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A discussion on integrated project planning - a stakeholder's approach

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Abstract. Project planning plays a vital role in the successful completion of a project. The building block of any project is upright strategic planning and optimal resource utilization. There are many project management activities, which can be done by a project manager in order to achieve the organization's mission and vision. But the vital activities which have to be followed during a project planning phase in the stakeholder's view are discussed in this paper.

1. Introduction

The Safe and successful completion of complex projects in industrial environments requires careful planning and collaboration of different stakeholders. The integration of task analysis, safety analysis and project optimization has to be applied to complex project planning. The results from the studies indicate that significant benefits in terms of time, cost and safety can be achieved through the application of the integrated methodology [1, 5, 10]. The observation and examination of the present level of involvement of the stakeholders stands as the purpose. Resource flows into a network and interaction controls are in the hands of the stakeholders and they are also the resource providers for an enterprise. Further, the organization's survival is strongly impacted by the stakeholders and hence it needs to be understood that appropriate key stakeholder management and involvement are a necessarily important project management plan [2].

Vital role is played by project planning for the success of any project. Drawing from prior research in strategic planning, strategic information systems planning and strategic manufacturing planning, research combines strategic planning characteristics derived from a rational approach with a second set of adaptive characteristics to create a comprehensive model [5]. In a large integrated company the key feature of the investment activity is done by the development of strategic projects as the desired strategic goals are achieved by ensuring that the implementation of desired strategic goal achievement [3]. Huge competition that is constantly increasing due to companies that are integrating vertically, the need for large organizations to find opportunity to survive grow and sustain, world economic globalization, constant look out for newer and better products and technology are causes for the need of strategic projects implementation in the current scenario. According to Schlumberger Business Consulting (SBC) research, in a decade the number of upstream-projects with budget size increased fourfold [11]. Issues of prioritization and determination of success criteria become crucially important in the context of the company's development strategy. There is a need for the transition to a fundamentally new level of corporate



governance projects, involving the inextricable connection and the strategic direction of all projects implemented in the company in all directions [5]. Business expansion through new business entry, higher production capacities, renovations in terms of material, techniques, processes etc. are reasons for investments to be taken up. The success of a project lies on perfect project planning. However, of late several literatures inquire about similar importance of planning with reference to several contexts.

Project managers must put more emphasis on planning in high risk project situations in order to meet project efficiency, whereas project steering committees to be more involved in approving plans of low risk projects to support benefit realization [9]. Unrealistic expectations at the planning stage along with several other reasons are reasons for delayed schedules and cost overruns in several projects. There are several explicit methods for analyzing and taking into account organizational dynamics (The study is devoted to the influence of factors on the value of a strategic project aimed at diversification of activities and the growth of a large company is studied) would be a stepping stone toward adding more realism to construction planning (while same can be applied to software or manufacturing industries) and control practice [6].

Business case development, scope planning, baseline plan development and risk planning along with three measures of project success; customer satisfaction, perceived quality of the project and success of the implementation process are highlighted [9]. Risk planning is one among the least practiced practices while baseline planning, project scope planning, business case development were the most practiced ones among the project planning practices that were surveyed. Mathematical aspects help us understand that the currently effective administrative and economic protection of knowledge-intensive and high-tech programs and projects requires a risk management methodology and tools that are typical of engineering activity and allow for estimating, compensating or mitigating such risks (this deals with financial and economic methods for risk neutralization, with risk mitigation, acceptance or transfer being of particular attention) [7].

Common indicator calculations along with additional effects taken into account are required for diversified growth while implementing investment projects. Cost based and Value factors are the factors that shape the investment value of the projects in the mineral resource sectors.

2. Planning phase

In the project life cycle conceptualization and planning play a predominant role in comparison to the other phases and play a prominent role in the success of the project. While improvement of the success of the project is an important objective, during the planning phase each process follows a different objective as per their requirement. For example success achievement in the project is very necessary for which a theoretical cost planning is highly necessary, a realistic cost limit is determined practically keeping in mind the market demand, money availability etc. An estimate of the costs requirement for contingency planning is needed for process planning integration. On similar lines there is a requirement for quality planning for the quality objectives to be met as requirement of key stakeholders

2.1 Quality planning

Provision of proper directions for goals that need to be perfect is taken care of in the establishment phase in the planning process. As shown in figure 1, a few tasks to be executed during this phase are as given: Project identification to fulfil the strategy of the organization, mission clarification of each project, preparation of a complete project plan and allocation of team members. The stakeholder needs, expectations and requirements are understood in complete through a systematic identification process in the following phase. The perception gaps in terms of understanding can be avoided by an explicit assessment of the customer expectations after identification of the right customers. The implementation of good and high quality work of the project that too on time and to provide customer satisfaction as well as stakeholder, needs, specifications and satisfaction, will be ensured by the activities. Design conformance as per the needs of the stakeholders will happen

through the usage and effective application of specific quality planning tools, tools, techniques, etc. The project development phase's main purpose is to identify and implement those activities that can deliver the results of the final project. The phase related to the process development is meant to ensure the delivery of the project as per the scheduled plan and design through the help of the elements of the process. Also the consistency of the process with the strategic objectives of the project is monitored. Of last, during the control phase the operational gap is sealed through the development and transfer of the plans in a professional manner over to the team involved in operations.

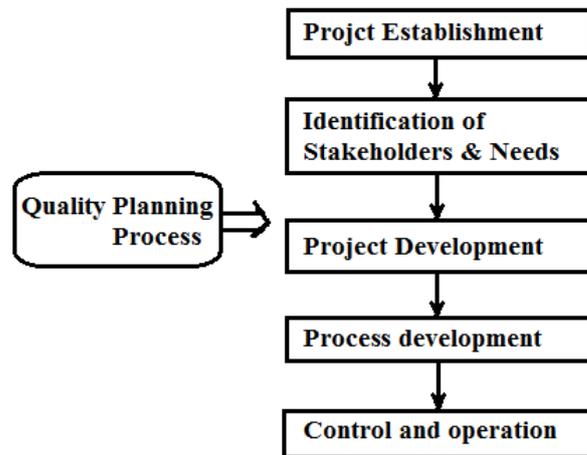


Figure 1. Phases of planning

In the area of project quality management, comprising of software quality management, three processes are involved as given below

- *Quality planning*: Standards and standard procedures that are applicable, are to be selected first and later modified as per requirements. This provides an explanation as an important contributing factor for fulfilling customer requirements.
- *Quality assurance*: A set of quality standards and organizational procedures for quality are established. The overall evaluation of the project performance for the fulfilment of the prescribed quality standards are ensured through this. In a way it's a responsibility for the quality throughout the life cycle of the project.
- *Quality control*: Ensuring that the standards and standard procedures are being implemented by the software development team happens during quality control. Specific results are monitored to verify the overall quality of the project and acts as a means of identifying ways to ensure quality of the project.

2.2 Strategy planning

A corporate managerial practice called strategic planning is a means by which a range of strategies are used to contribute to the vision and mission of an organization. Strategic planning needs to be a continuous process as the environment is a continuously changing entity. It is a process through which enterprises derive a strategy that would enable them to respond through anticipation of dynamic changes in the environment in which they operate. Organizations get benefitted even through non-financial consequences of strategic planning and hence it is advisable for organizations to have tools that are adequate to allow them to get measurements of the non-financial benefits as additions to already measured ones.

2.3 Process planning

The choice of relevant development methods and tools and the scope of the project along with the initial requirements need to be decided well in advance. There are several well defined software process models available to choose from. In fact the method to choose between the available process models has been a clear case of confusion and a long standing problem. There is empirical evidence to show and prove the non-conformance of enacted software processes with defined software models. One of the recognized risk reduction strategies for software engineering management is the need for a defined process. Further there is also a recognition for tailoring for suiting individual projects.

3. Identification of deliverables

Upfront infrastructure design also needs to be included along with the determination of variables while functional requirements are implemented. Further there are equal opportunities to reuse in-house software along with the use of commercial-off-the-shelf (COTS) software components and acquisition of open source software (OSS) components. The cost and effort required will be greatly impacted during the initial planning of the software project. At an early stage there are several incentives for architecture planning in case of waterfall approaches due to the lack of the presence of early functioning release. The commitment towards upfront architecture is found to be meagre during the development process in case of an interactive software process.

4. Influences of stakeholder

The key member roles identification in the project has seen major developments in the recent years. Stakeholder's contribution in various phases of the project has to be facilitated by project managers involved in the project to attain success in the projects. It has been examined widely in the literature that there is not much evidence in the industry practices for the improvement of the outcomes of a project to achieve success through an effective stakeholder interaction mechanism. The quality of a project is influenced by several factors. Nevertheless there has not been a wide examination of the key roles played by the stakeholders apparently in the determination of the project quality levels. The stakeholder's attitudes towards the project according to literature, determines the software quality in a software project or any other project for that matter. Hence it needs to be understood that the quality level of a project will be affected adversely if there is no commitment from major stakeholders in terms of carrying out responsibilities. The involvement of key stakeholders is a key feature during important life cycle stages for the development of the framework for quality improvement. There can be a considerable improvement of the project quality with the improvement of the efficiency and effective control of the process and process management team. For this, possession of critical information about the project is a necessity along with enough capability for accurate analysis of information and relevant project strategy outlining.

5. Risks

The possibility of a loss due to a problem in the near future is called risk. This may or may not happen or occur. The occurrence is attributed to lack of information or lack of control or lack of time or a combination of all or any two of them. When it comes to creating quality software in a specified time and a specified budget, there are several kinds of risks associated. A perceived reward would be needed to compensate for the risks taken by any organization for the risk taking to be worthwhile. The reward needs to be directly proportional to the reward for trying out to take a chance.

5.1 Software development risk

The possibilities of failures occurring in the software development process and to be specific, the product of the risk probability and risk even occurrence with associated losses is known as software development risk. The activities that are necessary for the control and analysis of risks are covered by risk management. The relevance of risks are high with respect to software development

since a negative impact on the development cost is very likely which in turn will have a detrimental effect by threatening the validity of the cost-benefit analysis carried out. This approach gains approach in the growing area of the economics of software. Recently there had been a lot of attention received due to the impact on investment decisions when risk is considered to be a possible cost. Risk identification is one of the most important steps and a possible way of doing it smartly is to create a list of possible known risks. The resultant output is in the form of a list of risks that are project –specific and also have the probability to compromise on the success of the project. Several techniques are available for the identification of risks such as reporting, interviewing, decomposition, critical path analysis, assumption analysis, risk taxonomy utilization etc.

- *Interviewing/Brainstorming:* Voluntary reporting acts as another technique for risk identification where risk identification and reporting to the management of the organization is rewarded suitable and encouraged among individuals *Risk Taxonomies:* Considerations must be there for risk taxonomies which are a list of problems that have already occurred elsewhere in other projects and can act as a checklist to find if potential risks have been taken into consideration.
- *Critical Path Analysis:* Risk identification must be on alert for the performance of critical path analysis for planning of a project.
- *Assumption Analysis:* Analysis of product and process assumptions needs to be done. As an example let us assume that there would be availability of hardware within the system test date or three experienced technical personnel would be hired before the starting time.

5.2 Risk Analysis and Mitigation

While performing risk analysis, assessment of risks is done to determine the following:

- *Likelihood:* Probability of loss due to risk. Impact: Risk turning into a problematic issue due to the risk size or loss due to the cost.
- *Timeframe:* When there is a need for a risk to be addressed (i.e. Higher priority for risks associated with near future activities compared to risks associated with similar risks in later activities) ,losses can be magnified by compounding risk conditions when the assessment of the interrelationship between risks is determined.

The candidature for the risks that could be subject to further action is established through the identification of the risks with the highest probable negative impact, which is done by comparison of the measurement of risk exposure for various risks, while analysing the risks. The risk analysis results forms the basis to provide us with a prioritized list of risks. Given below is a figure representing the risk mitigation methodology or the methods to handle risks.

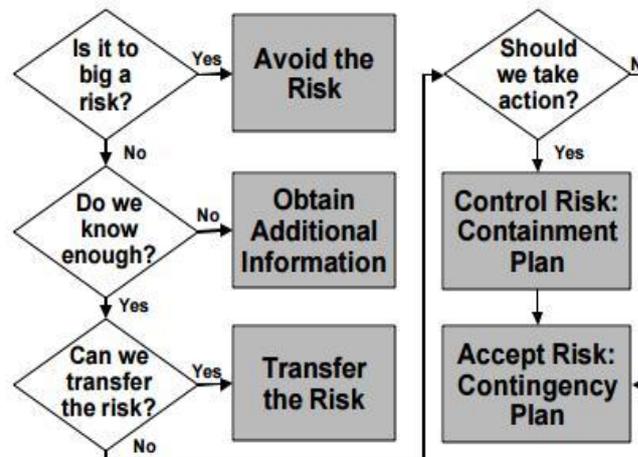


Figure 2. Risk Identification

Some basic techniques for avoiding general risks are:

- In-house development of software. Though it may prove to be slightly more expensive, identify subcontractors who are reliable and who have a proven track record and hand over the projects to them for execution.
- Negotiations can be carried out with the customer for the movement of the control device implementation into a future release of the software and the control device selected could be replaced with a device that is older with an interface that is well defined

5.2.1 Obtain additional information:

- An assessment of the capability of the subcontractor is to be performed. Further references form customers for whom projects have been executed could be asked for which would help in providing the reliability of the products and services provide by him
- Early design specifications for the device can be obtained by established communication links with suppliers of the device. Specifications of the interface are to be researched for information on similar control devices and devices already provide by the same provider.

5.2.2 Transferable risks

- Transfer the risk on to the subcontractor by building penalties into the contract for delivering software that does not have the required or specified reliability.
- Additional charges could be levied on the customer to transfer the risk on the customer in the contract if the customer fails to provide the specifications within the due date

5.2.3 Actionable risk

In Case the subcontractor to whom the project has been given fails to deliver the software at specified levels of reliability which would affect the total system reliability resulting in inability to meet specified performance levels there needs to be a back-up plan. And as a back-up plan, the pre assigning of a project engineer to take care of the requirement and the inspection of the design along with conducting of alpha testing at the site of the subcontractor needs to be done. While integration and system tests are conducted, a report of the defects data needs to be obtained from the subcontractors on a weekly basis.

Safety in terms of execution of a project can be ensured by always having a back-up plan also called as the contingency plan due to the fact that all risks cannot be eliminated at scratch but on the other hand are kept aside temporarily and considered only when a need for the same is identified.

5.2.4 Contingency plans

Risk contingency plans would be the need of the hour in case actions are not taken up to reduce the risks immediately or if the risk actions fail to eliminate or reduce the risks. The contingency plans would be effected only when problems arise out of the risks. Disaster recovery plans, establishment of fall-back positions with the help of external consultants due to non-availability of key personnel or selection of alternate approach due to inability of delivery of promised new technology are cases for contingency plans. The completion of the Critical design Review (CDR) would be the requirement due to an early trigger (reassessment of risk indicated). Major and critical defects that are detected during system testing are identifiers for contingency trigger plans. Liaising between an engineer and the subcontractor is a way of defect resolution and regression test plan implementation for subcontractors' maintenance release, as a contingency plan trigger

6. Earned value project management tool

Given below is the list of essentials required for earned value implementation for a majority of the projects.

6.1 Define work scope

With the help of a work breakdown structure (WBS) the work scope of the project needs to clearly defined. There cannot be a realistic accurate definition of a new job with absolute precision. However we can get close by making certain intelligent assumptions to quantify the work through proper planning, scheduling and confidence. The WBS is one of the most useful tools that is available for the project manager just like the organization chart is to the executive. The WBS give a clear picture of the tasks through the decomposition of the tasks one by one into measurable work packages. This would help in taking decisions regarding make or buy, assessment of risks, planning, scheduling, estimation and authorization to proceed with the project.

6.2 Create an integrated bottom-up plan

An integrated bottom-up plan consisting of detailed measurement cells known as Control Account Plans (CAPs) needs to be pooled along with critical processes along with a detailed scope of the work schedule and estimated requirements. The CAPS constitute a formal bottom-up plan for a project as the earned value management of the project needs to be implemented with CAPs in detail. The CAPs as individual components are a representation of the integration of critical process as a whole for scope of work, planning, scheduling, estimating and authorization. The project performance in total is the sum of the reflections of the detailed CAPs. The measurement of the performance will happen within the detailed CAPs. Hence it can be said that each CAP can be considered as a sub project that comes under the control of a CAP manager who will measure it and manage it.

6.3 Formally schedule CAPs

A formal scheduling system must be in place for scheduling and planning in detail each and every defined CAP. This could be considered the single most important critical tool for implementing the earned value. The approved work scope will be portrayed by the scheduling system of the project through the placement in specific timeframes for performance. The project's planned value will comprise of the scheduled work in terms of the earned value vernacular. The earned value of the projects is the portion of the planned value that is accomplished. It is important to note that the metrics of the earned value as well as the planned value must have the same metrics for measurement for their performance. The scheduling system if the project is critical to the employment of earned value as it acts as the transportation vehicle for the representation of the measurement of the project scope, earned value and planned value. Everyone needs to follow the planned value specified by project manager and act as a vital component of the project as it is constituted from the project master schedule.

6.4 Assign each CAP to an executive for performance

A permanent functional executive must be assigned with one of the defined CAPs which will make the executive committee to oversee each CAPs performance. By nature projects are transient with the permanent organizational structure of the enterprise as they eventually go out of existence after they are authorized, implemented and performed. It is advisable for a senior functional person such as the Vice president or director or at least a manager to adopt one of the defined project CAPs to avail responsible commitment for making the plan happen through functional executives empowered with authority and resources.

6.5 Establish a baseline that summarizes CAPs

The detailed CAPs summations are a representation of the established baseline of the total project performance measurement. Formation of a total baseline against which measurement of performance of the project can happen is the next logical step. All defined CAPs must be included in such baselines along with any reserves held by project managers. If the contingency reserves are held and controlled by senior management committee members instead of the project manager, it should not be brought into the project performance baseline. Generally the baseline includes things such as indirect costs, fee with reference to total authorized project funds, profits obtained etc., in a commercial type of contracts while these will not be a part of the internal projects. The baselines of earned value of projects of most internal projects is the sum of the CAPs defined

6.6 Measure performance against schedule

The scheduled performance of the project is to be measured periodically against its planned master project schedule. The project's planned scope is constituted by the controlled project master schedule that has been issued formally. Estimated resources such as money or time that are embedded into the CAPs that are authorized are loaded through the tasks described in the project master schedule. The quantification of the relationship between the accomplished work in comparison to the scheduled work is something that takes place within the CAPs. The scheduled variance in terms of earned value constitutes the difference between the scheduled work and accomplished work. The project is considered to be falling behind schedule if the value of the scheduled work does not match with the value of the work accomplished which is shown in the form of a negative schedule variance.

The criticality of the project is based on the assessment of each task that is behind schedule. In case of the late task being in the critical path or the case of the task carrying a high risk to the efforts of the project, to put the late task on schedule certain efforts have to be taken. A point to be noted is that the available added resources should not be spent for the acceleration of the performance, if there is a positive variance in the tasks or if it is not considered to be a thing of high risk for the project

6.7 Measure cost efficiency against the costs incurred

A relationship exists between the earned value of the project and the expenses needed for achieving the earned value which is in the form of the project's cost performance efficiency rate that is to be measured periodically. The cost efficiency reading provided by the earned value is the single largest benefit provided by the deployment of earned value. The cost efficiency factor is attained by finding the difference between the value of work performed and the expenses involved in completion of the work.

A condition of overrun is experienced by the project if the income is less than the expenditure on the project and absolute overruns become irrecoverable over a period of time. It has been found that there is deterioration of the overruns expressed as percentage values until mitigation actions for the conditions are taken in the project aggressively. One of the largest benefits reaped is identified to be the cost efficiency rate which has been found to be useably stable from 15% point and gets more stable progressively as it touches the 20-30-40% completion point progressively.

Hence in terms of monitoring an important metric for the project manager or enterprise executive is the cost efficiency factor.

6.8 Forecast final costs based on performance

Performance against the plan stands as a basis to forecast the final cost requirement of a project which is a thing to be done periodically. The earned value comes accompanied with some benefits and one among them is the independent forecasting ability of the final cost of the project at the completion stage which is termed as the “Estimate at completion”. Accurate estimation of funds requirement in total can be determined based on performance of a project against the plan and the project manager can assess the requirement for job completion within a finite range of values. As reflected in figure 1, when the earned-value statistical estimate of a project exceeds the official project estimates for the project completion someone who is a part of the senior management personnel should help in reconciling the professional difference of opinion.

6.9 Manage enduring work

Continuous management of the project backlogs and work needs to be taken up. Process performance improvements are to be got from future works and the brought from tasks that are ahead of the latest status dates. Assessment of accurate measures of performance schedule and measurement obtained till date could be available to the project manager through the earned value.

As a result of this, necessary pressure could be exerted and a more aggressive stand could be taken on the future work by the project manager in case the results obtained do not meet the desired standards. Accurate quantification of the value achieved by a work with the help of earned value will also let the project manager to quantify the work value and at the same time stay within the scope and objectives specified by the management of the organization.

6.10 Baseline change management

Management of baseline changes form an integral and vital part of maintaining the baseline of the project on a continuous basis. During the project duration, the proposed baseline changes are only as good as the measurement baseline of the performance of the project that has been put in place at the start of the project. The elimination or addition of the added scope of work into the base line determines the validity of the baseline performance due to failure of incorporation of changes.

Approval or rejection of changes determines the new changes in the project work that need to be addressed. Changes need to be closely managed and monitored for the validity of the initial baseline to be intact. Challenges faced during the initial scope and definition at the start of the project is equivalent to maintain the project baseline as well.

7. Conclusions

Project planning has been divided into four categories such as quality planning, strategy planning, and process planning and contingency planning. Although these doesn't ensure safe completion of the project thus continuous monitoring and control is needed. Risk's need not be eliminated from the scratch i.e. it can be kept in mind and only be resolved if and only if it is of any danger. Stakeholders play a vital role in project success as they define mission and vision of any project thus stakeholders must be active and constantly look at the progress at every stage. The Earned value project management tool helps to properly plan the project by defining the work space, forming CAPs, managing them, establishing baselines and managing them, and measuring costs and performance against the schedule.

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