A Study on Project Management in Software Engineering

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Abstract

The software industry is crucial in developing countries due to its value addition and high value. However, poor project management, particularly in developing countries, is a significant issue. This study focuses on planning for project success. This study explores the role of planning in software projects, focusing on planning factors, planning performance, and project outcomes. Planning factors include human, management, and technical aspects. Project outcomes are evaluated based on overall success, qualitative benefits, financial benefits, time, and costs. The framework suggests that project characteristics influence planning factors and performance. Smaller projects have better scheduling, budget excess, and intangible benefits. However, significant differences are mainly related to human factors, with foreign companies showing better project manager effort and customer involvement.

Keywords: SPM, Project Planning, Risk management, Project staffing, Scheduling

I. Introduction

In software industry, many techniques of general project management are applicable to software development. However, the software industry has also achieved a notorious reputation of poor performance in terms of schedule, cost, and quality assurance. Estimating, planning, and quality control processes are so bad that the majority of large system projects run late or exceed their budgets. Many are canceled without ever reaching completion (Jones, 1998). This failure of software is often referred to as the ―software crisis‖. This term refers to the fact that software projects are frequently delivered behind schedule, cost more than the original estimates, fail to meet user requirements, are unreliable, and virtually impossible to maintain (Chatzoglou and Macaulay, 1996). A study in the USA found that 31 percent of software projects were canceled before completion, and more than half the project's cost an average of 189 percent more than their original estimates (Whittaker, 1999). ―Software crisis‖ can be attributed to the poor application of design approaches, but also to inadequate project management due to lack of recognition and understanding of the real problems in software development (Ratcliff, 1987). Many previous studies have indicated the role of project management for project success. The results of Blackburn et al (1996) indicated that the methods employed to manage the project and the people involved in the cross-functional process of software development tend to be more important than the tools and technology. Although new technologies have been developed to facilitate software development process, programmer's knowledge and experience is still the key to better software development. Therefore, managing the programmers and related stakeholders in software development, is more important than the technology itself. In recent studies, Aladwani (2002) found the positive significant relationship between project planning and project success. Procaccino et al. (2002) also indicated the significant role of customer involvement and support from top management to the success of a project. The more customer involvement and top management support, the higher chance of project success.
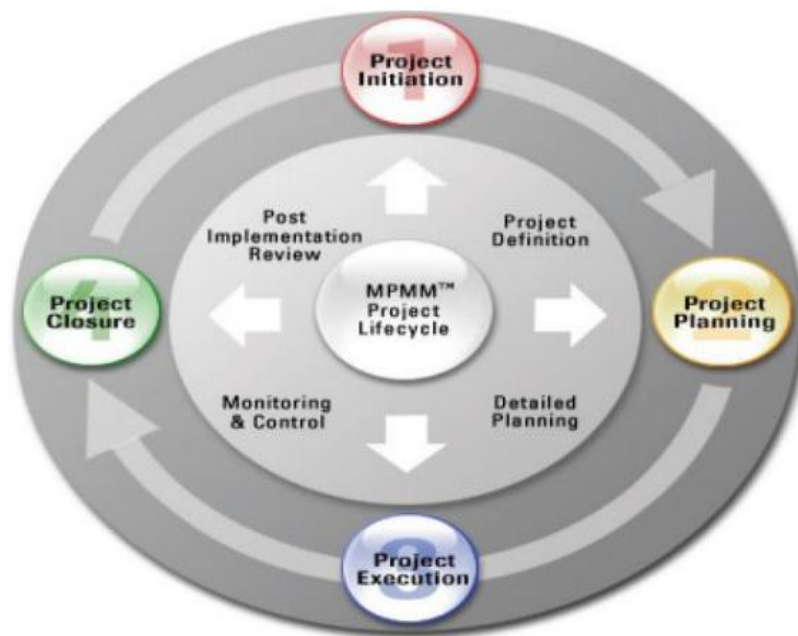
Figure 1. Project management

1.1 Project Management

Project Management is the art of maximizing the probability that a project delivers its goals on Time, to Budget and at the required Quality. The art of planning for the future has always been a human trait. In essence a project can be captured on paper with a few simple elements: a start date, an end date, the tasks that have to be carried out and when they should be finished, and some idea of the resources (people, machines etc.) that will be needed during the course of the project. Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements. Project management is accomplished through the use of the processes such as: initiating, planning, executing, controlling, and closing. It is important to note that many of the processes within project management are iterative in nature. This is in part due to the existence of and the necessity for progressive elaboration in a project throughout the project life cycle; i.e., the more you know about your project, the better you are able to manage it. [1]
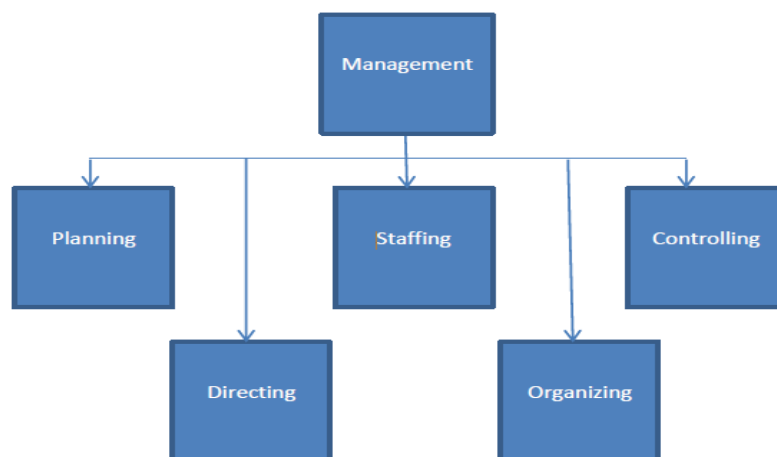

Figure 2. Elements of management activities

1.2 Software Project Management

When the plan starts to involve different things happening at different times, some of which are dependent on each other, plus resources required at different times and in different quantities and perhaps working at different rates, the paper plan could start to cover a vast area and be unreadable. Nevertheless, the idea that complex plans could be analyzed by a computer to allow someone to control a project is the basis of much of the

development in technology that now allows projects of any size and complexity, not only to be planned, but also modeled to answer 'what if?' questions.

The original programs and computers tended to produce answers long after an event had taken place. Now, there are many project planning and scheduling programs that can provide real time information, as well as linking to risk analysis, time recording, and costing, estimating and other aspects of project control. But computer programs are not project management: they are tools for project managers to use. Project management is all that mix of components of control, leadership, teamwork, resource management etc. that goes into a successful project. [3, 4]

Project managers can be found in all industries. Their numbers have grown rapidly as industry and commerce has realized that much of what it does is project work. And as project-based organizations have started to emerge, project management is becoming established as both a professional career path and a way of controlling business. So opportunities in project management now exist not only in being a project manager, but also as part of the support team in a project or program office or as a team leader for part of a project. There are also qualifications that can be attained through the professional associations.

1.3 Purpose of SPM

The projects are designed to achieve specific targets defined in terms of aims, tasks or a purpose. The nature and size of the project depends upon complexity of the task, realization of the aims and scope of the purpose any organization wants to achieve. In short project has to be aimed for achieving certain tasks in a given time frame. The projects are always designed considering time constraints. Extension to the project completion deadlines are always discouraged as time overrun, costs extra and in some cases opportunity cost for not completing a project is too high. Progressive elaboration is a characteristic of projects that accompanies the concepts of temporary and unique. Progressively means developing thoroughly in steps, and continuing steadily by increments while elaborated means worked out with care and detail; developed thoroughly For example, the project scope will be broadly described early in the project, and made more explicit and detailed as the project team develops a better and more complete understanding of the objectives and deliverables. [4, 5].

II.   Project Planning

- Probably the most time-consuming, project management activity
- Continuous activity from initial concept through to system delivery
- Plans must be regularly revised as new information becomes available
- Beware of grumbling developers
- Various different types of plan may be developed to support the main software project plan that is concerned with schedule and budget [3]

2.1 Types of Project Plan

Table 1: Project Plan

Plan	Description
Quality Plan	Describes the quality procedures & standards that will be used in a project
Validation Plan	Describes the approach, resources & Schedule used for system validation
Configuration Management plan	Describes the configuration management

2.2 Activity Organization

- Activities in a project should be organized to produce tangible outputs for management to judge progress
- Milestones are the end-point of a process activity
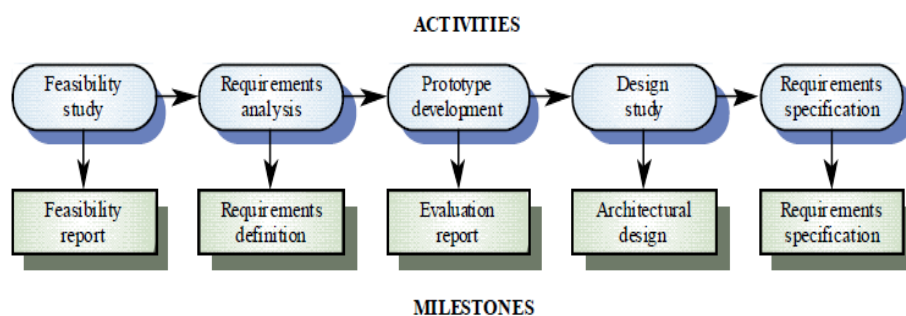- Deliverables are project results delivered to customers

ACTIVITIES

MILESTONES

Figure 3: Activity Organization

2.3 Project Scheduling
- Split project into tasks and estimate time and resources required to complete each task
- Organize tasks concurrently to make optimal use of workforce
- Minimize task dependencies to avoid delays caused by one task waiting for another to complete
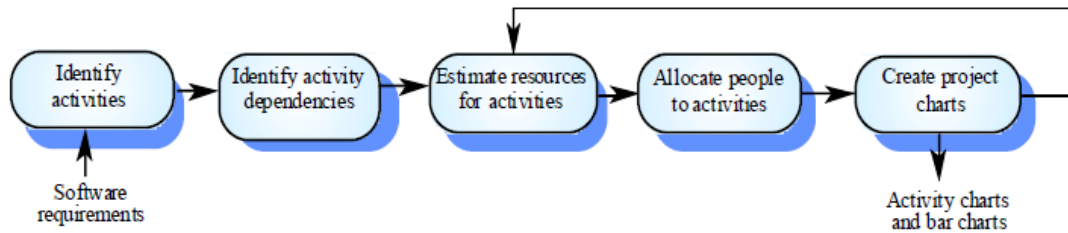- Dependent on project managers' intuition and experience [3]

Figure 4: Project Planning

III.   Risk Management

In risk management we are concerned with the risk of the development project not proceeding according to the plan. Specially the project running late or over budget and with the identification of the step that can be taken to avoid or minimize those risk. Some risks are more important than others. Whether or not a particular risk is important depends on the nature of the r risk, its likely effects on a particular activity and the criticality of the activity. High risk activities on a project critical path are a cause of concern. To reduce these dangers, we must ensure that risk are minimized or at least distributed over the project and ideally, removed from critical path activities. [2]

3.1. Nature of Risk

For the purpose of identifying and managing those risks that may cause a project to overrun its time-scale or budget, it is convenient to identify three types of risk.
- Those caused by the inherent difficulties of estimation
- Those due to assumption made during the planning
- Those of unforeseen event occurring

3.2. Managing Risk

The objective of risk management is to avoid or minimize the adverse effects of unforeseen events by avoiding the risks or drawing up contingency plans for dealing with them. There are a number of modules for risk management, but most are similar, in that they identify two main components – risk identification and risk management. Which shows a task breakdown structure for Barry Boehm calls risk engineering?
- Risk Identification: consists of listing all of the risk that can adversely affect the successful execution of the project.
- Risk Estimation: consists of assessing the like hood and impact of each hazard.
- Risk evaluation: consists of ranking the risks and determining risk aversion strategies.
- Risk Planning: consists of drawing up contingency plans and where appropriate, adding these to the project structure. With small project risk planning is likely to be the responsibility of the project managers but medium or large project will benefits from appointment of a full-time risk managers.
- Risk Control: concerns the main functions of the risk managers in minimising and reacting to problems throughout the project. This function will include aspects of quality in addition to dealing with problems as the occur.
- Risk Monitoring: must be an on-going activity, as the importance and like hood of particulate risk can change as the project proceeds.
- Risk Directing and Risk staffing: are concerned with the day-to-day management of risk. Risk aversion and problem solving strategies frequently involve the use of additional staff and this must be planned for direct. [6]

3.3. Risk Identification

The first stage in any risk assessment exercise is to identify the hazard that might affect the duration or resource costs of the projects. A hazard is an event that might occur and will if it does occur, create a problem for the successful completion of the project, In identification and analysing risk, we can usefully distinguish between

the cause, its immediate effect and the risk that it will pose to be the project. For example they illness of a team member is a hazard that might results in the problems of late delivery of a component. The late delivery of that component is likely have an effect on other activities and might, particularly if it is on the critical path; put the project completion data at risk. [2]

There will also be specific risks that are relevant to an individual project and these are likely to be more difficult to identify without an involvement of the members of the project team and a working environment that encouragement risk assessment. The categories of factors that will need to be considered include the following.

- Application factor
- Staff factors
- Project factors
- Project methods
- Hardware/ software factor
- Changeover factor
- Supplier factor
- Environment factor
- Health and safety factor

IV. Conclusion & Future work

This study focused on planning in software projects in a developing country. This research issues might be extended in other regions in the world. The extension of these research issues would be a better comparison with a wider range of software projects of international regional context with different characteristics like size, or type. It is also necessary to investigate the role of other areas of project management in software projects like quality management, risk management or conflict management. The problems of other stages like analysis and design, coding, testing or deploying in software development are also the issues for further research. The results of the exploratory study also suggest the important role of communication in project management. The problem of changing customers' requirements and the poor understanding of customers' expectation are evidences for more emphasis on the impact of project communication on project success.

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