risks may be different. While identifying the strategies of for risk management, it is beneficial to analyze and prioritize the risk, so that most appropriate strategy is identified and management energies can be focused on high priority risk. Risk analysis comprises of:

Risk Parameters

Risk parameters are used for evaluation of risks. Following are the parameters based on which a risk can be evaluated:

- Likelihood
- Impact
- Threshold to trigger management activities

Based on the combination of risk probability of occurrence and level of impact the risk priority is determined. An example for identification of the risk priority is given below.

Table 4: Risk Severity Matrix

Risk Likelihood	Risk Impact			
	Low	Medium	High	Very High
Low	Negligible	Negligible	Marginal	Critical
Medium	Negligible	Marginal	Critical	Catastrophic
High	Marginal	Critical	Catastrophic	Catastrophic
Very High	Critical	Critical	Catastrophic	Catastrophic

Risk Likelihood

This is the likelihood of a particular risk materializing. The risk likelihood may be very low, low, medium, high and very high.

Risk Impact

Risk component/impact is the various criteria, which can be impacted by the materialization of a risk and this may also be very low, low, medium, high and very high. The following are the components identified:

Cost/Effort

Quality of product (defects, performance)

Schedule

Based on the combination of risk likelihood of occurrence and level of impact the risk severity matrix is generated.

An example for identification of the risk priority is given below:

Risk Threshold

Risk Thresholds have been identified for the Risk components. Whenever these Thresholds are crossed, it will be escalated as per following criteria or as defined in RMP (Risk Management Plan).

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5.3 Risk Control

Once the risks are identified and Prioritized, it becomes very clear which risks the project should handle in order of priority.

Risk control activities consist of

- Risk Management Planning
- Risk monitoring and tracking

Risk management planning consist of identifying strategies, needed to minimize the risk consequences.

Risk monitoring and tracking consists of periodic review of risks and revision to the risk management plan.

5.3.1 Risk Management Planning

For each risk, based on the priority PM or nominated member identifies Mitigation strategy and Risk Handling Strategy

Mitigation Strategy: identifies the action to be taken before the risk occurs to minimize the consequences

Risk handling Strategy: (Contingency Plan) identifies the action to be taken after the risk occurs, in spite of implementing the mitigation strategy. Some of the potential risks along with the possible mitigation plan and risk handling plan (Based on Dr. Deming and Juran principles). [9] [10].

5.3.2 Risk Monitoring and Tracking

The Key to the risk action planning to consider the further consequences of a decision made. The risk management plan is to be maintained as a part of the project plan and needs to be re-visited whenever changes occur in the Project Management Plan (PMP).

For monitoring the risks following points need to be adhered:

Project shall be monitored for the risk on weekly basis by revised RMP.

The identified risk and mitigation plan to be discussed in project status meetings. If required, transparency may be maintained with the customer so as to obtain support from the customer in monitoring the project for possible risks. Potential risks and the risk mitigation plan shall be reviewed when necessary apart from the project review meeting/ progress review meetings. Open communication in team shall be cultivated to obtain the first hand information on potential risks.

Whenever the project plan is modified, the risk shall be re-assessed. Whenever, risk occurs in the project, the project plan/or the schedule shall be revised if necessary. Similarly, when the new risks are identified during project execution the Risk Management Plan (RMP) shall be revisited.

All the critical and catastrophic or equivalent risk need to be brought in the notice of senior management. Situation may arise in the project execution, when the occurrence of the risks becomes inevitable. The project team needs to be prepared to handle such risks as and when they happen, if essential, the team may be trained to face the risks to have a minimum impact on the execution of the project and quality of the work products in the course of events.

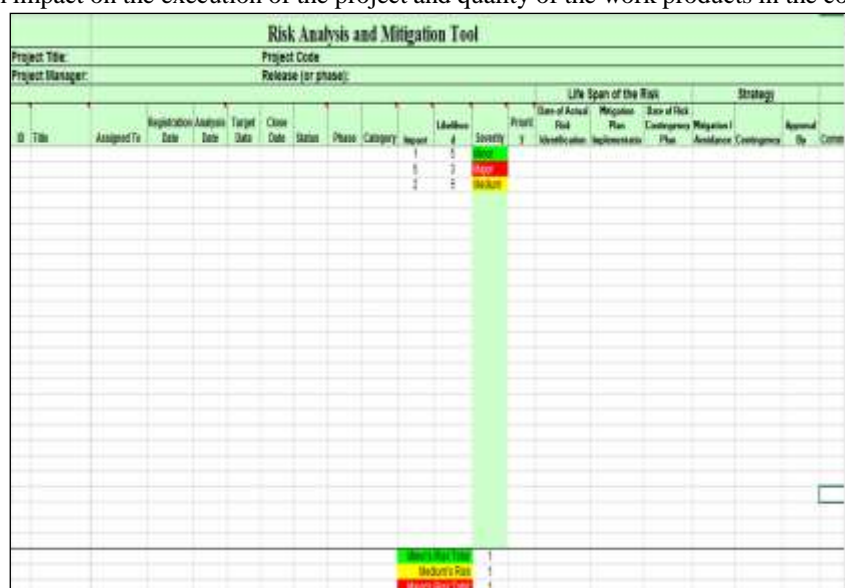


Fig 2 (a): Risk Analysis and Mitigation Tool

Impact	Likelihood	Severity	Risk Severity Matrix							
1	1	11 Minor								
1	2	12 Minor								
1	3	13 Minor								
1	4	14 Minor								
1	5	15 Minor								
2	1	21 Minor								
2	2	22 Minor								
2	3	23 Minor								
2	4	24 Medium								
2	5	25 Medium								
3	1	31 Minor								
3	2	32 Medium								
3	3	33 Medium								
3	4	34 Medium								
3	5	35 Medium								
4	1	41 Medium								
4	2	42 Medium								
4	3	43 Medium								
4	4	44 Major								
4	5	45 Major								
5	1	51 Medium								
5	2	52 Major								
5	3	53 Major								
5	4	54 Major								
5	5	55 Major								

Likelihood	Very High 5	High 4	Medium 3	Low 2	Very Low 1
Very High 5	Minor	Medium	Medium	Major	Major
High 4	Minor	Medium	Medium	Major	Major
Medium 3	Minor	Minor	Medium	Medium	Major
Low 2	Minor	Minor	Medium	Medium	Major
Very Low 1	Minor	Minor	Minor	Medium	Medium

	1	2	3	4	5
Very Low					
Low					
Medium					
High					
Very High					

Impact

Fig 2 (b): Risk Severity Matrix Calculation

VI. CONCLUSION

The risk analysis and mitigation carries out many activities that can be broadly divided into two categories:

- Risk Assessment
- Risk control

All the above mentioned applications were designed and developed using VBA (Visual Basic for Applications).

VBA was chosen as it is extensible, scalable, supports macros which play a key role for formulas and calculations. The user interface used was Microsoft Excel. VBA is compatible when managed with Microsoft Excel and SPSS. All the changes in the coding are reflected consequently in the Excel format. It is user friendly and simplistic. No special training is required for the project manager or the team members to work with excel based tools and techniques. Since, there is a constraint of time during project development in GCC countries. That's why, a platform was chosen where the project manager or the team does not have to invest additional time to learn how to work with these software project management based solutions.

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CITE AN ARTICLE

Koul, A. A FRAMEWORK FOR RISK ASSESSMENT IN SOFTWARE PROJECT MANAGEMENT IN GCC COUNTRIES. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY*, 7(3), 563-571.