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## REVIEW ARTICLE

### PROJECT MANAGEMENT (A CASE STUDY OF DELHI METRO PROJECT)

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#### ABSTRACT

Project management has emerged as a discipline in recent years. It developed from different fields of application including construction, engineering, communications, defence and the like. A successful project must be on time, on budget and deliver quality as promised. Anything less will be either a failed project or a challenged project. Research evidence shows that only a meager percentage of projects are successful by all measures and majority of projects are either partial failures or complete failures. In addition to the strategic definition of the projects' scope and time deadlines, it is argued that a project has a high probability of success if good planning, clear responsibility and accountability and schedule control, etc are adhered to strictly. This should certainly give proactive project managers both food for thought and motivation to action. With this perspective in mind, the present paper makes a modest attempt in defining project management in its real context, analyze and evaluate the benefits of efficient project management on the organizations' overall performance and the like.

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#### INTRODUCTION

Project management is about creating an environment and/or conditions in which a definite goal or objective can be achieved in a controlled manner by a team of people. In the modern era of hyper competition in knowledge and technology, projects-particularly information technology (IT) and information system (IS) related projects-fail too often because the project scope is not fully appreciated. These failures could also be people/process/product/technology related. Lewis (2002) has argued that although management of projects has been going on for thousands of years, the practice has been widely recognized as a discipline in its own right for only about fifteen years. A very short history indeed! Azzopardi (2009) confirms this view. However, Haughey (2011) contends that project management in the modern sense began in the early sixties although it has its roots much further back in the latter years of the 19<sup>th</sup> century. According to him, the need for project management was driven by businesses that realized the benefits of organizing work around projects and the critical need to communicate and co-ordinate work across departments and professions. One of the first major uses of project management was to manage the United States Space programme. The governments, military and corporate world have now adopted this practice. In the beginning, the word "Project" was associated with engineering, in particular, with developments at the forefront of technology. The next place it cropped up was information technology. Today, a project mentality is essential in the global economies and all fields of our day to day life.

#### Objectives of Study

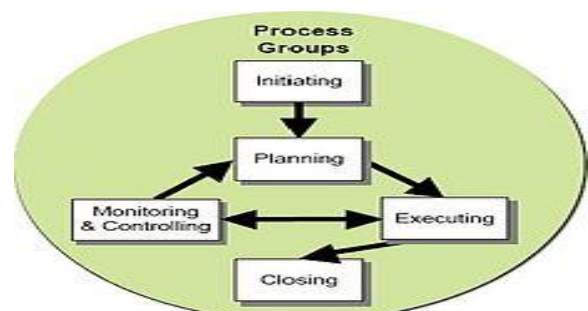
1. To study the Project Management Process
2. To study the various approaches to Project Management

#### Project Management Processes

Traditionally, project management includes a number of elements: four to five process groups, and a control system. Regardless of the methodology or terminology used, the same basic project management processes will be used. Major process groups generally include:

- Initiation
- Planning or development
- Production or execution
- Monitoring and controlling
- Closing

So Project Management is accomplished through the use of the following five processes:



- 1) **Project Definition and Initiation:** This is called the authorizing phase of the project. Here the goals, objectives and critical success factors of the project are defined. Everything that is needed to set-up the project before work can start is discussed. A business problem/opportunity is identified and various solution options are defined. A feasibility study is conducted and a recommended solution is approved and a project is initiated to deliver the approved solution for which a manager and a team of project members is recruited;
- 2) **Project Planning and Designing:** Once the scope of the project has been defined, the project enters the detailed planning phase which sets out how the work will be carried out including time, cost and resource estimates. The main thrust is defining and redefining objectives and selecting the best of the alternative courses of action to attain the objectives that the project is undertaken to address;
- 3) **Project Execution:** This phase involves execution of each activity and task listed in the project plan. It is here that work is done to deliver the product or service or desired outcome. It co-ordinates people and other resources to carry out the plan;
- 4) **Project Monitoring and Control:** It ensures that monitoring and measuring progress regularly to identify variances from plan so that corrective action can be taken when necessary to meet project objectives. This phase ensures that the project stay on track; and
- 5) **Project Closure:** Formalizing acceptance of the project/deliverables and disbanding of all the elements that were required to run the project. This phase consists of:

**Project close:** Finalize all activities across all of the process groups to formally close the project or a project phase

**Contract closure:** Complete and settle each contract (including the resolution of any open items) and close each contract applicable to the project or project phase.

## Testing

### System Testing

who may have worked on the project, the developed system must undergo rigorous testing in preparation for UAT by the customer. All modules – separately and together – must be tested against the BRD, FDD, and test scripts that have been developed.

### User Acceptance Testing

In the case of a software/IT project, that the customer come up with their own test scripts and scenarios to rigorously test the system prior to deployment.

### Signoff

Once the customer is satisfied with the delivered and tested system and all necessary test scripts have been run through satisfactorily by the customer, the PM must obtain an official

signoff of the system. This is critical to ensure success and scope maintenance going forward. Following official UAT signoff, we're ready for our next phase – Training.

## Approaches to Project Management

There are a number of approaches to managing project activities including agile, interactive, incremental, and phased approaches. Regardless of the methodology employed, careful consideration must be given to the overall project objectives, timeline, and cost, as well as the roles and responsibilities of all participants and stakeholders.

### 1. The traditional approach

A traditional phased approach identifies a sequence of steps to be completed. In the "traditional approach", five developmental components of a project can be distinguished (four stages plus control):

#### Typical development phases of an engineering project

- initiation;
- planning and design;
- execution and construction;
- monitoring and controlling systems;
- completion.

Not all projects will visit every stage, as projects can be terminated before they reach completion. Some projects do not follow a structured planning and/or monitoring process. Some projects will go through steps 2, 3 and 4 multiple times. Many industries use variations of these project stages. For example, when working on a brick and mortar design and construction, projects will typically progress through stages like Pre-Planning, Conceptual Design, Schematic Design, Design Development, Construction Drawings (or Contract Documents), and Construction Administration. While the terms may differ from industry to industry, the actual stages typically follow common steps to problem solving—"defining the problem, weighing options, choosing a path, implementation and evaluation."

### 2. Critical chain project management

Critical chain project management (CCPM) is a method of planning and managing projects that puts more emphasis on the resources (physical and human) needed in order to execute project tasks. The most complex part involves engineering professionals of different fields (Civil, Electrical, Mechanical etc.) working together. The goal is to increase the rate of throughput (or completion rates) of projects in an organization. Finally, projects are planned and managed to ensure that the resources are ready when the critical chain tasks must start, subordinating all other resources to the critical chain. Regardless of project type, the project plan should undergo Resource levelling, and the longest sequence of resource-constrained tasks should be identified as the critical chain. In multi-project environments, resource levelling should be performed across projects. However, it is often enough to identify (or simply select) a single "drum" resource—a

resource that acts as a constraint across projects—and stagger projects based on the availability of that single resource.

### 3. Extreme project management

In critical studies of project management it has been noted that several PERT based models are not well suited for the multi-project company environment of today. Most of them are aimed at very large-scale, one-time, non-routine projects, and currently all kinds of management are expressed in terms of projects. Using complex models for "projects" (or rather "tasks") spanning a few weeks has been proven to cause unnecessary costs and low manoeuvrability in several cases. Instead, project management experts try to identify different "lightweight" models, such as Agile Project Management methods including Extreme Programming for software development and Scrum techniques. The generalization of Extreme Programming to other kinds of projects is extreme project management, which may be used in combination with the process modelling and management principles of human interaction management.

### 4. Event chain methodology

Event chain methodology is another method that complements critical path method and critical chain project management methodologies. Event chain methodology is an uncertainty modelling and schedule network analysis technique that is focused on identifying and managing events and event chains that affect project schedules. Event chain methodology helps to mitigate the negative impact of psychological heuristics and biases, as well as to allow for easy modelling of uncertainties in the project schedules. Event chain methodology is based on the following principles.

- **Probabilistic moment of risk:** An activity (task) in most real-life processes is not a continuous uniform process. Tasks are affected by external events, which can occur at some point in the middle of the task.
- **Event chains:** Events can cause other events, which will create event chains. These event chains can significantly affect the course of the project. Quantitative analysis is used to determine a cumulative effect of these event chains on the project schedule.
- **Critical events or event chains:** The single events or the event chains that have the most potential to affect the projects are the "critical events" or "critical chains of events." They can be determined by the analysis.
- **Project tracking with events:** Even if a project is partially completed and data about the project duration, cost, and events occurred is available, it is still possible to refine information about future potential events and helps to forecast future project performance.
- **Event chain visualization:** Events and event chains can be visualized using event chain diagrams on a Gantt chart.

### 5. Process-based management

Also furthering the concept of project control is the incorporation of process-based management. This area has

been driven by the use of Maturity models such as the CMMI (Capability Maturity Model Integration).

### 6. Agile project management

Agile project management approaches based on the principles of human interaction management are founded on a process view of human collaboration. This contrasts sharply with the traditional approach. In the agile software development or flexible product development approach, the project is seen as a series of relatively small tasks conceived and executed as the situation demands in an adaptive manner, rather than as a completely pre-planned process.

#### Project Success and Failure

Project failures are all too common- some make the headlines whereas the vast majorities are quickly forgotten. The reasons for failures are wide and varied. Many studies have been undertaken for this purpose. For example, Field (1997) tells us that projects fail too often because the project scope is not fully appreciated and/ or user needs are not fully understood. Hulme (1997) says that MIS projects and associated procurements take place in an environment characterized by lack of management continuity and an incentive system that encourages overly optimistic estimates of the benefits that can be attained from doing the project. However, Leicht (1999) is of the view that higher user expectations can actually be the cause of project failures. The results of a research paper (Anil and Thomasson, 1991) studied 24 areas of project management and found that 03 out of 24, if done well, clearly indicated that a project has a high probability of success. The paper states "it may be inferred that these three variables (Good Planning, Clear Responsibility and Accountability, and Schedule Control) in particular have the greatest impact on the performance of the project" it may be indicated here that the Standish Group's CHAOS Report has identified following factors/indicators whether a project would be a success/ failure or a challenged one:

#### Factors Found in Successful Projects

- User involvement;
- Executive management support;
- Clear statement of requirements;
- Proper planning; and
- Realistic expectations.

However, a study by Jiang *et al.* (1996) produced a list of 13 success factors (called Jiang's 13) which are reproduced below:

- Clearly defined goals;
- Competent project manager;
- Top management support;
- Competent project team members;
- Sufficient resource allocation;
- Adequate communication channels;
- Control mechanisms;
- Feedback capabilities;
- Responsiveness to client;

- Client consultation;
- Technical tasks;
- Client acceptance; and
- Troubleshooting.

## Case Study

### THE DELHI METRO PROJECT: EFFICIENT PROJECT MANAGEMENT IN INDIAN PUBLIC SECTOR

#### Introduction

With a 6.5 km section of Line 3 becoming operational in April 2006, Phase I of the Delhi Metro project was nearing completion. Of the total length of 65.16 km of the first phase, 62 km had been completed and opened for service. This phase was set to cost Rs. 98 billion. As of early 2006, around 450,000 passengers were traveling by the Delhi Metro every day. The Delhi Metro was meant to solve Delhi's Traffic problems, which had become almost unmanageable. The first steps to build a metro system in the city were taken in the early 1990s. In 1995, the Government of India (GoI) and the Government of the National Capital Territory of Delhi (GNCTD) formed the Delhi Metro Rail Corporation Ltd (DMRC) under the Companies Act to construct the Delhi Metro.

Conceived as a social sector project, a significant portion of the project cost was funded through a soft loan provided by the Japanese government through Japan Bank International Corporation (JBIC)<sup>4</sup>. The rest was contributed by GoI and GNCTD through equity. With Phase I of the Delhi Metro project nearing completion, the GoI decided to extend the metro network and work on Phase II of the Delhi Metro project was set to commence in September 2006.

#### Metro Project

In order to implement the Delhi Metro project, the GoI and the GNCTD set up a 50:50 joint venture company called the Delhi Metro Rail Corporation Ltd. (DMRC). The company was incorporated under the Companies Act in May 1995. The DMRC was to complete Phase I of the project within 10 years, i.e., by the end of 2005.

#### Funding the Project

Globally, most urban MRTS projects were financially unviable because the fares could not be fixed solely on a commercial basis. If the fares were fixed too high, the passenger numbers would remain low, thereby defeating the very purpose of setting up the system. Therefore, the concerned governments generally bore the capital costs of an MRTS system. In the case of the Delhi Metro project too, the GoI and the GNCTD bore the capital costs. The total cost of the first phase of the project was initially estimated at Rs. 60 billion, at April 1996 prices. Later in 2002, with the cost of the project rising by approximately 10% per year, the estimate was revised to Rs. 89.27 billion...

#### Project Team

With the funding for the project being finalized, the next step was to constitute a project team. Sreedharan was appointed as project manager and managing director of the DMRC in November 1997. A technocrat, he had had a long stint in the Indian Railways (IR) and had retired in 1990. During his service with IR, he had earned a reputation for completing major projects on time and within the budget...

#### Planning the Project

In India, major infrastructure projects are often stalled because of a lack of funds, political interference, lack of professionalism and accountability, property disputes, corruption, etc. Therefore, even before the commencement of the project, the DMRC attempted to put in place effective systems to ensure the smooth progress of the project. Funding was not an issue in the case of the Delhi Metro project because it was settled even before the project commenced.

#### Managing the Stakeholders in the Project

Effective project management involved not only completing the project on schedule and within the budget, but also managing the project's stakeholders. The stakeholders included the governments, the contractors, the funding agencies, and the general public. Despite assurances that the DMRC would enjoy autonomy, it faced political pressure not only in its recruitment processes, promotions, and contract awarding but also in land acquisition...

#### Project Evaluation

The successful completion of the project effectively silenced the critics who had been skeptical about the ability of an Indian public sector organization to complete any project, let alone one as complex and costly as the Delhi Metro, on time and within the budget...

#### Project Implementation

Construction work on the project commenced on October 1, 1998. The entire project was divided into three lines. Further, these lines were divided into sections Line 1 (Shahdara to Rithala). The work on Phase I commenced with the Shahdara-Tis Hazari section of Line 1, covering a distance of about eight kilometers. The work involved utility diversions, barricading, and actual civil construction. A major part of this section was on elevated tracks. All tracks in the elevated corridor were laid on concrete (ballastless). The tracks were supported on single piers...

#### Outlook

The Delhi Metro was expected to play a major role in relieving the transport problems faced by the city's residence. Moreover with the GOI planning extensions to the Metro, it appeared that the benefits of an efficient transport system would be enjoyed by the people living in a wider geographical area than originally planned.

## Conclusion

The recent past has marked the beginning of modern project management era. Today, all organizations large or small are involved in implementing undertakings as diverse as the development of a new product, service, or a public relations campaign. In an effort to make organization even more innovative and successful and to keep ahead of their competitors, every organization is faced with development of complex services and processes. These need cross-functional expertise in a given organization. Hence, good project management is needed which is a process of continuous improvement. It is a process of making mistakes and learning from these mistakes.

Of course, there are many things that lead to project success and many that lead to failure. In addition to two important factors in successful project management being strategic definition of the project's scope and time schedule, surely and certainly Jiang's 13 success factors are also a good panacea to use as a starting point for our projects. Project management is a process of continuous study and learning. A well trained and capable project manager, whose role cannot be underestimated, must understand that there would be few successes if he does not devote himself to this never-ending process.

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