Project Management Challenges in Software Development

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Abstract

Challenges are inevitable. In a global market, opportunities are clubbed with challenges. Business sustainability is therefore depends on how effectively the businesses convert challenges into opportunities. Quality Management System standards like ISO, CMMi, PSP/TSP etc enables the software companies to adopt more matured approach to tackle and manage challenges. This article covers the most common challenges in software project management and how it has been addressed in a software development projects. This study revealed that software companies adopt a systematic way to identify and handle different challenges by clearly articulating the details in documents and have procedures to make those details aware to the respective stakeholders.

Introduction

Challenges are common in human life. We are facing challenges in day-to-day activities. The dimension and impact of challenges tomorrow may be different from today. In the global market, organizations need matured processes to identify and solve challenges to sustain themselves.

Cambridge online dictionary defines Challenge as "a job, duty, or situation that is difficult because you must use a lot of effort, determination, and skill in order to be successful" [1]. It emphasizes the extra effort, determination and skills one requires to overcome the challenge.

This article covers the most common challenges in software development and how it has been addressed.

Software Project Management

Software Project Management is a sequence of managerial activities in software project development that results software products. It is the application of knowledge, skills, tools and techniques to project activities in order to meet or, exceed stakeholders' needs and expectations within time and budget. It involves planning, estimation and scheduling, deployment of resources, defining roles and responsibilities, defining communication paths, negotiation etc.

Project Management Challenges

During the course of project execution, managers face lot of challenges. They adopt industrial best practices to identify, mitigate and plan contingencies. Following sections depict common challenges in Software Development and how it has been managed.

Unclear Goal: Unclear Goals means the goal is unrealistic in scope or may not be defined. Some cases the goal might be defined but team members are not aware of the merits of the goal. It results lack of focus to achieve the goal. Monitoring or controlling activities are not been practiced to evaluate process capabilities for achieve the goal.

This has been addressed by documenting the goal in the Project Plan (table-1). The details of specific actions to be carried out to meet the stated goals are also documented. The merit and the scope of the goals will be discussed in the project kickoff meetings. Periodic tracking has been done to ensure that the process is capable of meeting the goals.

Statistical tools have been used to monitor whether the process followed for achieving the goal is stable and capable (figure-1). If any variation with respect to the plan is noticed, then causal analysis will be done to identify the root cause and take corrective actions.

Undefined Roles and Responsibilities: In this case Roles and Responsibilities are not defined. Naturally team members work in their own way. Such chaotic situations end-up in unpredictable results. Team member never get chance to improve their skills due to absence of reviews and feedback. Such unmanaged process results inefficiency in execution and produce unpredictable results.

Table-1
Defining the Goal in Project Plan

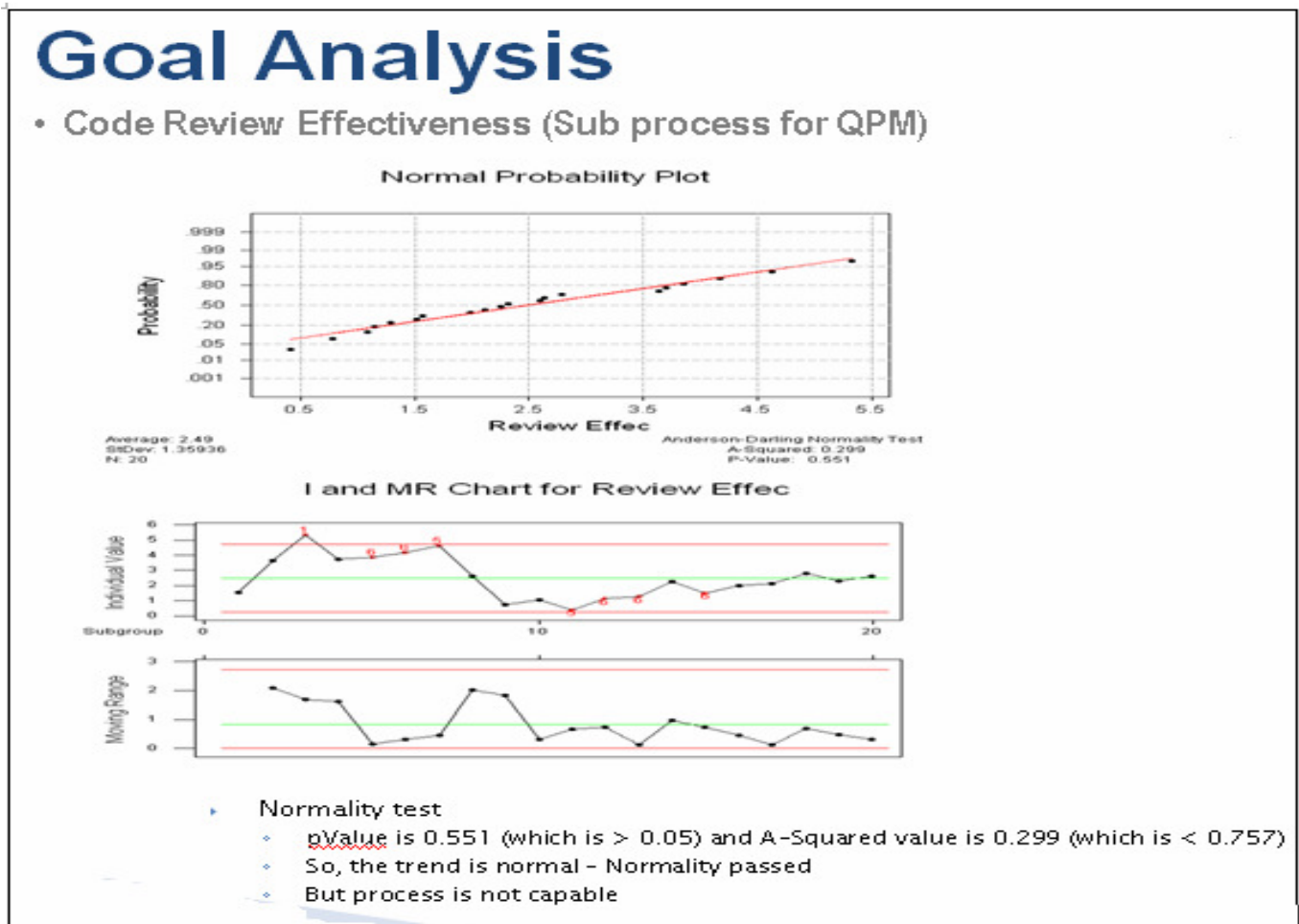| Quantified goal	Criteria for selecting the goal	Actions to achieve goals	Methods of measurement	Points of measurement	Action taken if quantified goal is not met
Product Goals					
Ensure module stability – ZERO basic functionality defects in modules	To meet customer expectation	Validation of module's basic functionalities (user scenarios) on fortnightly basis.	Number of bugs caught during validation	Fortnightly validation	The root cause will be analyzed and take appropriate corrective actions
Process Goals					
There should not be any ripples from bug fixes.	To meet customer expectation	· Ensure self review using Code Review checklist. · Code Review should cover all the functionality sequences · Catch maximum bugs from offshore testing	Will analyse the Ripples against bug fix.	Task Completion	Improvements required shall be planned

Figure-1
Goal Analysis using Statistical tools

This can be addressed by documenting roles and responsibilities in the Project Plan (table-2). It also defines the situation in which the escalations has to be triggered. Project weekly meeting minutes provides specific task planned and the respective responsible persons to perform the task.

Poor Change Management: In the highly demanding open economy, requirements get changed frequently to coup-up with market demands. Poor Change Management means the process is not capable of accommodating changes or unresponsive to change. Requirement changes are not controlled and tracked. The volume of work is not determined. Therefore the team members are forced to work under pressure to meet the deadlines and it affects the quality of the work product[4].

This can be addressed by defining Change Control and Change Management processes. The changes are controlled and monitored by Change Control Board (CCB). The impacts of changes are analyzed and those impacts are documented and tracked. Effort estimate and schedule will be revised based on the new scope. The changes in the estimate and schedule will be informed to the customer for approval.

Improper Risk Management: Risk management is not considered or planned. Project teams realize the risk only at the time it hits. Mitigation and contingencies are not planned.

Relevant data or statistical process control tools to predict the likelihood of hitting the risk are lagging[2].

In software development projects risks will be identified and analyzed. The possibilities of risk are discussed in weekly meetings and take appropriate mitigation plans. The contingency plan also defined if the risk hits. Risk analysis tools like Failure Mode Effect analysis (FMEA) has been used to determine Risk Priority Number (RPN) calculated using severity (SEV), probability (PROB), and detectability (DET) factors of the potential failures and take appropriate steps based on RPN value (table-3).

Undefined Communication Process: It leads to miscommunication and drain the essence of the information. Undefined communication can also cause poor escalation process. Communication failures in different managerial levels have different impact in project. According to Frederic P. Brooks ineffective communication is the root of most problems.

In software projects, communication channels with external groups were defined (table-4). It provides the process by which the respective communication has to be initiated. The responsible person (by role) for such communication is also stated in the project plan.

Table-2
Stakeholders Responsibilities defined in Project Plan HB-1 – Handbook for Roles and Responsibilities

	Role	**Name**	**Additional competency**
Onsite	Customer	<Customer name and address>	NA
	Onsite Coordinator	<Name>	5 years experience in UL and C++
Management Team	BU Head	<Name>	Ref. HB-1
	Delivery Manager	<Name>	Ref. HB-1
	PM	<Name>	10 years experience in UL and C++
	Process Consultant	<Name>	Ref. HB-1
Development Team	PL	<Name>	7 years experience in UL and C++
	APL	<Name>	Ref. HB-1
	PA	<Name>	Ref. HB-1
	CMIC	<Name>	Ref. HB-1
	Members	<Team members Name>	Ref. HB-1
CCB	CCB Chair	<Name>	Ref. HB-1
	Members	PL, APL, PrC, CMIC	Ref. HB-1
Integration Team	PIC	NA	Ref. HB-1
	Members	NA	Ref. HB-1
Release Team	Members	PL, APL,TL, ML, PrC	Ref. HB-1
Testing Team	Test Lead	NA	Ref. HB-1
	Members	NA	Ref. HB-1

Table-3
Sample of Failure Mode Effect Analysis

	Project Name								
				ABC					
No.	Development Item / Function	The Quality Risk which has the serious influence for a customer (End-user)	Failure Mode leading to the Quality Risk (Cause of primary)	Potential Cause(s) / Mechanism(s) of Failure Mode	SEV	PROB	Detection Method	DET	RPN
1	GUI Display	Painting issue when we do scrolling of GUI	The GUI has many controls and user want to scroll it to enter values	When the user want to do scrolling of GUI.	3	2	Do scrolling very fast	1	**6**
2	State Handling	State change based on events	Application should comply with external events	When different events send based on the user actions	3	3	On receiving external events	1	**9**
3	Cursor text is clipped	When a mouse is moved over the image rendering GUI, the cursor text is clipped after certain size.	User can not view the full cursor text	when the mouse is moved over UI image	3	3	Move mouse over the UI image rendering area	1	**9**

Table 4
Stakeholders Responsibilities defined in Project Plan

External Group	Activity	Responsibility	Monitoring and Control Process
Independent Testing Team	Test Plan preparation, Test Execution, Requirements Specification review and Review of Plans	Test Lead / Project Lead	Weekly Project meeting, Status board meetings
Process Consultant	Process consultancy, Audits, Review of Plans	Process consultant, Project Lead	Weekly Project meeting, Status board meetings, Auditing
Onsite Team/ Customer	Customer interaction and requirement clarification	Onsite Coordinator, Project Lead	Clarification sheets and mails
Training department	Provide requested training	Training coordinator	Send request and track training

Unrealistic Deadlines: Wrong estimate, Lack of Change Management, Poor Risk Management, Lack of Quantitative Management and Lack of using Project Scheduling and Tracking tools leads to the commitment of unrealistic deadlines[2].

In Software projects, scope changes are controlled. Revise the estimate and schedule if there is drastic scope change. Estimate will be reviewed by experts. Identify risk and layout appropriate mitigation and contingency plans. Team members know the objectives and deadlines. Periodic tracking has been done to ensure the progress with respect to the milestones. Statistical Process Control tools will be used to monitor the progress and take corrective actions if any deviations noticed.

Unavailability of Skilled Resources: It is due to poor Human Resource Management policies. Skills required for Project is not identified. Required orientation and trainings are not given to team members[4].

In Software projects, Skills required for the positions are defined. Project Specific required competencies are identified and documented in Project Plan (table-2). Training requirements are identified and informed to HR department at the beginning of project.

Lack of Quantitative Project Management: Lack of Quantitative Project Management is due to unavailability of relevant data or lack of quantitative data analysis. Process Performance Benchmarks may not be defined. Statistical Process Control tools to predict the probability of occurrence never practiced.

In Software projects, current performance baselines are derived based on past data collected from closed projects and then published it for reference. It is used to set the targets for the organization to meet the organization's objectives. Figure-4 is a snapshot of a Run Chart used for monitoring the sub process parameters. The blue and red lines are the ranges and green line represents the actual values. Pareto analysis (figure-5) is used to apply 80-20 rule to identify the most prominent causes (20%)

that contribute the major issues (80%), it is done as part of Causal analysis. Based on the analysis the weak areas are identified and corrective actions are triggered. Based on these inputs, adopt innovative solutions to meet targets by controlling the parameters to get the desired output. Monthly productivity with respect to the rework percentage is plotted to analyze the monthly productivity (figure-6).
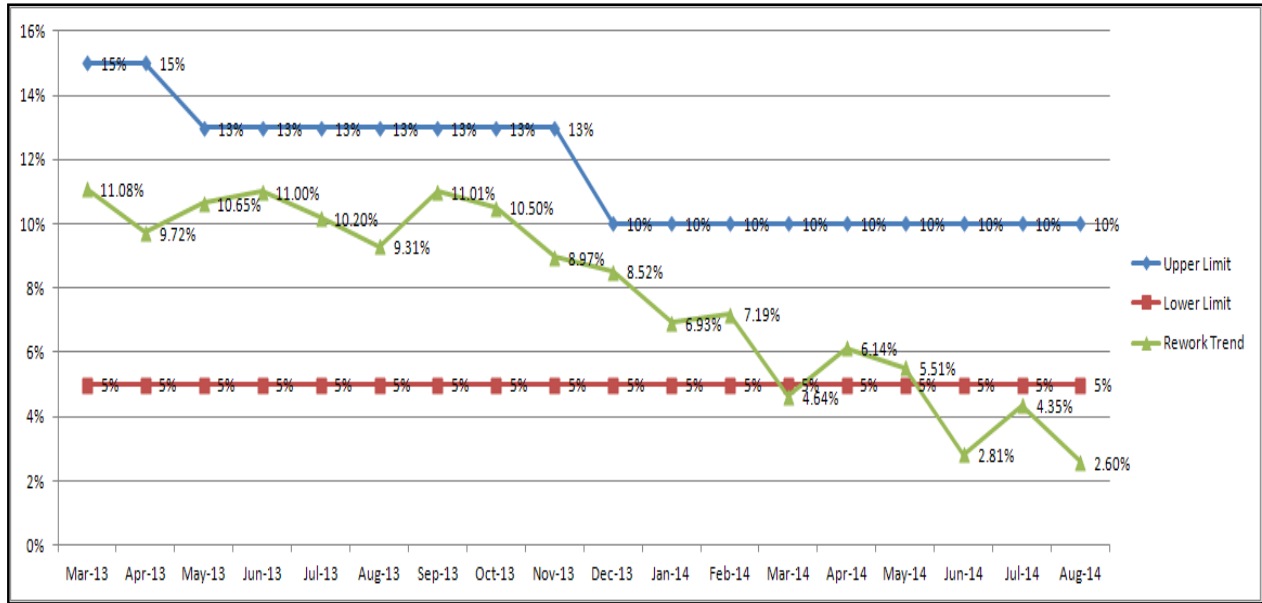
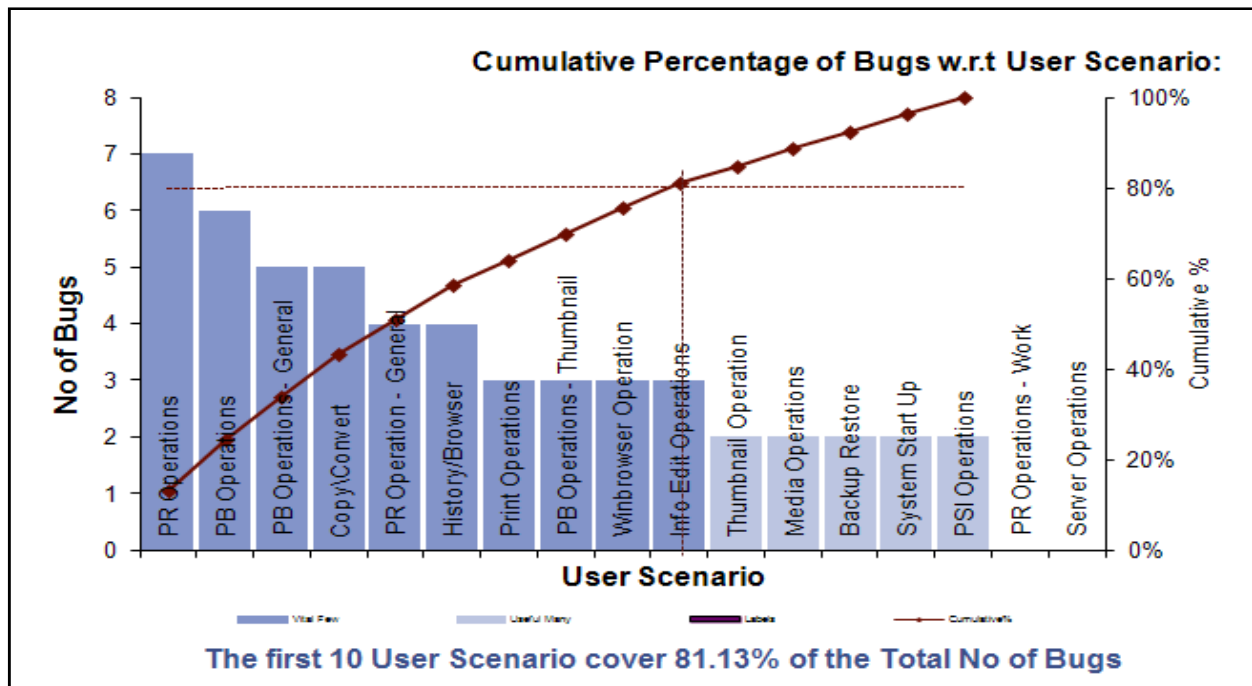

Figure-4
Process Control charts
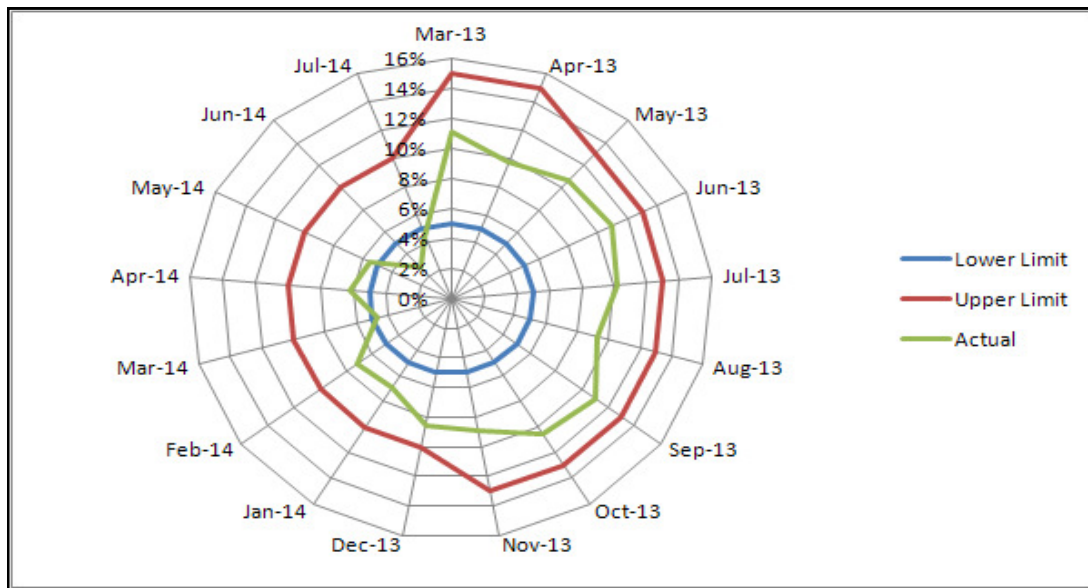

Figure-5
Process Control charts

Figure-6
Process Control charts

Micromanagement: It is called 'Baby sit' approach. Supervisor closely observes or controls the work of an employee. It affects supervisor–employee communication, creativity, productivity, problem-solving, flexibility, trust, feedback, openness, and company growth and goal attainment[3]. It hinders employee development. Further, employee will not be able to function without the support of the manager.

In Software projects, Managers were supervising larger concerns. Task is divided and assigned to the team members. Senior members perform the reviews and provide feedback to the team members.

Lack of Stakeholder Commitment: Roles and Responsibilities of Stakeholder are not defined. There is a lack of coordination among Stakeholder. In such situation priorities and preferences will be unclear and it cause communication gap.

In Software projects, Roles and Responsibilities of Stakeholder were defined in Project Plan (table-2). Stakeholder commitment can be improved by involving them in the meetings and conferences. In the case of Agile SCRUM projects, SCRUM meetings were conducted and project stakeholders participate and update status and progress.

Conclusion

Challenges are inevitable. Open economy provides plenty of opportunities and challenges not only to IT industry but to all business sectors. The sustainability of business is therefore depends on how effectively and efficiently the managers address the challenge and convert it to opportunities. The industrial best practices and Quality Management standards like ISO, CMMi, PSP/TSP etc provides guidelines to formulate matured Quality Management systems. However the changing challenges are the main challenge the managers are facing today.

Reference

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