Customization of Project Planning and Its Execution

Varsha Vilas Doijad, A. K. Gupta

Abstract*—Project Planning is one of the key functions of Project Management for timely and successful implementation of any project. The time frame available for any industrial project to be executed is very less and to make the matter more difficult the statutory clearance & approvals from government often take longer than expected thus further reducing the available time. This study contributes to project management needs some flexibility during project execution to adjust to emerging needs of the project and to take advantage of increasing knowledge about the nature of the project and the project management becomes flexible, efficient and effective. The purpose of these project management guidelines is to organize, plan and control the projects. They are designed to help to maximize the potential for the projects to succeed by helping the address each element of the project at the right time and to the right level of detail for the size and complexity of the project. Thus the understanding of project planning and its execution in construction is an important part of project management. The priority of success factors identified in this research is not reflected in the literature because in this research, success was defined more broadly than just delay. For example, organizational planning was ranked the most important factor in the literature, but in this research it was ranked the second most important success factor. This discrepancy in the ranking of success factors could be explained in a number of ways. First, this work limited the number of success factors to seven, which may have affected their priority. Secondly, the work focused on the delay factors relevant to the building construction process, whilst the literature mostly identified success factors based on overall construction projects, or on a particular segment of a construction project such as productivity, quality or procurement.

***Index Terms*— Building construction process, Project Management, Success factors, Productivity, Procurement.**

I. INTRODUCTION

Project plan is the basic guideline followed in executing any project and its planning is most instrumental in successful implementation of a Project. Present day projects are facing huge challenges of resource constrains which can be managed through effective Project planning and its implementation. Customization of the Project plan and Schedule based on local input is also a key parameter in successful implementation of any Project. The concepts of implementing 5 S in Project planning and schedule verification also will require a customization check to ensure what we are planning is practically possible which is done through customization check and ascertaining the customization Index for the schedule prepared. Modern day Project management requires innovation at all levels and latest technology implementation to get it implemented in least time and cost. There are two basic phases in project management; the Planning phase and the Controlling phase. Better Planning will make a strong base for effective Control of a project.

In today's project execution, Optimization is the key and emphasis is more on how the execute a Project. Project Planning is one of the key functions of Project Management for timely and successful implementation of any project. The time frame available for any industrial project to be executed is very less and to make the matter more difficult the statutory clearance & approvals from government often take longer than expected thus further reducing the available time.

Large-scale government projects were the impetus for making important decisions that became the basis for project management methodology such as the transcontinental railroad, which began construction in the 1860s. Suddenly, business leaders found themselves faced with the daunting task of organizing the manual labor of thousands of workers and the processing and assembly of unprecedented quantities of raw material. Near the turn of the century, Frederick Taylor (1856–1915) began his detailed studies of work. He applied scientific reasoning to work by showing that labor can be analyzed and improved by focusing on its elementary parts that introduced the concept of working more efficiently, rather than working harder and longer. Taylor's associate, Henry Gantt (1861 - 1919), studied in great detail the order of operations in work and is most famous for developing the Gantt Chart in the 1910s. A Gantt chart is popular types of bar charts that illustrates a project schedule and have become a common technique for representing the phases and activities of a project work breakdown structure, so they can be understood by a wide audience. Although now considered a common charting technique, Gantt charts were considered quite revolutionary at the time they were introduced. Gantt charts were employed on major infrastructure projects including the Hoover Dam and the Interstate highway system and are still accepted today as an important tool in project. (Merrie et al., 2010)

The output from these processes, the project plans, makes up an input to the executing processes. A distinction is made between the project plans proper and the project performance baselines. A work authorization system is a formal procedure for sanctioning project work to ensure that work is done at the right time and in the proper sequence. (Lauri Koskela and Greg Howell, 2002)

II. FACTORS AFFECTING THE EVALUATION METHODOLOGY

Before providing any evaluation methodology, which deal with planning, execution and safety in the project management should be studied with their importance and sensitivity. These factors can be listed broadly as listed below.

Revised Version Manuscript Received on July 20, 2015.

Ms. Varsha Vilas Doijad, Department of Civil Engineering, Sanjay Ghodawat of Institution, Kolhapur, India.

Dr. A.K. Gupta, I/C Principal, Dr. J. J. Magdum College of Engineering, Jaysingpur, India.

A. *Resource Planning*

The resources of an organization consist of people, materials, equipment, knowledge and time. Organizations typically have limited resources; therefore, tradeoffs on what project resources are expended and when are made every day within organizations. A resource allocation plan is an important tool in effective management of scarce resources.

The timing of the need of those resources can be and should be determined within the project schedules. A resource plan, which describes the type of resource needed and the timing of that need, is critical to effective resource management. As the project schedule changes, the resource plan must also be flexible enough to adjust as these changes occur.

This Resource Planning will help you identify the:

- ✓ Types of labor required for the project
- ✓ Roles and key responsibilities for each labor type
- ✓ Number of people required to fill each role
- ✓ Items of equipment to be used and their purposes
- ✓ Types and quantities of equipment needed
- ✓ Total amount of materials needed
- ✓ This Resource Plan will also help you to:
- ✓ Plan the dates for using or consuming these resources
- ✓ Identify the amount of resource required per project activity
- ✓ Create a detailed resource utilization schedule

B. *Material Management*

Materials management is an important element in project planning and control. Materials represent a major expense in construction, so minimizing procurement or purchase costs presents important opportunities for reducing costs. Poor materials management can also result in large and avoidable costs during construction. First, if materials are purchased early, capital may be tied up and interest charges incurred on the excess inventory of materials. Even worse, materials may deteriorate during storage or be stolen unless special care is taken. For example, electrical equipment often must be stored in waterproof locations. Second, delays and extra expenses may be incurred if materials required for particular activities are not available. Accordingly, insuring a timely flow of material is an important concern of project managers.

Materials management is not just a concern during the monitoring stage in which construction is taking place. Decisions about material procurement may also be required during the initial planning and scheduling stages. For example, activities can be inserted in the project schedule to represent purchasing of major items such as elevators for buildings. The availability of materials may greatly influence the schedule in projects with a fast track or very tight time schedule: sufficient time for obtaining the necessary materials must be allowed. In some case, more expensive suppliers or shippers may be employed to save time. Materials management is also a problem at the organization level if central purchasing and inventory control is used for standard items. In this case, the various projects undertaken by the organization would present requests to the central purchasing group. In turn, this group would maintain inventories of standard items to reduce the delay in providing material or to obtain lower costs due to bulk purchasing. This organizational materials management problem is analogous to inventory control in any organization facing continuing demand for particular items.

Materials ordering problems lend themselves particularly well to computer based systems to insure the consistency and completeness of the purchasing process. In the manufacturing realm, the use of automated materials requirements planning systems is common. In these systems, the master production schedule, inventory records and product component lists are merged to determine what items must be ordered, when they should be ordered, and how much of each item should be ordered in each time period. The heart of these calculations is simple arithmetic: the projected demand for each material item in each period is subtracted from the available inventory. When the inventory becomes too low, a new order is recommended. For items that are non-standard or not kept in inventory, the calculation is even simpler since no inventory must be considered. With a materials requirement system, much of the detailed record keeping is automated and project managers are alerted to purchasing requirements. The organization chart are strictly follow to avoid delay in construction and control cost of project as shown in Figure No. 1.

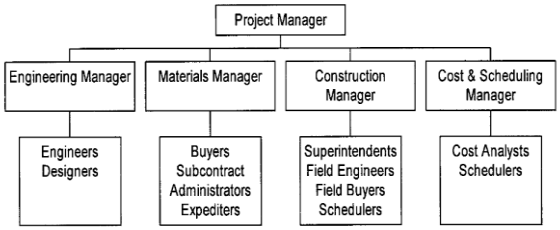


Figure No. 1. Roll of heads in planning

A successful engineering and construction project fulfills the customer's needs while profiting the engineering company. In the current business environment, money is tight and clients are looking for engineering companies that can provide the best product at the lowest cost. Engineering solutions to this problem include using complex analytical tools to quickly create efficient designs, utilizing composite materials and custom designing equipment for optimum output. However, the area most often overlooked in this effort is materials management, which is generally considered to be a support function in engineering companies.

Considering that for a typical industrial facility 10% to 15% of the total cost is for engineering design and 50% to 60% is for equipment and materials, it is obvious that obtaining the equipment and materials at the lowest possible cost will provide the greatest savings.

Materials management is a management system that integrates the traditional areas of purchasing, expediting and controlling the progress of the vendor. It is an essential part of project management and can be integrated with engineering to provide an end product that meets the client's needs and is cost effective. A typical engineer/procure/construct (EPC) project can be divided into seven distinct stages,

during which the project manager must ensure a materials management focus among the project management team. The seven stages are planning, preliminary design, final design, procurement, vendor control, construction and closeout.

C. Quality Management

The Quality Management Plan defines the acceptable level of quality, which is typically defined by the customer, and describes how the project will ensure this level of quality in its deliverables and work processes. Quality management activities ensure that:

- ✓ Products are built to meet agreed- upon standards and requirements
- ✓ Work processes are performed efficiently and are documented
- ✓ Non-conformances found are identified and appropriate corrective action is taken

Quality control activities monitor and verify that project deliverables meet defined quality standards. Quality assurance activities monitor and verify that the processes used to manage and create the deliverables are followed and are effective.

The purpose of developing a quality plan is to elicit the customer's expectations in terms of quality and prepare a proactive quality management plan to meet those expectations. The Quality Management Plan helps the project manager to deliverables are being produced to an acceptable quality level and the project processes used to manage and create the deliverables are effective and properly applied every project delivers something at the end of the project execution. When it comes to the project initiation, the project management and the client collaboratively define the objectives and the deliveries of the project together with the completion timelines.

During the project execution, there are a number of project deliveries made. All these deliveries should adhere to certain quality standards (industry standards) as well as specific client requirements. Therefore, each of these deliveries should be validated and verified before delivering to the client. For that, there should be a quality assurance function, which runs from start to the end of the project. When it comes to the quality, not only the quality of the deliveries that matter the most. The processes or activities that produce deliverables should also adhere to certain quality guidelines as well. As a principle, if the processes and activities that produce the deliverables do not adhere to their own quality standards (process quality standards), then there is a high probability that deliverables not meeting the delivery quality standards.

To address all the quality requirements, standards and quality assurance mechanisms in a project, a document called 'project quality plan' is developed by the project team. This plan acts as the quality bible for the project and all the stakeholders of the project should adhere to the project quality plan.

D. Time Management

There are many reasons why time management is important in construction. One of these is the fact that workers are often paid by the hour, so time management will help control salary costs. Another reason time management in construction is important is that having work delayed or behind schedule can hinder the overall project, especially when one group or company must wait for another company to finish a certain type of work before beginning the next step in the project. Time management in construction also is vital because, if projects are not finished in a timely manner, or at least as quickly as promised, then this can void a contract and cause the construction company to lose payment for breach of contract. Looking into the future, it also is important to have effective time management in place for construction companies, because projects that are not finished on time can derail company efforts to secure bids on other projects, especially if they have a reputation for not being reliable and timely.

In construction, one of the biggest costs besides materials is paying workers. Skilled workers are often paid by the hour. Having effective time management in construction projects includes giving workers reasonable goals, workable time frames and the resources to do their jobs, and expecting them to complete their responsibilities in a timely manner. The more efficiently, accurately and effectively that workers complete their tasks, the lower the overall cost will be.

Time management in construction is important, as well, because construction projects are usually under formal written and legally binding contracts by which they must abide. Workers and supervisors must honor the contracts as written and agreed upon. If a company that is responsible for constructing an office building does not have the project completed by the date agreed on, it may lose part or all of the money it otherwise would have earned because of a breach of contract. Time management, which includes firm goals, is, therefore, essential for construction projects.

Time is a terrible resource to waste. This is the most valuable resource in a project. Every delivery that you are supposed to make is time-bound. Therefore, without proper time management, a project can head towards a disaster. When it comes to project time management, it is not just the time of the project manager, but it is the time management of the project team. Scheduling is the easiest way of managing project time. In this approach, the activities of the project are estimated and the durations are determined based on the resource utilization for each activity. In addition to the estimate and resource allocation, cost always plays a vital role in time management. This is due to the fact that schedule over-runs are quite expensive.

E. Budget Management

For cost control on a project, the construction plan and the associated cash flow estimates can provide the baseline reference for subsequent project monitoring and control. For schedules, progress on individual activities and the achievement of milestone completions can be compared with the project schedule to monitor the progress of activities. Contract and job specifications provide the criteria by which to assess and assure the required quality of construction.

The final or detailed cost estimate provides a baseline for the assessment of financial performance during the project. To the extent that costs are within the detailed cost estimate, then the project is thought to be under financial control. Overruns in particular cost categories signal the possibility of problems and give an indication of exactly what problems are being encountered. Expense oriented construction planning and control focuses upon the categories included in the final cost estimation. This focus is particular relevant for projects with few activities and considerable repetition such as grading and paving roadways as show in Figure No.3.3.

For control and monitoring purposes, the original detailed cost estimate is typically converted to a project budget, and the project budget is used subsequently as a guide for management. Specific items in the detailed cost estimate become job cost elements. Expenses incurred during the course of a project are recorded in specific job cost accounts to be compared with the original cost estimates in each category. Thus, individual job cost accounts generally represent the basic unit for cost control. Alternatively, job costs accounts may be disaggregated or divided into work elements which are related both to particular scheduled activities and to particular cost accounts.

One particular problem in forming a project budget in terms of cost accounts is the treatment of contingency amounts. These allowances are included in project cost estimates to accommodate unforeseen events and the resulting costs. However, in advance of project completion, the source of contingency expenses is not known. Realistically, a budget accounting item for contingency allowance should be established whenever a contingency amount was included in the final cost estimate.

A second problem in forming a project budget is the treatment of inflation. Typically, final cost estimates are formed in terms of real dollars and an item reflecting inflation costs is added on as a percentage or lump sum. This inflation allowance would then be allocated to individual cost items in relation to the actual expected inflation over the period for which costs will be incurred. In the big picture world of project management, ensuring the overall success of a project is a project manager's top priority. If a project goes wildly over-budget (as they often do), it will not be considered a success, even if it's delivered on time and meets end users' needs. That's why project managers need to meticulously manage their budgets. Here are four strategies for maintaining control of your project budget and preventing massive cost overruns.

1. Continually forecast the budget. A project run without frequent budget management and reforecasting will likely be headed for failure. Why? Because frequent budget oversight prevents the budget from getting too far out of hand. A 10 percent budget overrun is far easier to correct than a 50 percent overrun. Your chances of keeping the project on track with frequent review of the budget plan is far greater than if you forecast it once and forget about it.

2. Regularly forecast resource usage. Just as the budget needs to be constantly revisited to keep it on track, you need to do the same for resource usage, since the people working on a project contribute to its cost. Project managers should review the number of people currently working on a project and the project's future resource needs on a weekly basis. Doing so will ensure that you're fully utilizing the resources you have and that you have the right resources ready for the rest of the project. Regularly revisiting the resource forecast will help keep your project budget on track.

3. Keep the team informed. Always keep the project team informed of the project budget forecast. An informed team is an empowered team that takes ownership of the project. By keeping the team informed of the budget status, they will be more likely to watch their project charges and far less likely to charge extra 'gray area' hours to your project (those are the hours that they know they worked by aren't sure what they were working on.)

4. Manage scope meticulously. Scope creep is one of the leading causes of project overruns. As unplanned work finds its way into your project, billable hours mount and the project budget can get out of control. Project managers must carefully manage scope by creating change orders for work that isn't covered by the project's initial requirements. Change orders authorize additional funding for the project to cover the cost of extra work, and thus keep the project to its new budget.

The project budget must be a living part of projects—something project managers review with their teams and their stakeholders on a regular basis. Project managers who carefully watch budgets throughout the lives of their projects will keep stakeholders and management happy and thus experience greater project and career success

F. Environmental Impact

Since construction is considered as one of the main sources of environmental pollution in the world, the level of knowledge and awareness of project participants, especially project managers, with regards to environmental impacts of construction processes needs to be enhanced. One of the main strengths of environmental assessment (EA) is its flexibility. All projects have a planning process in which EA can be integrated. Given its sensitivity to the social and economic as well as environmental impacts of projects, the EA process can be used in a project to accomplish many different objectives.

EA can be effectively employed by project managers to compensate for shortcomings in the project planning process. For example, a project which failed to adequately consult the community at the outset can take advantage of the EA to involve the community in a necessary exchange of ideas and views. The EA can help establish and strengthen decision-making and communication mechanisms within a project. It can also pave the way for introducing innovations.

An EA may reveal sound environmental, social or economic reasons for shifting a project's direction. In view of the primacy accorded the opinions and aspirations of local people, the EA process may also function as a project control mechanism. While the EA should not be expected to correct all the weaknesses of a flawed planning process, when properly designed and executed, it can be a valuable tool for project implementation. When the role of the EA is more restricted, the situation can work in reverse.

Other project planning activities can be used to gather necessary information for the EA and to create support for the EA process. Each project manager must decide how much importance to accord each planning activity.

Most governments and donor agencies acknowledge the contribution of EA to improved project design. The weakness of EA in the past has been largely due to poor techniques and the failure to pay attention to findings at the implementation stage (ESSA Technologies 1994). A review of current environmental practices found the major benefits of the EA process for project sponsors to be (ESSA Technologies 1994: 16): Reduced cost and time of project implementation, cost-saving modifications in project design, increased project acceptance, avoided impacts and violations of laws and regulations, improved project performance and avoided treatment / cleanup costs.

The benefits to local communities from taking part in environmental assessments include: A healthier local environment (forests, water sources, agricultural potential, recreational potential, aesthetic values, and clean living in urban areas). That includes improved human health, maintenance of biodiversity, decreased resource use, fewer conflicts over natural resource use and increased community skills, knowledge & pride.

Given the dearth of research in the field, it is not surprising that there is little information on the cost of carrying out EAs on community development projects. However, we can look to the experience with large projects for some indication of the costs involved. According to the World Bank, the cost of an EA rarely exceeds one percent of the total project cost. Mitigation measures usually account for three to five percent of total project cost. These not include the cost of environmental damage caused by a project which has not undergone an EA. Given the modest budgets of most community development projects, it is imperative to find ways to limit costs. Over time, many believe that the costs of assessing small projects will eventually become proportionate to those of larger ones.

G. Safety:

Our exclusive Contractor Safety Management Process is a powerful, effective approach for companies that are committed to creating and maintaining safe, incident-free construction sites.

III. PROJECT MANAGEMENT EVALUATION PROCEDURE

A. Resource Allocation

Minimizing duration is critical to success in many development projects. Resource allocation policies during such projects determine the fractions of resources that are to be assigned to constituent tasks. The choice of allocation policy can strongly influence project durations. But policies for reduced project duration are difficult to design and implement because of closed loop flows of work that generate dynamic demand patterns and delays in shifting resources among activities. Resource demand estimates and resource adjustment times are two policy features that managers can readily alter to influence project durations. These features are used to describe allocation policies in a relatively simple project model. Myopic and foresighted policies are distinguished by their use (or lack thereof) of rework and multiple backlogs in allocation. Optimal policies under perfect and limited managerial control are described by testing myopic and foresighted policies across a range of project complexities and adjustment times under deterministic and uncertain conditions. Counter-intuitive results from this analysis indicate that minimum resource allocation delay does not produce minimum durations, myopic polices can produce shorter durations than foresighted policies, and increasing uncertainty decreases durations under certain conditions.

B. Resource Smoothening

A scheduling calculation that involves utilizing float or increasing or decreasing the resources required for specific activities, such that any peaks and troughs of resource usage are smoothed out. This does not affect the overall duration. It is also known as time limited resource scheduling. Resource smoothing is used when the time constraint takes priority. The objective is to complete the work by the required date while avoiding peaks and troughs of resource demand. Resource levelling is used when limits on the availability of resources are paramount. It simply answers the question ‘With the resources available, when the work will be finished?’

Few reusable resources are limitless, so the time schedule has to be adjusted to take into account the limited availability of resources over time. There are two approaches to reconciling resource limits and time constraints; resource smoothing (or time limited resource scheduling) and resource levelling (or resource limited scheduling).Resource smoothing is used when the time constraint takes priority. The objective is to complete the work by the required date while avoiding peaks and troughs of resource demand. A smoothed resource profile will be achieved by delaying some work. This will remove some flexibility from the schedule and its ability to deal with unavoidable delays, but the advantage is usually a more efficient and cost-effective use of resources.

C. Inventory Control

Once goods are purchased, they represent an inventory used during the construction process. The general objective of inventory control is to minimize the total cost of keeping the inventory while making tradeoffs among the major categories of costs: (1) Purchase costs, (2) Order cost, (3) Holding costs, and (4) Unavailable cost. These cost categories are interrelated since reducing cost in one category may increase cost in others. The costs in all categories generally are subject to considerable uncertainty.

D. Site Layout

Most construction sites that run into trouble do so for reasons related to managerial factors rather than because of technical problems. The site-based management can make significant improvements in the cost and time savings during the construction process without involving a mass of additional work.

The role of site managers is to control and maintain work performance and then taking actions to rectify situations where performance is unsatisfactory. Site management, in general, involves many tasks, such as site investigation before construction process starts, material delivery and procurement management, keeping better site records, keeping good site communication and high level of information flow, monitoring performance regularly, establishing a well co-ordination system among different parts, and performing a good site layout planning. Among the important tasks of site management is the site layout planning. Extensive time loss and cost overruns could result in large projects, where the number of manpower, subcontractors, and equipment involved are high, if there is no effective and systematic approach to site planning. A detailed planning of the site layout and location of temporary facilities can enable the management to make considerable improvement by minimizing travel time, waiting time, and increasing worker morale by showing better and safer work environment. Due to its importance, this research focuses on the site layout planning problem.

E. Buffer stock (Safety stock)

Safety stock (also called buffer stock) is a term used by logisticians to describe a level of extra stock that is maintained to mitigate risk of stock outs (shortfall in construction material) due to uncertainties in supply and demand. Adequate safety stock levels permit business operations to proceed according to their plans. Safety stock is held when there is uncertainty in demand, supply, or manufacturing yield; it serves as an insurance against stock outs. Safety stock is used as a buffer to protect organization from stock outs caused by inaccurate planning or poor schedule adherence by suppliers. As such, its cost (in both material and management) is often seen as a drain on financial resources that results in reduction initiatives. In addition, time sensitive goods such as food, drink, and other perishable items could spoil and go to waste if held as safety stock for too long. Various methods exist to reduce safety stock; these include better use of technology, increased collaboration with suppliers, and more accurate forecasting

F. Sampling / Testing

Quality Program Manager is responsible for developing the Statistical Sampling Program for the project as well as reviewing and monitoring the implementation of project-specific Statistical Sampling and Testing Plans (SSTP) to ensure consistency and effectiveness. The Project and Construction Management (PCM) teams are responsible for developing and implementing project-specific Statistical Sampling and Testing Plans. In addition, they are responsible for maintaining qualified testing laboratories to carry out the functions of the SSTP. Laboratory managers are responsible for complying with the laboratory qualification requirements developed by the PCMs. Design-Build contractors are responsible for cooperating and coordinating with the Authority's designated statistical sampling and testing personnel and for ensuring their sampling and testing operations are being conducted in accordance with contract requirements.

All samples taken for use in the decision to accept or reject construction or materials shall be random samples. Any contractor testing results used in the acceptance decision must be validated by the PCM's sampling and testing. PCM testing shall be performed on samples that are taken independently of the contractor's samples. In order for a sample to be considered independent, each sample must contain independent information reflecting all sources of variability associated with the material, process, sampling and testing in the test results.

G. ISO Certification

SO 9001:2008 sets out the criteria for a quality management system and is the only standard in the family that can be certified to (although this is not a requirement). It can be used by any organization, large or small, regardless of its field of activity. In fact ISO 9001:2008 is implemented by over one million companies and organizations in over 170 countries. This standard is based on a number of quality management principles including a strong customer focus, the motivation and implication of top management, the process approach and continual improvement.

H. Customer feedback

Assessing your Customer's satisfaction is one of the most crucial aspects of any kind of business. Construction industry is no exception to this.

To put it simply: no happy customer = no business!

This is a detailed Customer Satisfaction Form for use at the end of any Construction Project. It has questions about Health & Safety, Environment & Sustainability, Quality Management, Planning & Program and General Questions

I. Scheduling & Planning of activity

In addition to assigning dates to project activities, project scheduling is intended to match the resources of equipment, materials and labor with project work tasks over time. Good scheduling can eliminate problems due to production bottlenecks, facilitate the timely procurement of necessary materials, and otherwise insure the completion of a project as soon as possible. In contrast, poor scheduling can result in considerable waste as laborers and equipment wait for the availability of needed resources or the completion of preceding tasks. Delays in the completion of an entire project due to poor scheduling can also create havoc for owners who are eager to start using the constructed facilities.

Attitudes toward the formal scheduling of projects are often extreme. Many owners require detailed construction schedules to be submitted by contractors as a means of monitoring the work progress. The actual work performed is commonly compared to the schedule to determine if construction is proceeding satisfactorily. After the completion of construction, similar comparisons between the planned schedule and the actual accomplishments may be performed to allocate the liability for project delays due to changes requested by the owner, worker strikes or other unforeseen circumstances.

J. Progress on work

Despite considerable attention by researchers and practitioners, the process of construction planning and scheduling still presents problems and opportunities for improvement. The importance of scheduling in insuring the effective coordination of work and the attainment of project deadlines is indisputable. For large projects with many parties involved, the use of formal schedules is indispensable.

The network model for representing project activities has been provided as an important conceptual and computational framework for planning and scheduling. Networks not only communicate the basic precedence relationships between activities, they also form the basis for most scheduling computations.

K. Updating of the delays in construction activity

Scheduling and project planning is an activity that continues throughout the lifetime of a project. As changes or discrepancies between the plan and the realization occur, the project schedule and cost estimates should be modified and new schedules devised. Too often, the schedule is devised once by a planner in the central office, and then revisions or modifications are done incompletely or only sporadically. The result is the lack of effective project monitoring and the possibility of eventual chaos on the project site.

On "fast track" projects, initial construction activities are begun even before the facility design is finalized. In this case, special attention must be placed on the coordinated scheduling of design and construction activities. Even in projects for which the design is finalized before construction begins, change orders representing changes in the "final" design are often issued to incorporate changes desired by the owner.

L. Estimation:

The costs of a constructed facility to the owner include both the initial capital cost and the subsequent operation and maintenance costs. The magnitude of each of cost components depends on the nature, size and location of the project as well as the management organization, among many considerations. The owner is interested in achieving the lowest possible overall project cost that is consistent with its investment objectives.

It is important for design professionals and construction managers to realize that while the construction cost may be the single largest component of the capital cost, other cost components are not insignificant. For example, land acquisition costs are a major expenditure for building construction in high-density urban areas, and construction financing costs can reach the same order of magnitude as the construction cost in large projects such as the construction of nuclear power plants.

M. Source of finance

The cycle begins with the initial conception of the project and continues through planning, design, procurement, construction, start-up, operation and maintenance. The basic concepts of facility investment evaluation, including time preference for consumption, opportunity cost, minimum attractive rate of return, cash flows over the planning horizon and profit measures. Methods of economic evaluation, including the net present value method, the equivalent uniform annual value method, the benefit-cost ratio method, and the internal rate of return method.

In setting out the engineering economic analysis methods for facility investments, it is important to emphasize that not all facility impacts can be easily estimated in dollar amounts. For example, firms may choose to minimize environmental impacts of construction or facilities in pursuit of a "triple bottom line:" economic, environmental and social. By reducing environmental impacts, the firm may reap benefits from an improved reputation and a more satisfied workforce. Nevertheless, a rigorous economic evaluation can aid in making decisions for both quantifiable and qualitative facility impacts.

It is important to distinguish between the economic evaluation of alternative physical facilities and the evaluation of alternative financing plans for a project. The former refers to the evaluation of the cash flow representing the benefits and costs associated with the acquisition and operation of the facility, and this cash flow over the planning horizon is referred to as the economic cash flow or the operating cash flow.

N. Financial analysis

A profit measure is defined as an indicator of the desirability of a project from the standpoint of a decision maker. A profit measure may or may not be used as the basis for project selection. Since various profit measures are used by decision makers for different purposes, the advantages and restrictions for using these profit measures should be fully understood.

There are several profit measures that are commonly used by decision makers in both private corporations and public agencies. Each of these measures is intended to be an indicator of profit or net benefit for a project under consideration. Some of these measures indicate the size of the profit at a specific point in time; others give the rate of return per period when the capital is in use or when reinvestments of the early profits are also included. If a decision maker understands clearly the meaning of the various profit measures for a given project, there is no reason why one cannot use all of them for the restrictive purposes for which they are appropriate. With the availability of computer based analysis and commercial software, it takes only a few seconds to compute these profit measures. However, it is important to define these measures precisely:

O. Rain water harvesting

RAINWATER HARVESTING is a process involving collection and storage of rain water (with the help of artificially designed system) that runs off natural or man-made catchment areas e.g. roof top, compounds, rock surface or hill slopes or artificially repaired impervious/semi-pervious land surface. Undoubtedly a number of factors contribute to the amount of water harvested e.g. the frequency and the quantity of rainfall, catchments characteristics,

water demands and the quantum of runoff, and above all speed and ease with which the rainwater percolates through the subsoil to recharge the ground water.

Due to deforestation and the consequent ecological imbalance, the water level beneath the ground is being depleted day by day. As known to all, the constant rising demand of water supply, especially from the urban areas does not match with the surface water sources, as a result of which the water reserves beneath the ground level are overexploited. This consequently results in the water level depletion.

P. Eco friendly material

Today many people that are building or remodeling their houses choose to use eco-friendly building materials. An eco-friendly building material is one that increases the efficiency of energy used and reduces impact on human well-being and the environment. There are many different materials that can be used that are eco-friendly; from foundation, to insulation, to interior and exterior wall finishes, flooring, and countertop materials. Phenomenal growth in the construction industry that depends upon delectable resources. Production of building materials leads to irreversible environmental impacts. To manage our business operations to prevent pollution including climate change, criteria are taken into account in the procurement of goods and services. Be a respectful neighbor by minimizing the impact that our activities, sites and premises have on local communities protect and, where feasible, enhance biodiversity on sites and premises where we hold responsibility or can influence those who do seek to influence our clients to adopt, and our designers to provide, solutions that benefit the environment

Q. Safety

As with all the other costs of construction, it is a mistake for owners to ignore a significant category of costs such as injury and illnesses. While contractors may pay insurance premiums directly, these costs are reflected in bid prices or contract amounts. Delays caused by injuries and illnesses can present significant opportunity costs to owners. In the long run, the owners of constructed facilities must pay all the costs of construction. For the case of injuries and illnesses, this general principle might be slightly qualified since significant costs are borne by workers themselves or society at large. However, court judgments and insurance payments compensate for individual losses and are ultimately borne by the owners.

The largest single category for both injuries and fatalities are individual falls. Handling goods and transportation are also a significant cause of injuries. From a management perspective, however, these reported causes do not really provide a useful prescription for safety policies. An individual fall may be caused by a series of coincidences: a railing might not be secure, a worker might be inattentive, the footing may be slippery, etc. Removing any one of these compound causes might serve to prevent any particular accident. However, it is clear that conditions such as unsecured railings will normally increase the risk of accidents.

Various measures are available to improve jobsite safety in construction. Several of the most important occur before construction is undertaken. These include design, choice of technology and education. By altering facility designs, particular structures can be safer or more hazardous to construct. For example, parapets can be designed to appropriate heights for construction worker safety, rather than the minimum height required by building codes.

Choice of technology can also be critical in determining the safety of a jobsite. Safeguards built into machinery can notify operators of problems or prevent injuries. For example, simple switches can prevent equipment from being operating when protective shields are not in place. With the availability of on-board electronics (including computer chips) and sensors, the possibilities for sophisticated machine controllers and monitors has greatly expanded for construction equipment and tools. Materials and work process choices also influence the safety of construction. For example, substitution of alternative materials for asbestos can reduce or eliminate the prospects of long term illnesses such as asbestiosis.

Educating workers and managers in proper procedures and hazards can have a direct impact on jobsite safety. The realization of the large costs involved in construction injuries and illnesses provides a considerable motivation for awareness and education. Regular safety inspections and safety meetings have become standard practices on most job sites.

Pre-qualification of contractors and sub-contractors with regard to safety is another important avenue for safety improvement. If contractors are only invited to bid or enter negotiations if they have an acceptable record of safety (as well as quality performance), then a direct incentive is provided to insure adequate safety on the part of contractors.

R. Project management evaluation procedure

Evaluation procedure is carried in two stage i.e. Stage 1; Screening Phase and Stage 2; Detailed Evaluation Phase. The various steps included in these stages are given below.

Stage 1; Screening Phase

- ✓ Step: 1. Visual inspection and examination of as-built information by collecting existing data (owner, contractor and consultant)
- ✓ Step: 2. Critical Success Factors (CSF) is calculated by considering all these factors such as Resource Planning, Material Management, Quality Management, Time Management, Budget Management, Environmental Impact and Safety which is directly related to performance of planning during execution of project as per the details

Stage 2; Detailed Evaluation Phase:

- ✓ Step: 1. Identify the main deficiencies from the screening phase.
- ✓ Step: 2. Perform detailed analysis for the main deficiencies in Resource Planning, Material Management, Quality Management, Time Management, Budget Management, Environmental Impact and Safety by manually or using any software to determine the critical path to improved performance of planning and its execution of project.

IV. PROJECT MANAGEMENT EVALUATION OF EXISTING BUILDINGS

To illustrate the procedure of evaluation by the proposed method three example buildings are taken. The three buildings chosen are located in Sangali, Pune. Following are the building chosen for evaluation.

Two of the buildings chosen in Tire II city (Pune) and two are chosen in Tire III cities like Sangali and Kolhapur. To compare the proposed evaluation procedure with the other available procedures, the example buildings are also evaluated using these procedures.

Rohan Kritika is a powerful blend of state-of-the-art amenities, innovative features and architectural detail. Together, they create a piece of art, a living experience that transforms. This project boasts of eco-friendly homes with a strong emphasis on aesthetics, designed to alleviate the senses. Each home has been thoughtfully designed to provide a peaceful experience composed of airy, unadulterated views of the horizon with natural light washing over the space. Providing a wholesome experience both mentally and spiritually, the landscape is a mix of soft, blue waters, lush greenery and strong lines. Sitting in the middle of the complex surrounded by pools of water, is the breathtaking landscaped garden with innovative features.

Leher literally means a gust of wind. The central idea behind Rohan Leher - II is open spaces, wind and even more wind. This stunning masterpiece is spread over 3.5 acres. It has been designed with strong architectural practices in place where the use of wind, natural light and space has contributed in creating a place that lives, that breathes and is one with you. The grand entrance plaza, at once gives you a complete view of the buildings, green gardens and the open sky. This expansive view is welcoming and homely and as is with most Rohan Properties, not a vehicle in sight. Maintaining the sanctity of a home, the property is built in a manner that does not allow vehicles on the ground floor. This ensures a cleaner, quieter and safer environment.

At Present “Hirashree Lake City” is the biggest Township in Kolhapur near Rankala Lake. Aesthetically spread over 7.5 acres of land, this project full of grandeur is an outcome of Shree Builders and Developers’ successful journey of 21 years. This township with 8 towers and 24 twin bungalows is all set to be a charming feather in Kolhapur’s cap. The organization is awarded with ISO 9001-2008. The Company is known for its quality construction, standards and also for its ethics, transparency, reliability, professionalism and reflexivity

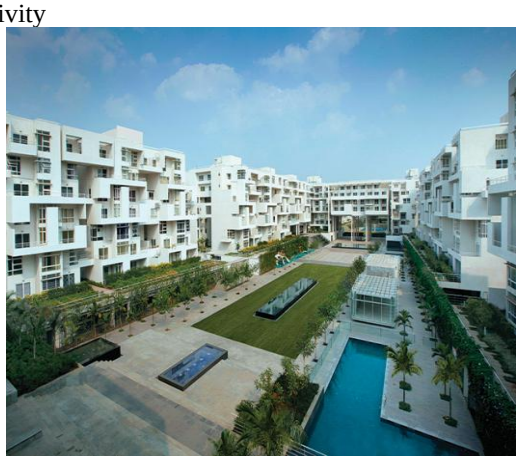


Figure No.2: 3D view of Rohan Laher 2, Baner, Pune

Figure No.3: 3D view of Hirashree Lake City Project

Table No. 2. Evaluation Sheet of Project Rohan Kritica, Pune

SHEET NO. 01

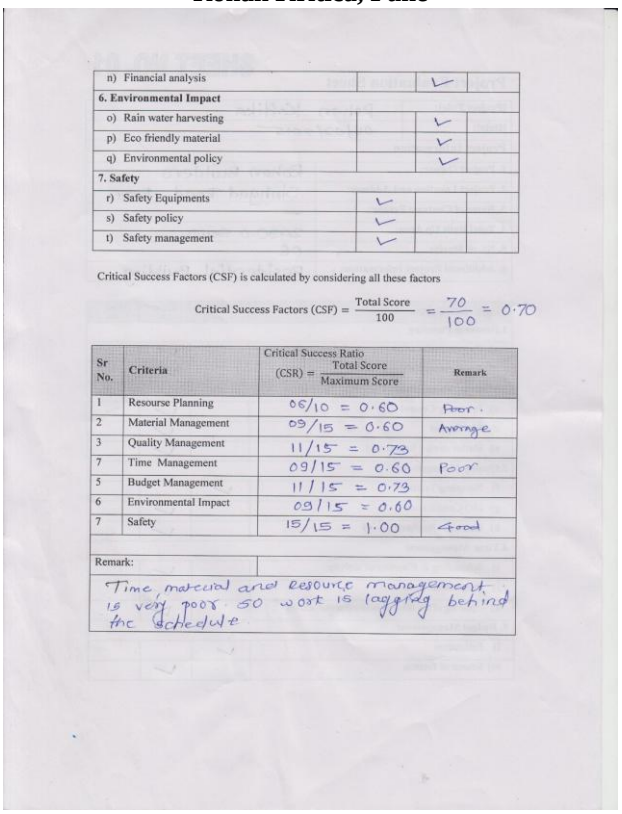
Project Evaluation Sheet

[Project Title]:	Rohan Kritika
[Date]:	09/02/2015
Project Information	
1. Project Owner:	Rohan Builders
2. Project Location and Address:	Sinhgad Road, Pune
3. Name of Contract Person:	—
4. Total Built Up Area:	2430.0 Sqm
5. No. of Storey:	08
6. Additional Project Information:	Residential Building

Project Information	Very Good (5)	Good (3)	Poor (0)
1.Resourse Planning			
a) Resource allocation		✓	
b) Recourse smoothing		✓	
2.Material Management			
c) Inventory Control		✓	
d) Site Layout		✓	
e) Buffer stock (Safe stock)		✓	
3.Quality Management			
f) Sampling/Testing	✓		
g) ISO Certification		✓	
h) Customer feedback		✓	
4.Time Management			
i) Scheduling & Planning of activity		✓	
j) Progress on work		✓	
k) Updating of the delayed in construction activity		✓	
5. Budget Management			
l) Estimation	✓		
m) Source of finance		✓	

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

Table No. 3. Critical Success Factors (CSF) of Project Rohan Kritica, Pune



n) Financial analysis		✓	
6. Environmental Impact			
o) Rain water harvesting		✓	
p) Eco friendly material		✓	
q) Environmental policy		✓	
7. Safety			
r) Safety Equipments	✓		
s) Safety policy	✓		
t) Safety management	✓		

Critical Success Factors (CSF) is calculated by considering all these factors

$$\text{Critical Success Factors (CSF)} = \frac{\text{Total Score}}{100} = \frac{70}{100} = 0.70$$

Sr No.	Criteria	Critical Success Ratio (CSR) = Total Score / Maximum Score	Remark
1	Resourse Planning	06/10 = 0.60	Poor.
2	Material Management	09/15 = 0.60	Average
3	Quality Management	11/15 = 0.73	
7	Time Management	09/15 = 0.60	Poor
5	Budget Management	11/15 = 0.73	
6	Environmental Impact	09/15 = 0.60	
7	Safety	15/15 = 1.00	Good

Remark:

Time, material and resource management is very poor. So work is lagging behind the schedule

V. CONCLUSION

This work has demonstrated that there is strong agreement between groups (owners, contractors, and engineers) on the correlation between critical delay factors and critical success factors. This leads us to conclude that owners, contractors and engineers are largely in agreement with regards to their evaluation of success factors that avoid delay factors. In this research a new hierarchy scheme for the seven critical success factors in avoiding the identified critical delay factors has been created, based on the importance of critical success factor outcomes from this research. The critical success factors for the building construction process will address the gap in the research literature in the construction industry.

This discrepancy in the ranking of success factors could be explained in a number of ways. First, this work limited the number of success factors to seven, which may have affected their priority. Secondly, the work focused on the delay factors relevant to the building construction process, whilst the literature mostly identified success factors based on overall construction projects, or on a particular segment of a construction project such as productivity, quality or procurement. Thirdly, the target project was a public project, and was evaluated by different project participants. The literature on critical success factors focused on private projects, or both public and private projects. Finally, this study was also restricted to the building construction industry, with its different environmental, political and cultural issues. Given the research circumstances and conditions, the hierarchy derived from this study is consistently supported by the results from all three groups (owners, contractors and engineers).

ACKNOWLEDGMENT

First of all I would like to thank Dr. A.K. Gupta who is presently working as I/C Principal of Dr. J. J. Magdum College of Engineering, Jaysingpur for guiding me throughout this dissertation work. I am extremely grateful to him for all his invaluable guidance and kind suggestions during all the phases of my dissertation work. His ever encouraging attitude, guidance and whole hearted help were biggest motivation for me in completing this dissertation work.

I am thankful to the Chairman Mr. Vijayraj J. Magdum of Dr. J. J. Magdum Trust, Jaysingpur, for their encouragement. Also I am thankful to Prof. D. B. Desai Head, Department of Civil Engineering for providing necessary facilities for completion of this dissertation work.

REFERENCES

1. Arditi D., Gunayadin H.M (1998), Factors that affect process quality in the life cycle of building projects, Journal Construction Eng Manage, ASCE 124(3) pp 194-203
2. Baker, B.N., D.C. Murphy and D. Fisher (1988). Factors affecting project success. International Project Management Handbook ed. 2nd edition 902 -919, New York
3. Belout A. (1998), Effects of human resource management on project effectiveness and success: towards a new conceptual framework, International Journal of Project Management, Vol.16 (1), pp. 21-26
4. Bennett, F.L., (2003). "The Management of Construction: A Project Lifecycle Approach." Oxford: Butterworth Heinemenn
5. "Building Information Model (BIM)" by Project Execution Planning Guide published in The Computer Integrated Construction Research Group - Version 2 (April 2010)
6. Elkingtin P. and Sallman C., (2002). "Managing project risks: a case study form the utilities sector". International Journal of Project Management. Vol. 20, No. 1, pp. 49-57
7. Ewelina Gajewska, Mikaela Ropel (2011). "Risk Management Practices in a Construction Project – a case study." Master of Science Thesis in the Master's Programme Design and Construction Project Management, Department of Civil and Environmental Engineering, Division of Construction Management, Chalmers University of Technology, Sweden 2011, Master"s Thesis 2011:47.
8. Gena L. Abraham. (2003), Critical success factors for the construction industry, Construction research congress, winds of change: integration and innovations in construction, proceedings of the congress, pp 521-529
9. Lauri Koskela and Greg Howell (2002), the theory of project management: Explanation to novel methods" Proceedings IGLC-10, Gramado, Brazil
10. Merrie Barron, PMP, CSM, Andrew R. Barron "Project Management 101" (2002)
11. Mohan V. Tatikonda (1999) "Successful execution of product development projects" in the effects of project management formality, autonomy and resource flexibility by, Kenan-Flagler Business School, University of North Carolina at Chapel Hill
12. Randall L Englund "Project Portfolio Management", Organic approach to project management journal (August, 2008)

AUTHORS PROFILE

Ms. Varsha Vilas Doijad, Assistant Professor, Department of Civil Engineering, Sanjay Ghodawat of Institution, Kolhapur, India, Area of Specialization: Construction Management

Prof. Anil Kumar Gupta, I/C Principal, Dr. J. J. Magdum College of Engineering, Jaysingpur, India, Area of Specialization: Construction Management Distinguished Indian Award by Cafet Innova Technical Society, Hyderabad Best Social Service Award for contributions to Technical Education by Rotary District 370