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Project Management

Elixir Project Mgmt. 42 (2012) 6164-6168

Project management processes and tools & techniques- a foundation for

project's success

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ARTICLE INFO

Article history: Received: 28 September 2011; Received in revised form: 17 December 2011; Accepted: 3 January 2012;

Keywords

Project, Project Management, Tools & Techniques, Project Management processes, Project manager.

ABSTRACT

Project management is not a new management trend; it is a professional practice that has reached wide acceptance in many facets of industries. The purpose of project management is to foresee as many of the dangers and problems as possible and to plan, organize and control activities so that projects are completed successfully in spite of all the risks. This process should start well before any resource is committed, and must continue until all work is finished. Organizations that have adopted project management as a key competency have benefited from improved project outcomes to significant competitive advantage. There are many aspects involved in successful project management: Solid processes, tools & techniques, experience, hard work, good teamwork and good work practices. This paper focuses on two important aspects of project management – the processes and the tools & techniques we use for the successful completion of a project.

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Introduction

Project management has evolved to plan, coordinate and control the complex and diverse activities of modern industrial, commercial and management change, Infrastructure and IT projects. Project management over the years has been a successful tool for implementing change in organizations. Organizations have reported the benefits derived from using project management tools and techniques and methodologies to implement change (Ifeoluwa Ajelabi et al. 2010). All projects share one common characteristic - the projection of ideas and activities into new endeavors. It is concerning to note that only about 34% of all the projects undertaken globally SUCCEED! This only means that the concept of "Managing Projects effectively and successfully" is poorly understood. In this direction the Project Management Institute (PMI) has developed the Project Management Body of Knowledge (PMBOK) for the successful completion of project with stated objectives/scope. Burj Dubai Tower - World's Tallest building project was managed by engineers from the Project Management Institute -PMI and Project Management Information System (PMIS).

PMBOK (2008) defines a project management as "The application of knowledge, skills, tools, and techniques to meet the project requirements". Project management is accomplished through the application and integration of the project management processes of initiating, planning, executing, monitoring and controlling, and closing. i.e. project management is an interrelated group of processes that enables the project team to achieve the project successfully. These processes manage inputs to produce outputs from specific activities; the progression from input to output is the nucleus of project management and requires integration and iteration. The benefits derived from practicing good project management are very valuable.

PMBOK prescribes a set of tools and techniques, performed by people, to describe, organize, and monitor the work of project activities. Project managers are the people responsible for

managing the project processes and applying the tools and techniques used to carry out the project activities. There are many advantages to organizing projects and teams who utilize these techniques.

A Brief history of Project Management

Man-made projects are not new; monuments surviving from the earliest civilizations testify to the incredible achievements of our ancestors and still evoke our wonder and admiration (Parker. Iain 2007). The earliest known organized dwellings at Mohenjo Daro date back to 3000 BC. Skills, management in construction are evident in the innumerable monuments ranging Pyramids of Egypt to Taj Mahal of India to Great Wall of China. The modern concept of project management began with the Manhattan Project - the U.S. military led to develop the atomic bomb. Modern projects, for all their technological sophistication, are not necessarily greater in scale than some of those early mammoth works. But economic pressures of the industrialized world, competition between rival companies, and greater regard for the value, well-being and hence the employment costs of working people have all contributed to the development of new project management ideas and techniques (Scott Berkum 2005). Project

There are many definitions for what constitutes a project; some of these definitions describe the nature of a project and how it differs from other type of work, the descriptions used to define a project include the following:

PMBOK (2008) defines a project as "a temporary endeavor undertaken to create a unique product or service or result".

• Temporary is a characteristic of every project that has a definite beginning and a definite end.

Uniqueness is an important characteristic of project deliverables. For example, several thousands of office or commercial buildings have been developed, but each individual facility is unique—different owner, different design, different location, different contractors, and so on.





• The presence of Projects range in size, scope, cost and time from mega international projects costing several millions of dollars over many years - to small domestic projects with a low budget taking just a few hours to complete.

Common examples of projects are construction of a building, re-alignment of a section of road, replacement repetitive elements does not change the fundamental uniqueness of the project work.



Fig. 1 The progressive elaboration of House Construction Project

• Progressive elaboration is another characteristic of a project in which projects are often defined broadly when they begin, and as time passes, the specific details of the project become clearer. Therefore, projects should be developed in increments. A project team should develop initial plans and then update them with more detail based on new information. For example, we intended to construct a 2 Bed Room house. The progressive elaboration of this project is shown in fig 1.

• The International Organization for Standardization (ISO 10006 standard) has a rigorous definition of a project. "A project is a unique process consisting of a set of co-ordinated and controlled activities with start and finish dates, undertaken to achieve an objective conforming to specific requirements including the constraints of time, cost and resources." of a bridge on heavy traffic road, introduction of a new product, installation of a new piece of machinery in a manufacturing plant, general election, creation of a new software tool, or the design and launch of a new advertising campaign, Career development (education and training courses) etc.

Project Manager

Managing projects well requires a great deal of time, skill, and finesse (Rajendra D S 2010). There are many sides to project management and this is what makes it so interesting and demanding. Project managers are expected to take an uncertain event and make a certain promise to deliver. They are also expected to do this within a specified time and within a limited budget.

The project manager is the person responsible for accomplishing the project objectives. A good project manager is crucial to a project's success. Project managers work with the project sponsors, the project team, and the other people involved in a project to meet project goals.

For the endeavor to be successful, the project must be accomplished on time, within budget, and to the appropriate degree required to satisfy the objective. For success to be achieved, the project manager must be skilled and operate in an environment which enables a project team to function. Excellence in project management should be viewed as the positive trend in the performance of successful projects.

Project management processes

There are several aspects involved in successful project management: Solid processes, tools & techniques, hard work, experience, good teamwork, work practices. Project Management processes and tools & techniques

are two the important aspects that very project managers must understand and use judiciously for the successful completion of the project.

For the successful completion of any project, numerous project management processes interact with each other and each process belongs to a specific project management process group. The project management and is to understand which processes are involved in which process group and how they are interdependent (Baker et al., 2000 & Harpal Singh 1981,).

The project management processes are heavily influenced by the Plan-Do-Check-Act cycle which is the basic foundation for continual improvement concepts in a wide variety of industries and disciplines.

Processes for project management are well-documented and readily available today – from professional institutes and organizations such as the Project Management Institute (PMI) and the International Project Management Association (IPMA), to chartered institutes of various project-oriented professions, books and research papers, training organizations, and internal groups (for example, staff working in program and project management offices) in commercial and non-commercial organizations. Ensuring a thorough understanding of processes to follow and how to "embody them" in our project is crucial to setting our project up for success.

The PMBOK (2008) guide recognizes 42 processes that fall into five basic process groups and nine knowledge areas that are typical of almost all projects.

Each of the nine knowledge areas contains the processes that need to be accomplished within its discipline in order to achieve an effective project management program (Fig. 2). Each of these processes also falls into one of the five basic process groups, creating a matrix structure such that every process can be related to one knowledge area and one process group.



Fig. 2 Project Management frameworks



Fig. 3 Project Management Process Groups overlapping in a phase

Project Management process groups (Kathy Schwalbe 2007) overlap and occur at various levels of intensity throughout each Project Phase and they are not one-time, discrete events. Fig. 3 shows the Project Management Process Groups overlapping in a phase. The level of activity and length of each process group varies for every project. Normally, the initiating and closing processes are usually the shortest and require the least amount of resources and time, at about 5–10 percent each, followed by the planning processes, at about 15–25 percent. The executing processes require the most resources and time, generally 50–60 percent. Monitoring and controlling is done throughout the project and generally takes 5–15.

All of the processes and interactions do not apply to all projects or phases.

The project manager, along with project team, is always responsible for determining:

- What processes are appropriate?
- What is the appropriate degree of rigor for each process?
- This is called tailoring!

Examples:

• Software development projects dependent on unique resources define roles and responsibilities before scope definition.

• A firm whose projects find sizable outsourcing / procurement of materials need to describe in their planning where the work is contracted out/ how they are procuring materials.

• On smaller projects, involving handful of people, there is no need for communications planning.

• On larger and complex projects, more detailed and meticulous planning is required

Risk is a big agenda and risk identification will be more exhaustive. Create a separate risk categories for better project management:

- Quality risks
- Technical risks
- Cost risks
- Schedule risks
- Managerial risks.

Having a solid understanding of the processes which is required to create a Project Management Plan (PMP) is the fundamental and hence the PMP accurately portrays how the team will deliver the project. We must then display the behaviours and take the actions to make it happen. The same could be said of the project estimating and cost control process, the scheduling process, the procurement process, the quality process, the process of controlling risks and all other aspects of program and project management.

Tools & techniques

Tools & Techniques can undoubtedly provide structure to our work, as long as they are task-appropriate and designed to support the process, they help us to become more efficient (Morris Peter). Years ago, project management was carried out with tools & techniques that were more manually-intensive than those used today – but they were tools nonetheless. In the same way, carpenters relied on manual saws and now use a variety of powered devices to help them get the job done more quickly and with less physical effort, and designers used hand-built models in the absence of specialist computer simulation software.

Project management tools of varying levels of complexity flourish today. Some have evolved into entire systems for managing the project itself, whilst others are specific to particular disciplines (Baker et al. 2000). Many project management tools have been developed by the organizations that have refined them over the years through the use of feedback and wisdom from user groups. Whether they are scheduling tools, resource management tools, estimating tools, scope management tools or a composition of all these facets and more, they can provide a solid platform ("railway tracks", if you like) to control projects. And that is one of the keys to using tools – we need to use the right one for the job at hand: it should be a platform to achieve efficiency, and should be used appropriately and properly as a result of training (Milosevic Dragan 2003).

We all need and expect good tools to help us do our jobs. Whether we are an office-based professional project manager who uses a multitude of computer-based tools, or a professional who works in a different environment, we can't do our best without the right tool. As an example, consider scheduling. Today's computer-based scheduling tools are very powerful, and allow real-time consolidated views ranging from a single project to a portfolio view of a global scale (Turner R).

The various tools & techniques that are frequently used in the project are:

1. Expert judgment: is based on the experience and knowledge of Subject Matter Experts (SMEs). It's used to:

1. Help to assess inputs required to develop the project charter etc.

2. Applied to any technical and management details

3. Comprises special expertise from any group or individual

2. Project management information system: is an automated system used by the project management team to aid execution of the activities planned in the project management plan and also to store records for easy access.

3. Change control meetings: Which is responsible for accept/reject change requests. Change control board should have well defined authority and makeup.

4. Decomposition: Decomposition is the process of breaking down major project deliverables or sub-deliverables into smaller, manageable components until they are defined to work on package level.

5. Inspection: Inspection includes measuring, examining, and verifying to determine whether the work and deliverables meets requirements and product acceptance criteria. Inspection may be termed as:

- Reviews
- Product reviews
- Audits
 - Walkthroughs

6. Templates: An activity list or a portion of an activity list from a previous project. Related activity attributes information in the templates also helps. Templates can help identify typical schedule milestones. 7. Precedence Diagram Method (PDM): helps us to:

• Communicate: The visual representation make it easier for us to communicate the flow of project execution or the project activity flow.

• Identify missing activities: When an activity is not identified, it'll never be done. By visually representing the activities, there is a greater chance for our team to identify missing activities.

• Identify dependencies: Each activity is dependent on some other activity. When a dependency is not identified, the project will be delayed until such a time that identification occurs. For example, if there is a critical component that is being produced by a third-party vendor, the final product is dependent on the vendor. So, even if we complete all other activities, the project will not be complete until the vendor supplies the critical component.

• Identify critical activities: Certain activities have a greater impact on project schedule than others. By using PDMs, we can determine the activities critical to the project schedule. This is known as the Critical Path Method (CPM).

• Create a project schedule: The final goal of PDM is to create a practical and robust project schedule.

8. Critical Path Method (CPM): The Critical Path Method (CPM) is one of several related techniques for doing project planning. CPM is for projects that are made up of a number of individual "activities." If some of the activities require other activities to finish before they can start, then the project becomes a complex web of activities.

CPM can help us to figure out:

• How long our complex project will take to complete

• Which activities are "critical," meaning that they have to be done on time or else the whole project will take longer .

9. Program Evaluation and Review Technique (PERT): A powerful technique for estimating tasks where there may not be sufficient information is the Program Evaluation Review Technique (PERT). PERT was developed as a solution to handling uncertainties in estimating activity durations by using three time estimates: Optimistic, Most likely, and Pessimistic. It originated in late 1950s during U.S. Navy's Polaris Missile System program. Using the PERT approach for determining the project schedule enables the project manager to provide much more information by taking into account poorly defined areas, probabilities, and ranges for the schedule (versus single point t estimates).

10. Earned Value Management (EVM): Earned Value Management integrates scope, time and cost measures to help assess and measure project performance and progress. It is a systematic project management process used to find variances in projects based on the comparison of worked performance and the work planned (Pratt Marry 2006), EVM is used on the cost and schedule control and can be useful in project forecasting. The project baseline is an essential component of EVM and serves as a pivotal point for all EVM related activities and provides quantitative data for project decision making.

11. Forecasting: As the project progresses, the project team can develop a forecast for the Estimate At Completion (EAC). This may differ from Budget At Completion (BAC).

12. Quality audits: Quality audits is a structured, independent review (scheduled or random, in-house or by outside third party) to determine whether project activities comply with organizational and project policies, processes, and procedures (Rajendra 2010).



13. Conflict management: Conflict is an inevitable part in a

project environment. "Successful conflict management increases productivity and brings in positive working relationships".

14. Contract types: Contract type selection:

Different contract types suit different types of purchases
Degree of risk assessed by both buyer and seller decides the choice of a Contract Type.

Don't forget to integrate the contract change control system with the integrated change control system.

Results and discussions

Project Management processes and tools & techniques are the two vital features that very project manager must understand and use them sensibly to control the project.

The authors have come across certain issues in Buildings and Infra-structure projects:

1. Project managers are in utmost urgent to start the project without understanding the processes and tools & techniques relevant to the project.

2. Project planning process is least attended and understood by the project team. Having a solid understanding of the processes required to create a Project Management Plan (PMP) is fundamental to ensuring the PMP accurately describe how the team will deliver the project. The same could be thought of the project estimating and cost control process, the scheduling process, the procurement process, the quality process, the project of controlling risks and all other aspects of project management.

3. Most of the project managers not aware that the projects are unique in nature and they have to select most appropriate processes and tools & techniques for the projects.

Change control meetings regarding change requests are not properly controlled and poorly documented. Change control board should have well defined authority and makeup. Which is responsible for accept/reject change requests.

5. Project risk management process is not considered in most of the cases.

6. Records management is poorly understood and poorly documented.

7. Decomposition process of breaking down major project deliverables or sub-deliverables into smaller, manageable components until they are defined to the work package level is least understood.

8. Project Quality Plan and Inspections and Test Plans are of poorly designed.

The above issues shall be addressed by utilizing expert's judgment and subject matter experts.

Conclusion

Project Management processes and tools & techniques play an important role in achieving the project objectives at competitive cost, on time and with desired quality. They are two the important aspects that very project managers must understand and use them judiciously for the successful completion of the project (Chapman, James R). This paper has examined how Project Management processes and tools & techniques can be applied to improve project management performance.

Project managers must understand the project management processes first, and then use the most appropriate tool & techniques available to them to undertake the process. They need to combine process familiarity, embodied with the tools & techniques to carry out their work.

We cannot use a tool & techniques effectively unless we know the processes it guides or instructs us to follow. The need to know "why" and "how" to use a tool is the reason that we first need an understanding of processes. Without the "why" and the "how," we will not understand the real meaning behind the task at hand.

We consider that processes and tools & techniques need to work in harmony with each other, and that the process should determine how the tool & techniques needs to be used. Tools vary in their level of complexity, and they can definitely help our efficiency and level of consistency and control if

• They are appropriate for the task at hand

• They are used properly.

Having a solid understanding of the processes which is required to create a Project Management Plan (PMP) is fundamental and hence the PMP accurately describe how the team will deliver the project successfully on time within the budget.

Acknowledgements

The authors wish to place on record their sincere thanks to Dr. Shivakumariah, principal, SIT, Tumkur and Dr. M.N. Channabasappa, Director, SIT, for providing facilities to prepare this paper. Many thanks are extended to Dr. P.H. Shivapraksh, Head, Department of Civil Engineering, SIT, for his encouragement during the development of this paper.

References

A Guide to Project Management Body of Knowledge (PMBOK)

4th edition (2008), *PMI*, USA

Baker, Sunny and Kim (2000), Complete Idiot's Guide to Project Management, 2ed., Chapter 15, Alpha Books

Bent James, Project Management for Engineering and Construction, *Prentice Hall*, New Delhi

Chapman, James R., Principle Based Project Management website: www.hyperthot.com/project.htm

Rajendra Prasad D.S. (2010), A Simple Approach to Project Management, *Sapna Book House*, Bangalore,

Rajendra Prasad D S (2010), Quality Management System in Civil Engineering, Sapna Book House, Bangalore

Geer David (2006), Measuring Project Risk, *Computer World*, January 2006

Ifeoluwa Ajelabi & Yinshang Tang (2010), The Adoption of Benchmarking Principles for Project Management Performance Improvement, *International Journal of Managing Public Sector Information and Communication Technologies (IJMPICT)*, Vol. 1, No. 2, December

Harpal Singh (1981), Construction Management and Accounts, *Tata McGrw Hill*, New Delhi

Kathy Schwalbe (2007), Project Management in IT, Ceanage Learning India Pvt. Ltd., Delhi

Morris Peter, The Management of projects, Thomas Telford

Milosevic Dragan (2003)., Project Management Toolbox: Tools and Techniques for the Practicing Project Manager, *John Wiley & Sons Inc.*

Parker, Iain (2007), Project Management: Art or Science, *BCS*, December 2007

PMP Course Material (2010), PMAC, New Delhi

Pratt Marry (2006), Earned Value Management, Computer World, April 2006

Scott Berkum (2005), The Art Project Management, CA: O'Reilley Media Inc.

Choudhary S (1988), Project Management, Tata McGraw Hill, New Delhi

Turner R, Handbook of project Based Management, McGraw-Hill, New Delhi