## ABSTRACT

PROJECT MANAGEMENT: A Profession, role and activity

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This thesis analyzes the fundamentals of project management and intends to present a realistic look at the challenges of the project environment and the skills needed to successfully bring a project to fulfillment. The tools and techniques of project management adopted by organizations are examined and a real world application is added to reinforce the study. General framework of project management is studied and project management phases are discussed in detail. The differences between projects and ongoing operations are emphasized and modern issues like quality management, risk management and communications management are explained. Project management is recognized as a professional discipline that contributes significant competitive advantages to any enterprise.

Key words: Planning, estimating, scheduling, budgeting, work breakdown structure

# ÖZET

PROJE YÖNETİMİ: İş, rol ve aktivite

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Bu çalışma proje yönetimi esaslarını analiz etmekte ve proje ortamındaki zorluklara ve bir projenin başarıyla gerçekleştirilmesi için gerekli olan becerilere gerçekçi bir bakış sunmaktadır. Şirketler tarafından benimsenen proje yönetimi araç ve teknikleri incelenmiş ve çalışmayı desteklemek amacıyla gerçek bir proje örneği çalışmaya eklenmiştir. Proje yönetimi genel çatısı ve proje yönetim aşamaları incelenmiştir. Projeler ve süregelen operasyonlar arasındaki farklar belirtilmiş ve kalite yönetimi, risk yönetimi ve iletişim yönetimi gibi modern kavramlar açıklanmıştır. Proje yönetimi, herhangi bir organizasyona rekabetçi avantajlar sağlayan profesyonel bir disiplin olarak tanımlanmaktadır.

Anahtar kelimeler: Planlama, tahminleme, zaman çizelgeleme, bütçeleme, iş ayrışım yapısı

To My Parents

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# CHAPTER I

## INTRODUCTION

Before understanding the new interest in project management and project-driven organizations, we must first understand the concept of projects. Projects are all the work which is done *one time*. Whether it is designing an aircraft, building a multi-complex fitness centre, or creating a business logo, every project produces an outcome and every project has a beginning and an end. Fundamental to understanding the importance of projects is realizing that each one produces something unique. So designing and tooling up to build a new sports car is a project, but manufacturing thousands of them is not. Manufacturing and other repetitive processes are defined as *ongoing operations*. They have the opposite characteristics of projects in that they have no end and they produce similar, often identical, products.

"As more repetitive jobs are replaced by automation, it is becoming increasingly necessary to be able to lead change. Economically, the arguments for understanding project management are even stronger. People and companies that innovate, create and lead change, enjoy higher incomes and profit margins than those companies that compete based on economies of scale and efficiency. We live in a world where change and the rate of change are constantly increasing. In order to survive and prosper, organizations need to continually modify their products and services. Projects are the means by which these innovations are effected." [1]

Project management has gone beyond being merely a personal skill set. It is now considered as an organizational competency. Whether someone is in charge of increasing the firm's total project management capability or playing a role on a project, people contribute to the firm's ability to effectively complete projects.

Project management is not a new concept. The pyramids and aqueducts of antiquity certainly required the coordination and planning skills of a project manager. While supervising the building of the famous cathedrals, they experienced all the torments of a modern-day project manager: incomplete specifications, insufficient labour, unsure funding, and a powerful customer. But only in the 20$^{th}$ century did the title and discipline emerge.

Much of modern project management was defined in the 1950s, on the major cold war defence programs. As a result, the discipline grew up within the aerospace and defence industries, but in the 1990s project management broke out of its traditional

boundaries. It is now a recognized and valued skill set in organizations across the spectrum, from health care to manufacturing, software to natural resources.

### 1.1. Project Management Overview

The use of projects and project management continues to grow in our society and its organizations. We are able to achieve goals through project organization that could be achieved only with the greatest of difficulty if organized in traditional ways.

APMBOK (Association of Project Management body of knowledge) defines project management as "The process by which projects are defined, planned, monitored, controlled and delivered such that the agreed benefits are realized." [2] Projects are unique, transient endeavours undertaken to achieve a desired outcome, whether a product or service.

"A project is a one-time and temporary activity, and this property contrasts with processes, or operations, which are permanent or semi-permanent ongoing functional work to create the same product or service over and over again. The management of these two systems is often very different and requires varying technical skills and philosophy, hence requiring the development of project management." [3]

The first challenge of project management is to ensure that a project is delivered within defined constraints. The second challenge is to optimize allocation and integration of inputs needed to meet pre-defined objectives.

Cost, time, and quality are the three primary variables and the constraints of a project. If we change one or more variables, the remaining ones will also change. For example, if the amount of time and money available for a project are reduced, this will almost certainly limit the quality of the product. Similarly, to deliver the same quality in a shorter period will cost more. The challenge is to balance these variables to create the optimal cost-schedule-quality equilibrium.

Project management can be a profession, a job, a role or an activity. Depending on how an organization is structured, what its culture is, and what the goals of the project are, project management can be an informal or highly defined role. The project management activity is leading the team in figuring out what the project is (planning, scheduling, and requirements gathering), shepherding the project through design and development work, and driving the project through to completion.

The big challenges like project vision, feature lists, and schedules always come down to lots of little challenges that are positively influenced by how easily good knowledge and information flow through a team. Project managers play a critical role in making that flow active and healthy.

"Whether it is little or big things, the actions and decisions managers make should have clear benefits for the entire team. It might take a week or a month to become visible, but a good project manager will create a positive impact on the quality of the work produced, and often the quality of life experienced by everyone involved. In the

end, project management is about using any means necessary to increase the probability and speed of positive outcomes.” [4]

## 1.2. The History of Project Management

Project management, as an idea, goes back a very long way. If we think about all the things that have been built in the history of civilization, we have thousands of years of project experience to learn from.

The history of projects reveals that most projects have strong similarities. They have requirements, designs and constraints. They all depend on communication, decision making and combinations of creative and logical thinking. Projects usually involve a schedule, a budget and a customer. Most importantly, the central task of projects is to combine the works of different people into a singular coherent whole that will be useful to project or customers.

“As a discipline, project management developed from different fields of application including construction, engineering, and defence. In the United States, the forefather of project management is Henry Gantt - called the father of planning and control techniques - who is famously known for his use of the bar chart as a project management tool and for his study of the work and management of navy ship building.” [5] His work contributed to most of the modern project management tools including the work breakdown structure (WBS).

"The 1950s marked the beginning of the modern project management era. Again, in the United States, prior to the 1950s, projects were managed on an ad hoc basis using mostly Gantt charts, and informal techniques and tools. At that time, two mathematical project scheduling models were developed: (1) the "Program Evaluation and Review Technique" or PERT, developed by Booz-Allen & Hamilton as part of the United States navy's Polaris missile submarine program; and (2) the "Critical Path Method" (CPM) developed in a joint venture by both DuPont Corporation and Remington Rand Corporation for managing plant maintenance projects. These mathematical techniques quickly spread into many private enterprises." [6]

Project Management Institute (PMI) was formed in 1969, to serve the interest of the project management professionals. "The premise of PMI is that the tools and techniques of project management are common even among the widespread application of projects from the software industry to the construction industry. In 1981, the PMI Board of Directors authorized the development of what has become the *A Guide to the Project Management Body of Knowledge* (PMBOK), containing the standards and guidelines of practice that are widely used throughout the profession. The International Project Management Association (IPMA), founded in Europe in 1967, has undergone a similar development and instituted the IPMA Project Baseline. Both organizations are now participating in the development of a global project management standard." [7]

# CHAPTER II

# PROJECT MANAGEMENT STEPS

## 2.1. Defining the Project / Initiation

Project initiation is the process of formally launching a project. The project manager verifies that all the information needed to begin the project is on hand, and he/she summarizes the information in the *project charter* which is the sole deliverable from this phase.

Defining the project is surely one of the most important phases of project management where stakeholders, rules, project charter, statement of work, responsibility matrix, communication plan, and project proposal are issued.

In figure 2.1, initiation process can be seen in a block diagram showing all the phases in project management.

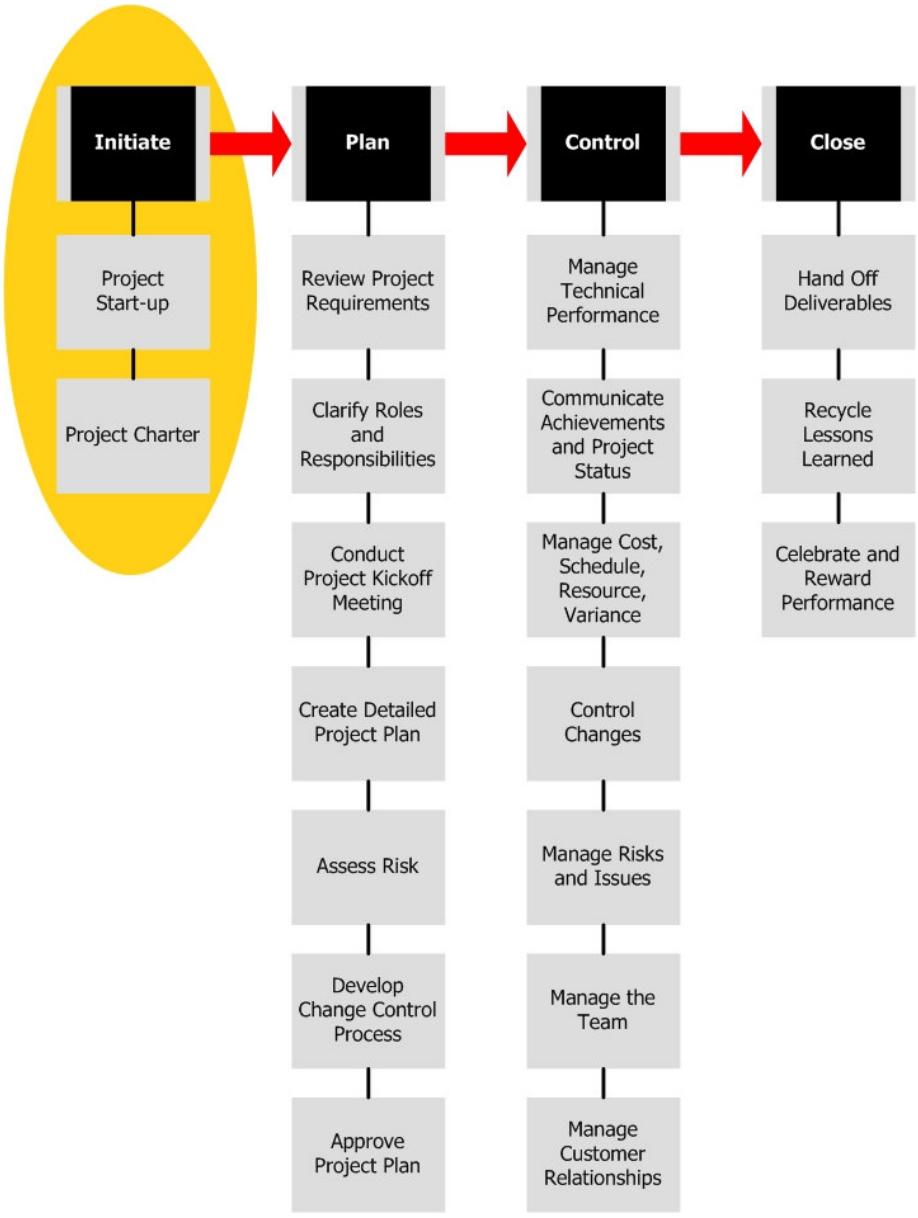



Figure 2.1 - Process block diagram with the initiation step highlighted. *Source*: Cook, Curtis R. (2005)

## 2.2. Stakeholders

Usually, it seems as though technology does all the heavy lifting in our economy. However, a closer look reveals that it is always *people* who make the technology produce. On projects, these movers and shakers are called *stakeholders*, because they all have a part in the project. The first task of a project manager is to identify these stakeholders.

Customers, decision makers, vendors, and employees obviously belong to this group, but, in a larger sense, anyone who participates in the project or is influenced by its results is a stakeholder.

Identifying stakeholders is a primary task because all the important decisions during the definition and planning stages of the project are made by these stakeholders. These are people who, under the guidance of the project manager, establish agreements on the goals and constraints of the project, construct the strategies and schedules, and approve the budget.

First project success factor states that the project team, customer, and management must all agree on the goals of the project. Satisfying all stakeholders is a tough target, particularly if they pop up later in the project with new demands and requirements. This is why it is critical for project managers to know from the start exactly who the stakeholders are and what they expect.

"Project managers may have to satisfy each stakeholder, but they will also receive valuable contributions from each one. All parties involved in a project have a vital interest in the project's success and each has an essential contribution to make. Whether it is authority, funding, or expertise in product requirements, all contributions are needed to ensure success." [8]

## 2.3. The Rules

The need for project rules is part of the challenge of each new project. Since each one is different, it is necessary to re-create the basic roles and processes of management every time a project begins.

All project management activities flow from and depend on these rules, which is why there must be general acceptance of the project rules before the project begins. All the stakeholders must agree on the goals and guidelines of the project. Without these documented agreements, project goals and constraints might change every day. They are the guidelines that orchestrate all aspects of the project.

## 2.4. Project Charter

Since projects are unique and temporary, a project manager's position and authority are temporary. When a project begins, most of the people and organizations necessary for its success don't even know it exists. Without formal recognition, the project manager might operate mysteriously and without supervision, but with far less spectacular results. That is why a project charter is so important; it brings the key players out into the open where everyone can see them.

A project charter announces that a new project has begun. The purpose of the charter is to demonstrate management support for the project and the project manager. It is a simple yet powerful tool. As an announcement, it can take the form of an e-mail or a physical, signed document. It contains the name and purpose of the project, the project manager's name, and a statement of support from the issuer. The charter is sent to everyone who may be associated with the project, reaching as wide an audience as practical because its intent is to give notice of the new project and new project manager.

A sample project charter can be seen below:

| | |
|---|---|
| **Project name:** | **Sponsor:** |
| **Project manager:** | **Date:** |

This charter serves to announce the initiation of the [project name] project. We are undertaking this project [project background and purpose is described].

[Project manager's name] has been selected to lead this project.

Please provide your complete cooperation to the project and to [project manager's name].

Thank you

## 2.5. Statement of Work

Clearly documented and accepted expectations begin with the statement of work (SOW). It lists the goals, constraints, and success criteria for the project – simply rules of the game. The statement of work, once written, is then subject to negotiation and modification by the stakeholders. Once they formally agree to its content, it becomes the rules for the project.

The statement of work is similar to a contract in that each is a tool that clarifies responsibilities and actions in a relationship. The difference is in the audience each one is aimed at. While a contract is a formal agreement between two legal entities, an SOW is directed solely at stakeholders from the same legal entity.

## 2.6. Responsibility Matrix

A statement of work answers many questions about a project, including the purpose, scope, deliverables, and the chain of command. There is, however, a need for another document that precisely details the responsibilities of each group involved in a project. This is called a *responsibility matrix*. The importance of this document is growing as corporations reengineer themselves and form partnerships and virtual companies. In these kinds of environments, many groups that otherwise might have nothing to do with each other are brought together to work on projects. A responsibility matrix is ideal for showing cross-organizational interaction.

## 2.7. Communication Plan

People make projects happen; they solve problems, make decisions, and draw results. It is the job of the project manager to encourage other people to be more productive. Through agreements, plans, recommendations, status reports, and other means, a project manager coordinates and influences all the stakeholders while giving them the information they need to be more productive. He/she also manages customer expectations. No matter what the task is, every action of a project manager includes communication. Careful planning reduces the risk of a communication breakdown.

"A *communication plan* is the written strategy for getting the right information to the right people at the right time. The stakeholders identified on the statement of work, the organization chart, and the responsibility matrix are the audience for most project communication. However, on every project, stakeholders participate in different ways, so each has different information requirements." [9]

## 2.8. Project Proposal

The basic content of the project proposal overlaps the content found in the statement of work. Both are used to move a project from an inspiration to a tangible, achievable goal. Since the proposal is written first, any overlap with the statement of work represents an opportunity to either verify and earlier assumption or to develop that topic in greater detail. The content of the project proposal covers many topics that will be investigated in greater detail further along in the project.

The proposal content will vary dramatically depending on the industry and the size of the project. However, these are the minimum topics that must be shown on the proposal as informative as possible:

- **Project goal:** The specific desired results from the project over a specified time must be stated.
- **Problem/opportunity definition:** The problem/opportunity must be described without suggesting a solution. The people approving the project must understand the fundamental reason the project is being undertaken.
- **Proposed solution:** It must be described what the project will do to address the problem/opportunity, being as specific as possible about the boundaries of the solution such as what organizations, business processes, information systems, and so on will be affected.
- **Cost-benefit analysis:** This section summarizes the financial reasons for taking on the project. It consists of an analysis of the expected benefits in comparison to the costs with an attempt to quantify the return on investment. Tangible and intangible benefits, required resources, and financial return must be addressed.
- **Business requirements:** The primary success criteria for the project should be described in terms of what the business or customer will be able to do as a result of the project's successful completion.
- **Scope:** The major accomplishments required to meet the project goal must be listed and described. These may include process or policy changes, training, information systems upgrade, facility changes, and so forth.

- **Obstacle and risks:** The primary obstacles to success and the known risks that could cause disruption or failure must be described. The difference between obstacles and risks is that risks *might* occur, but obstacles are *certain* to occur.
- **Schedule:** At a high level, the expected duration of the project (planned start and finish), significant milestones, and the major phases must be described. This is an initial schedule estimate that will be refined during project definition and planning, but it is always useful to manage expectations by commenting on the accuracy of this schedule prediction.

## 2.9. Project Planning

The guiding principle of project planning is to keep it as simple as possible, given the size of the project. The best and quickest way to develop the plan is to assemble the project team and lead a brainstorming session to capture and record the information needed. Simple techniques and materials can be used and then a draft plan will be created for review of the team. Once the team concurs with the draft, the project manager meets with the sponsor, makes any needed adjustments, and puts the plan in final form for the sponsor's approval. Once approved, the plan becomes known as the baseline.

The project charter is the principal input to project planning. It provides all the information the project manager needs to get going.

Project planning is relatively straightforward. The project team decomposes the project objectives into a list of manageable chunks of work called a *work breakdown structure (WBS)* or, more commonly, a *task list*.

After the team creates the WBS, task dependencies are identified. On small projects this is somewhat intuitive and obvious, but on larger projects it is hard work. This action, along with calculating the duration of each task, will result in creation of the project schedule and will reveal the critical path. Once resources have been assigned to tasks in the WBS, the project schedule can be refined, analyzed for risks, and prepared for approval.

Depending on the size of the project, the project team may produce a variety of subordinate plans, such as risk plan, a communication plan, and a scope change control plan. Once all the information has been gathered and documented, the sponsor approves the plan and the team is authorized to move forward and execute the plan.

## 2.10. Project Planning Steps

The first two actions prepare the groundwork for planning and so can be considered as pre-planning activities while the remaining five steps develop the detailed plan.

- **Creating the project definition.** The project manager and the project team develop the statement of work which identifies the purpose, scope and deliverables for the project and defines the responsibilities of the project team.

- **Developing a risk management strategy.** The project team evaluates the likely obstacles and a strategy for balancing costs, schedule and quality.
- **Building a work breakdown structure.** The team identifies all the tasks required to build the specified deliverables. The scope statement and project purpose help to define the boundaries of the project.
- **Identifying task relationships.** The detailed tasks, known as work packages, are placed in the proper sequence.
- **Estimating work packages.** Each of these detailed tasks has an estimated amount of labour and equipment needed and the duration of the task.
- **Calculating initial schedule.** After estimating the duration of each package and figuring out the sequence of tasks, the team calculates the total duration of the project. This initial schedule, while useful for planning, will probably need to be revised further down the line.
- **Assigning and levelling resources.** The team adjusts the schedule to account for resource constraints. Tasks are re-scheduled in order to optimize the use of people and equipment used on the project.

"These steps generate all the information required to understand how a project will be executed. They are systematic, but don't necessarily come up with the "right answer". It may take several iterations of these steps to find the answer which is the optimal balance between cost, schedule and quality." [10]

## 2.11. Work Breakdown Structure

At a high level, we may understand a project well enough to balance its cost-schedule-quality equilibrium, but we also need to be able to break it down to understand the whole project by understanding its parts. The work breakdown structure (WBS) is the tool for breaking down a project into its component parts. It is the foundation of project planning and one of the most important techniques used in project management. If done well, it can be the secret to successful project management.

The work breakdown structure identifies all the tasks in a project; in fact, a WBS is sometimes referred to simply as a task list. It turns one large, unique piece of work into many small and manageable tasks. The WBS uses outputs from project definition and identifies the tasks that are the foundation for all subsequent planning. (See Figure 2.2)

The WBS is the key to the rest of the planning process and is used for scheduling, budgeting, resource assignments, scope change control, variance analysis and control, and status reporting. Most organizations accomplish the same general types of projects repeatedly. As a result, teams will rarely have to create a WBS from scratch.

The reason for including as much of the work as possible in the WBS is simply that if a substantial piece of the work is left out, the schedule and budget estimates will be wrong. When the work is ultimately discovered as missing from the project plan during execution, time, resources, and money will have to be added, causing

variances and missed expectations. Creating a WBS at the task level is the first real step in the detailed project planning effort.

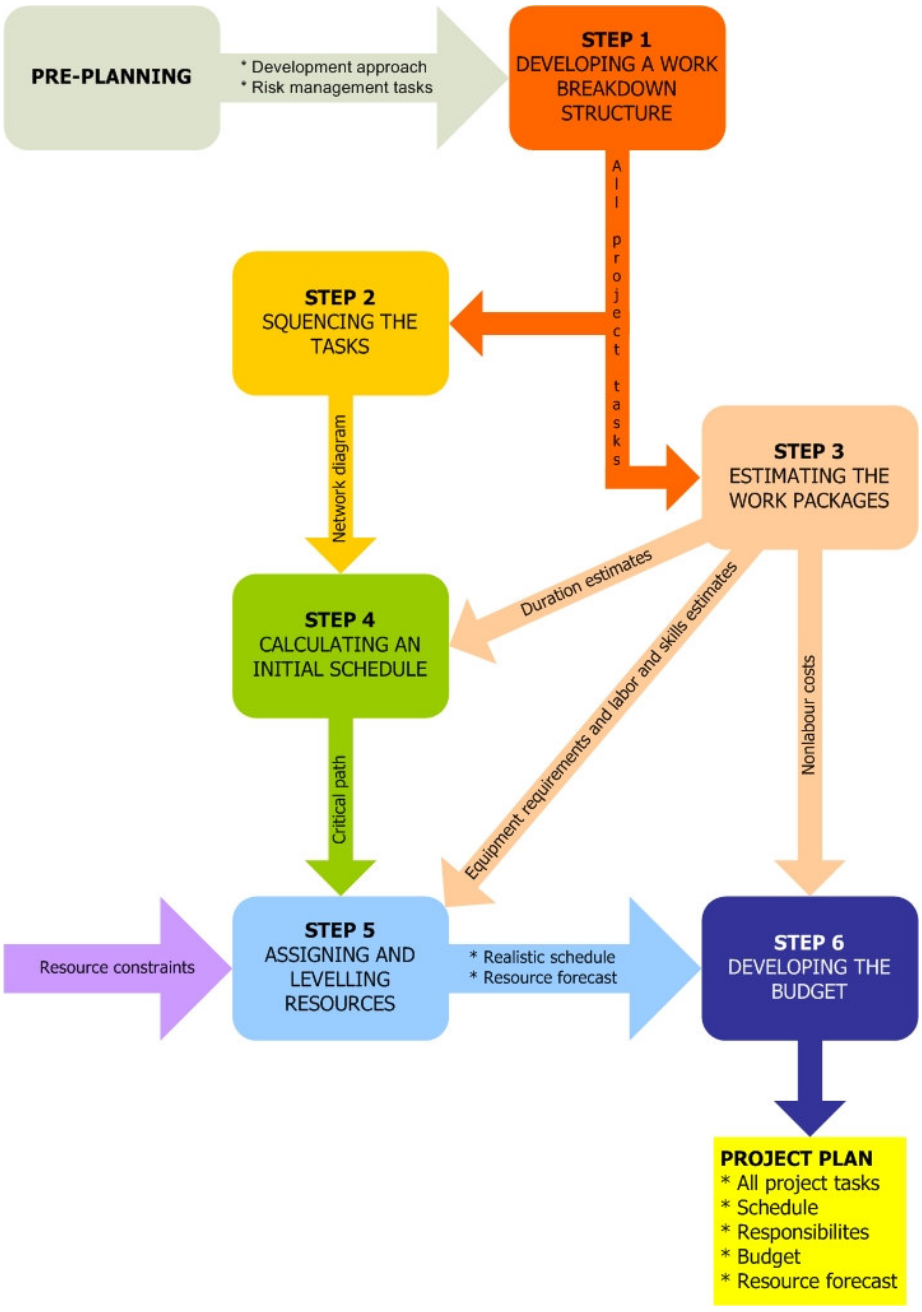



Figure 2.2 - Detailed planning model. *Source*: Verzuh, Eric (2005)

Generally speaking, a project is composed of phases which can be broken down further into specific tasks for assignment to project team members. For each project phase and task, the question is whether that element can or should be broken down further to better define the project work to be accomplished. If the answer is yes, the element is broken into smaller pieces, each of which is similarly evaluated.

Every task in the WBS will have a corresponding deliverable: some tangible evidence of task completion. Later on, during the control phase of the project, there will be a need to measure and evaluate whether the work is being done on time and as specified.

Work breakdown structures can be set up in either graphic or outline form. (See figures 2.3 and 2.4 as visual samples) Either way, they list the various tasks involved. The graphic WBS shows the picture that makes it easy to understand all parts of a project, but the outlined WBS is more practical because hundreds of tasks can be listed on it - far more than can be listed using the graphic approach.

The WBS clarifies and provides necessary details for a number of project management activities. Building a WBS helps to provide a detailed illustration of project scope, to monitor progress, to create accurate cost and schedule estimates and to build project teams.

The WBS breaks all the work in the project into separate tasks. It does not necessarily show the sequence in which work is performed; such sequencing is determined when

a schedule is developed. There are two kinds of tasks on a WBS: summary tasks and work packages.

"Install sprinkler system" for a lawn is a summary task, because it includes several subtasks. Each of these separate subtasks is called a work package. By performing all these simple work packages, a summary task is accomplished. A summary task is not actually executed; it is, rather, a summarization of the subordinate work packages which are actually executed. Understanding the relationship between summary tasks and work packages is fundamental to building a good WBS." [11]

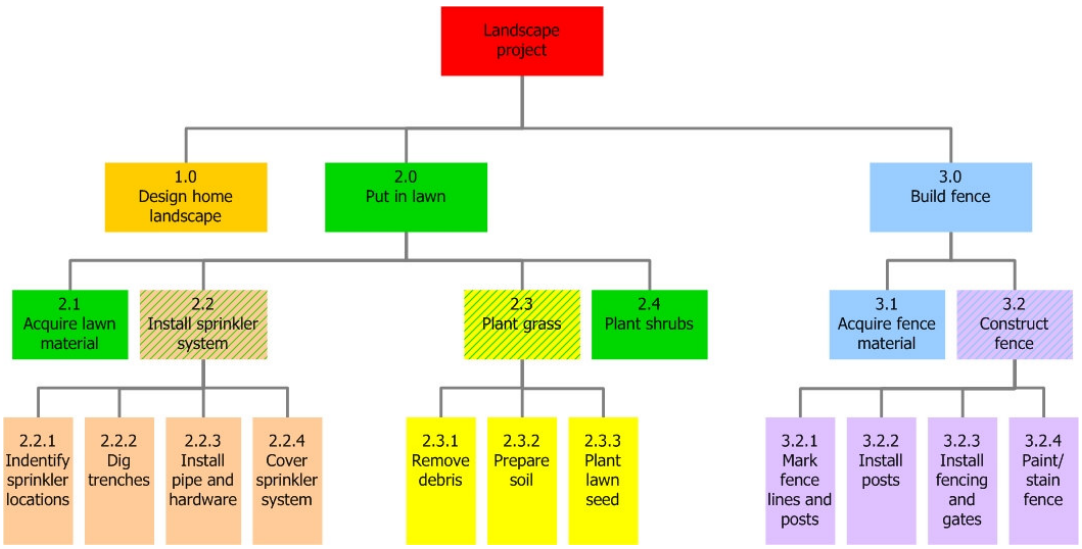



Figure 2.3 - Work breakdown structure in chart form *Source*: Verzuh, Eric (2005)

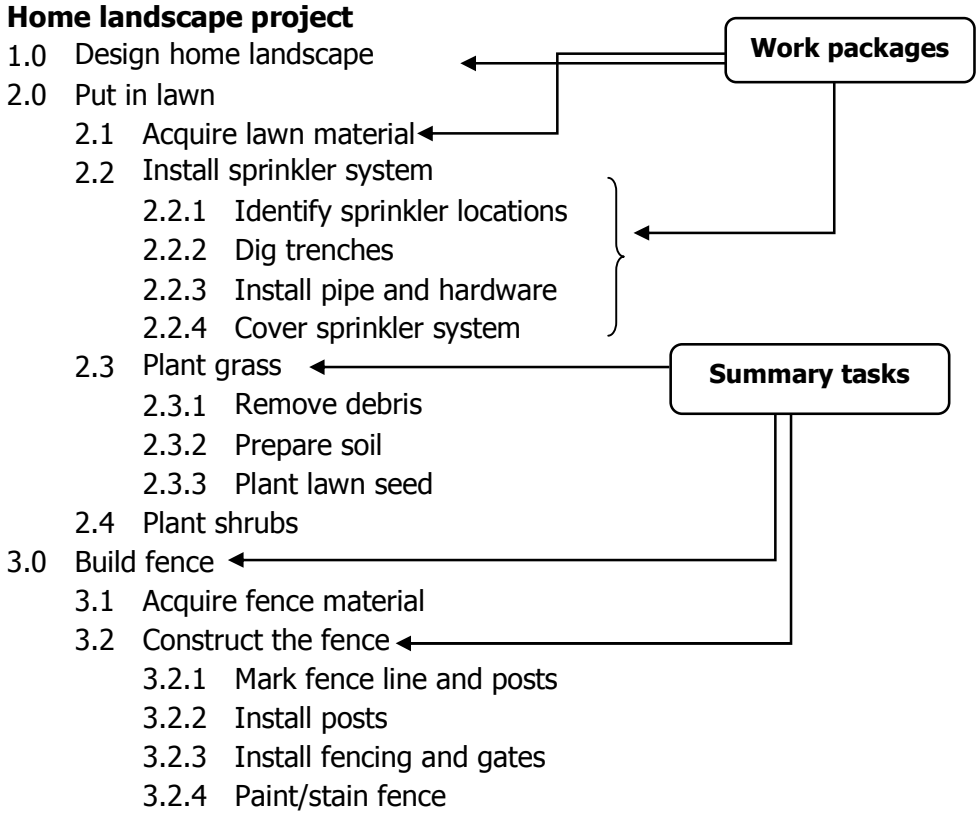



Figure 2.4 - Work breakdown structure in outline form *Source*: Verzuh, Eric (2005)

## 2.12. Estimating

Estimating is forecasting the future, trying to predict the time and money necessary to produce a result. Forecasting the future is an uncertain business, so it should come as no surprise when an estimate turns out to be wrong. However, a wrong estimate is not good enough for most of the project stakeholders: especially customers want the project on time and within the promised project budget.

As stated before, projects are unique; the more unique they are, the more difficult it is to estimate. Every project will produce a unique product, which means that a different combination of tasks will be employed. In addition, there are usually a number of other unpredictable factors on any project such as the unfamiliarity of the people in the project team to the project manager, reliability of the new technology and learning curve of the team, and incorrect timing predictions.

In Figure 2.5 the relationships between WBS, estimating and scheduling can be seen. Estimating the work should occur after we have identified the work and have thought about what resources are needed for the project. The output of estimating will be the input for the project budget and the project schedule.

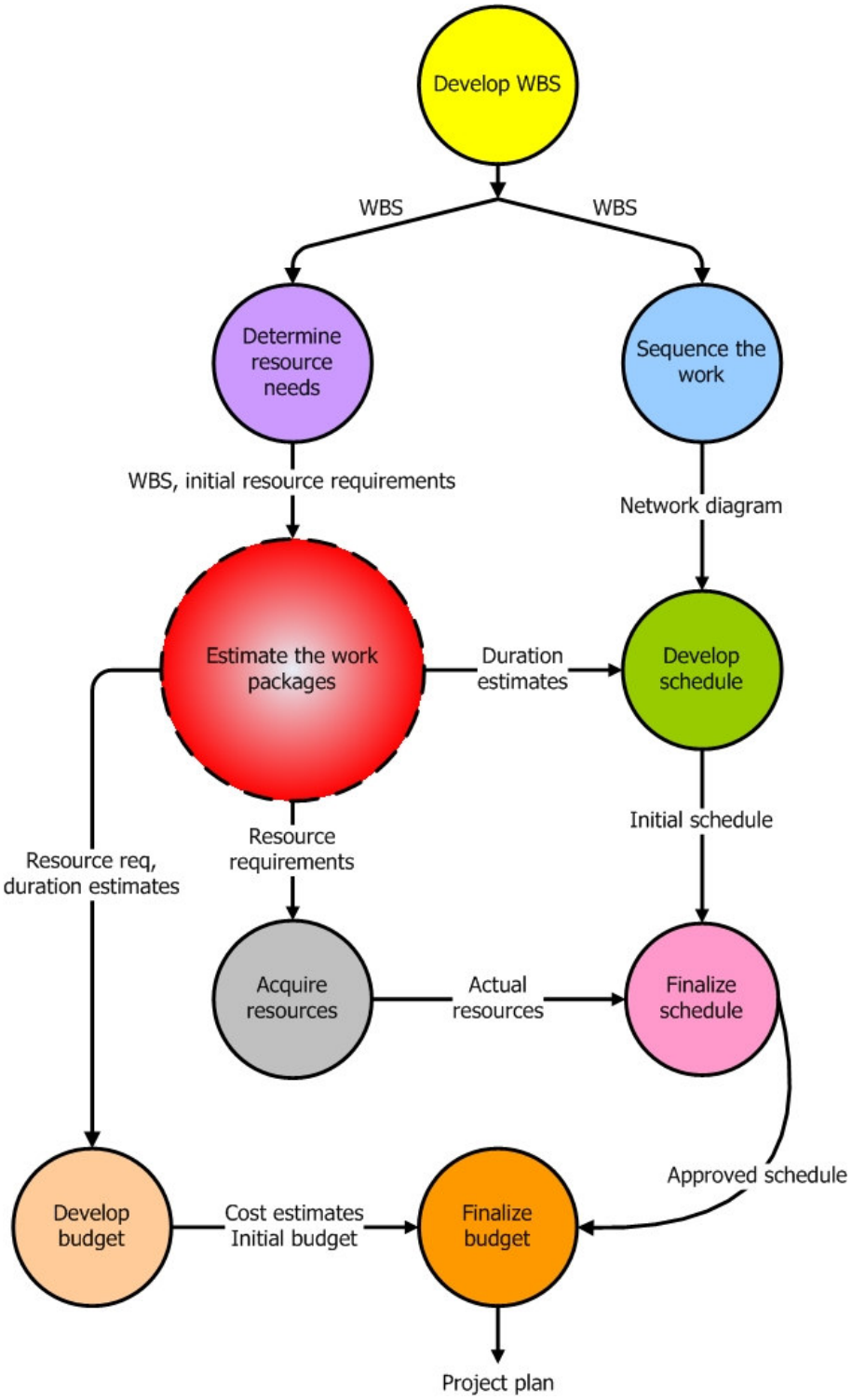



Figure 2.5 - The step of estimating the work in the development of the project schedule. *Source*: Horine, Gregory M. (2005)

## 2.13. Estimating Techniques

There are several key estimating techniques which are examined below:

| Estimating Technique | Key Characteristics | Notes |
|---|---|---|
| **Top-down** | Used in early planning phases and project selection. Utilizes historical information to form estimates. | Reliable if WBS from previous projects mirror the WBS needed for this project. |
| **Bottom-up** | Used to develop detailed estimates. Provides estimate for the lowest level of the WBS (work package). Provides the most accuracy. | Best technique for identifying risk factors. Takes most time and money to develop. |
| **Effort distribution** | Uses project phase percentages to estimate. Example would be<br>Initiation phase %10<br>Plan phase %10<br>Elaboration phase %20<br>Construction phase %40<br>Deploy phase %20 | Used in organizations that use common methodology and/or that do similar projects. Can be used if enough information is known for one of the major project phases. |
| **Heuristic** | Based on experiences. "Rule-of-thumb" estimating. Frequently used when no historical records are available. | Also known as Delphi technique and expert judgement. |
| **Parametric** | Uses historical data and statistical relationships. Developed by identifying the number of work units and the duration/effort per work unit. Examples include lines of code for software development or square footage for construction. | Also known as Quantitative-based estimating. Can be used with other techniques and methods. |
| **Phased** | Estimates the project phase by phase. Provides for a detailed, bottom-up estimate for the next phase and a higher level, top-down estimate for the other phases. Best technique to use on high-risk projects. | Incorporates "re-estimating" as part of the management approach. Best use of estimating resources. Excellent risk management tool. |

Table 2.1 - Estimating Techniques *Source*: Horine, Gregory M. (2005)

For each estimating technique, there are one or more methods that can be leveraged. Table 2.2 lists these methods and summarizes the key characteristics of each.

| Estimating Method | Key Characteristics | Notes |
|---|---|---|
| **Expert judgement** | Relies on subject matter expert (SME) in targeted work area | Used most effectively with bottom-up estimating. |
| **Historical information** | Relies on actual durations from past projects. The three types are project files, commercial databases, and project team members. | Many organizations do not accurately capture this information. Recollection of project team members is the least reliable source. Critical to improving estimate accuracy in an organization. |
| **Weighted average (PERT)** | Uses three estimates for each activity (weighted average): optimistic, most likely, pessimistic<br>E=(O+4M+P) / 6<br>Each estimate is captured for each activity | Used mainly on large scale or high-risk projects. Excellent risk management technique; is time-consuming.<br>PERT = Program Evaluation and Review Technique |
| **Risk factors** | Adjusting an original estimate based on one or more risk factors. Used in conjunction with other methods. | Common risk factors impacting effort estimates include<br>Complexity: technical, process<br>Organizational change<br>Requirements: volatility, quality<br>Resources: skills, costs, etc |
| **Team (consensus) estimating** | Uses multiple SMEs to develop independent estimates. Facilitation meeting used to reconcile differences and develop consensus estimates. | Best for identifying assumptions and other risk factors. Avoids one person being accountable for estimate. Allows for multiple historical perspectives to be taken into account. Allows SMEs from different backgrounds to complement one another. |

Table 2.2 - Estimating Methods *Source*: Horine, Gregory M. (2005)

As with all other planning activities, work estimates are refined and improved as more is learned about the project. At a minimum, each project (or project phase) should be estimated three times. Each estimate provides a greater degree of accuracy.

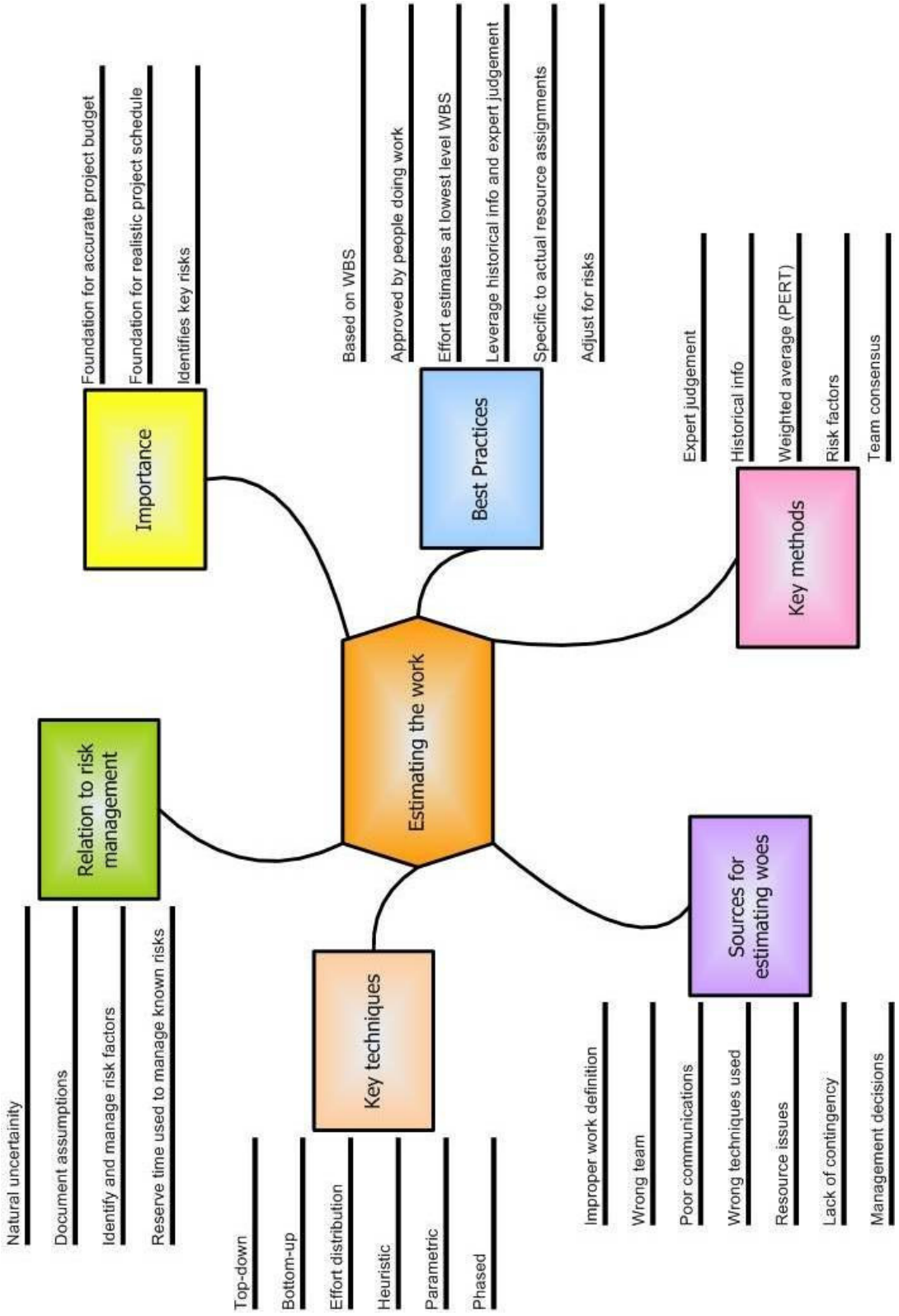



Figure 2.6 - Estimating the work overview *Source*: Horine, Gregory M. (2005)

## 2.14. Scheduling

"We believe that being on time is not about targeting a specific moment but instead, it is about being within a range of moments, and for some people, that range is wider than for others. It is not a surprise that so many projects come in late. We tend to estimate based on weak assumptions, predict outcomes for work based on the best possible set of circumstances and simultaneously avoid placing too much confidence in any schedule we see or create." [12]

Regardless of the tasks involved, all schedules serve three primary purposes. The first, and the most well known, is to make commitments about when things will be done. The schedule provides a form of contract between every person in a team or in an organization, confirming what each person is going to deliver over the next week, month, or year. Schedules are often focused externally, outside the project team rather than within, because they are used to help close a deal or comply with a customer's timeline. In order to allow customers or partners to make plans based on a given project, a time has to be agreed upon for when specific things will be done.

The second purpose of a schedule is to encourage everyone who is contributing to the project to see her efforts as part of a whole, and invest in making her pieces work with the others. Until there is a draft schedule suggesting specific dates and times for when things have to be ready, it is unlikely that connections and dependencies across people or teams will be carefully examined. Instead, everyone will work on her own task, and tend not to think about how her work will impact others.

"It is only when the details are written down, with people's names next to them, real calculations can be made and assumptions examined. It is not easy to forget or ignore something when it is posted on a whiteboard, reminding the team of what needs to be done. This psychological or pressure shift is called forcing function. A forcing function is anything that naturally forces a change in perspective, attitude, or behaviour. So, schedules are important forcing functions for projects. If used properly, schedules force everyone whose work appears on them to carefully think through the work they need to do and how it fits into what others are doing. This awareness of the relationship between parts is somewhat independent of the schedule itself. This forcing function is a critical step toward realizing the project's potential. Even if the schedule slips, is doubled, is halved, or goes through a variety of other permutations, the commitments and connections everyone has made with each other will be maintained." [13]

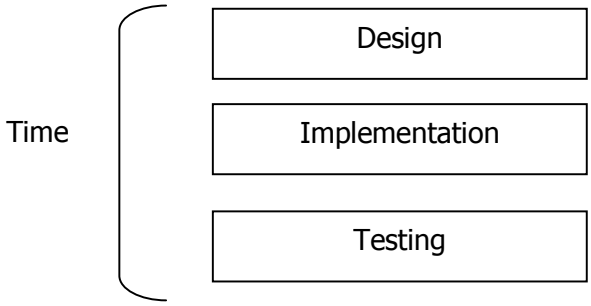
The third purpose of schedules is to give the team a tool to track progress and to break the overall work into manageable pieces. Breaking things down into one- or two-day sizes actually helps people to understand what the work is that they need to do. From the project manager's perspective, a good schedule gives a clear view of the project, flushes out challenges and oversights, and increases the probability that good things will happen.

The larger and more complex the project, the more important schedules are. On larger projects, there are more dependencies between people, and decisions and timings have greater odds of impacting others.

With these three purposes in mind, it is easy to see that perfect schedules do not solve all of the problems that projects might have. A schedule cannot remedy bad design or engineering practices, nor can it protect a project from weak leadership, unclear goals, and poor communication. So, for as much time as it takes to create schedules, they are still just lists of word and numbers. It is up to someone to use them as a tool for managing and driving a project.

There is one basic rule of thumb for all schedules: the rule of thirds. It's an extremely rough estimation, but it is the simplest way to approach and understand schedules.

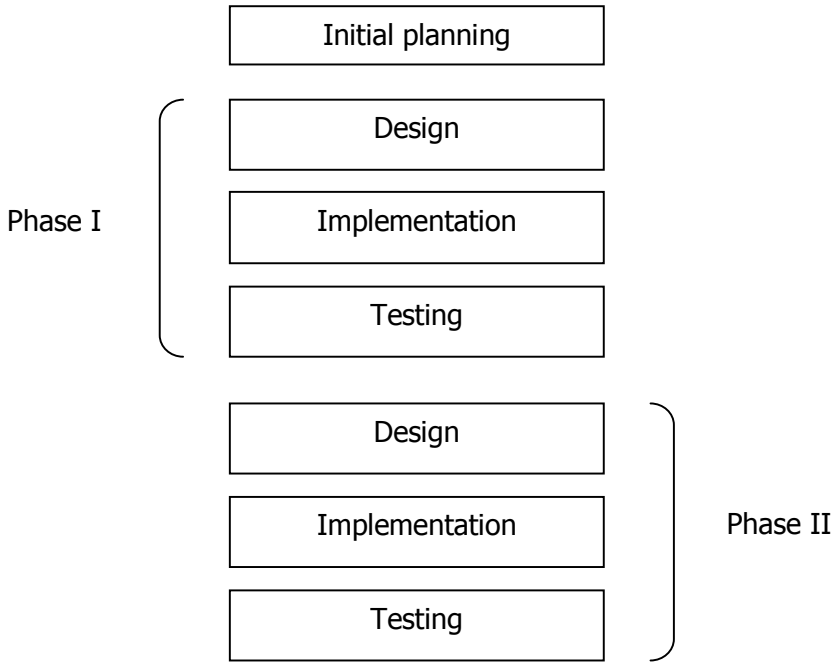
For any project, the available time should be broken into three parts - one for design, one for implementation, and one for testing. Depending on the methodologies used, these phases will be called different names, or they may overlap with each other in certain ways, but all methodologies have time dedicated to these three main activities.




Where it gets complex is on larger or longer projects, where schedules are divided into smaller pieces, with each piece having its own design, implementation, and testing time. These pieces are sometimes called iterations, phases or milestones.

The more change and project volatility that is expected, the shorter each milestone should be. This lowers the amount of overall risk in the schedule because the master plan has been divided into manageable pieces. Those breaks between chunks of the schedule provide natural opportunities to make adjustments and improve the chances that the next milestone will more accurately direct its work.

For most projects, the initial planning time is used to capture necessary information from customers and team members to define how many phases are needed and what the focus should be for each one. Depending on the larger plan, each phase might dedicate more time to design or test. A phase could be divided into two smaller phases, or two phases could be combined together. But in all cases, time should be allocated between phases to take advantage of what has changed and how this change can be managed. This includes responding to problems that arose during the previous phase, which could not be addressed fully during that phase.



Scheduling always represents and encompasses many different aspects of what the project is now and will be later; schedules are simply about prediction. No matter how precisely they are drafted or how convincing they appear, they are just a summation of lots of little estimations, each one unavoidably prone to different kinds of unforeseeable oversights and problems. Good schedules come only from a leader or a team that continuously observes and shows good judgement in many different aspects of the project. Schedules need to be good enough for the team, provide a basis for tracking and making adjustments, and have a probability of success that satisfies the client, the business, or the overall project sponsor.

"During the design process, part of the work for the team is to break down the design into small chunks of work that can be built. These chunks, often called work items or a work breakdown structure (WBS), become the line items in the master schedule for the project. The work items should be intelligently distributed across the team and by the help of calculations, a schedule is created. Each of these work items has an amount of time assigned, and on the basis of the estimates, the schedule is built.

By the simplest definition, good work estimates have a high probability of being accurate and bad work estimates have a low probability; it's the judgement of team leaders that define the bar for a given project. It requires an active process of reviewing estimates and pushing, leading, and nudging others to get them to the level they need to be." [14]

Scheduling can be difficult because few people enjoy estimating complex things that they will be held accountable for after a certain amount of time. It is entirely possible that whatever we commit to doing today might be impossible or undesirable to do when the time comes. It just might turn out to be more difficult than we thought and by saying something can be done in a certain amount of time, we might be wrong.

Even team members, who understand the estimation process and believe in it, do not like to do it. Each project has similar time estimating challenges and techniques although there might be some fundamental differences in the nature of the project. The primary difference is in how much time the teams are given to generate estimates and how disciplined they are in the use of that time. We should keep in mind that good estimates only come from credible designs which are provided by team members with clear information.

If leaders acknowledge weak estimates in the schedule and are comfortable with greater schedule risk, there is nothing wrong with weak estimates. On smaller and faster projects, rough estimates may be all that the project needs. Requirements may be changing very often and the nature of the business or organization might demand more flexibility and less structure.

While good estimates go a long way toward improving schedules, many of the factors that impact a schedule cut across individual line items. The trap this creates is that despite how perfect and wonderful all the estimates are, the real schedule risks are the things which are not written down. There is a common set of these schedule

oversights that all project managers need to be familiar with. The trouble is that, someone might be mistaken by one oversight that he is willing to look out for it in the future. That's why project management and scheduling in particular, require experience to become proficient.

## 2.15. The Snowball Effect

Even if every kind of probability was examined by some question and answer session, because of independent contributions to a schedule, it is still easy for schedules to slip. Each decision the team makes, from design choices to estimations, is the basis for many of the decisions that follow. An oversight early on in the process that is discovered later on will have a stronger impact on the project. This compounding behaviour of the schedules is easy to underestimate because the cause and effect are not often visible at the same time; the effect is usually seen after the cause occurs. In the worst case, when several major oversights occur, the odds of a schedule holding together are slim to none. And of course, this gets even harder. The way probability works is that the likelihood of a series of independent events occurring is the multiplication of the likelihood of each individual event; this is also known as compound probability. So, if the probability of finishing a task is 8 out of 10 (8/10), and the probability of finishing the next task is 8/10, the total probability of finishing both of the tasks is not 8/10, but 64/100. This means that if the team is 80% probable to make its dates each week, the odds of a slip happening continually increase over time.

Because the schedule represents the totality of the project, the only way to use schedules effectively is to understand all of the things that should happen in order to succeed in the project. It is an interdisciplinary and complex activity, not just an engineering or management subject.

- The more change that is expected, the shorter the milestones should be. Small milestones set the team up for easier mid-game strategies. This gives management shorter intervals between reviews, and it reduces the risk of making several changes. Also, the team can be prepared to expect changes at milestone crossovers, so they will expect change instead of resisting it.
- "A major psychological challenge for scheduling is to make use of proper scepticism, without deflating the passion and motivation of the team. Unlike the creation of a vision document, where spirit and optimism about the future must reign, a schedule has to come from the opposite perspective. Schedules should not reflect what might happen or could happen under optimal conditions. Instead, a good schedule declares what will happen despite several important things not going as expected." [15]
- The process of design is the best insurance against ignorance and unexpected challenges. Better design practices are the only way to improve the ride of the team through implementation and other phases.
- Whatever schedule approach or technique is used, it should be common knowledge to the team. If each person has a basic understanding of how schedules work and the particular strategy about the current project, they will

be able to ask better questions and be more likely to understand and believe in what's being planned.

- If it is known that there is a complex component at some stage of the project, the team should deal with those challenges up front in the schedule. "The bigger the risk, the more time is needed to deal with it. If the risks are not addressed until later on in the schedule, we'll have fewer degrees of freedom in responding to them." [16]

## 2.16. Realistic Scheduling

When we think about what makes a project successful, surely it is "a realistic schedule". More specifically, a realistic schedule:

- Includes a detailed knowledge of the work to be done
- Has task sequences in the correct order
- Accounts for external constraints
- Takes into consideration all the objectives of the project
- Can be accomplished on time, given the ability of skilled people and enough equipment

## 2.17. Scheduling Techniques

There are a few visual scheduling techniques and the most well-known technique is PERT which tries to minimize risks by averaging out high, medium, and low estimates for work. This is good for two reasons. First, it forces everyone to realize estimates are predictions, and that there is a range of possible outcomes. Second, it gives

project managers a chance to adjust how aggressive or conservative the schedules are.

## 2.18. GANNT Charts

A *Gannt chart* is a traditional technique for scheduling and planning small projects with relatively few activities and precedence relationships. The technique - also called a *bar chart* - was developed by Henry Gannt as a tool for displaying the time progression of a project in the form of a specialized chart. The Gannt chart has been a popular project scheduling tool since its inception and is still widely used today. It is a graphical representation of the duration of tasks against the progression of time and is the direct precursor of the CPM/PERT technique.

For larger projects, a work breakdown structure would be devoted to identify the tasks before constructing a Gannt chart. For smaller projects, the Gannt chart itself may be used to identify the tasks.

The Gannt chart provides a visual display of the project schedule, indicating when activities are scheduled to start, when finished, and when extra time is available and activities can be delayed.

"Gantt charts illustrate the start and finish dates of the terminal elements and summary elements of a project. Terminal elements and summary elements comprise the work breakdown structure of the project. Some Gantt charts also show the

dependency relationships between activities. The strength of the Gannt chart is its ability to display the status of each activity at a glance." [17]

Although a Gannt chart is easily comprehended for small projects that fit on a single sheet or screen, they can become quite bulky for projects with more that 25-30 activities. Larger Gannt charts may not be suitable for most computer displays. A related criticism is that Gannt charts communicate relatively little information per unit area of display. That is, projects are usually more complex than can be communicated effectively with a Gannt chart.

Gannt charts only represent part of the triple constraints of projects, because they focus primarily on schedule management. Moreover, Gannt charts do not represent the size of a project or the relative size of work elements, therefore the magnitude of a behind-schedule condition is easily mis-communicated. If two projects are the same number of days behind the schedule, the larger project has a larger impact on resource utilization, yet the Gannt chart does not represent this difference.

Although project management software can show schedule dependencies as lines between activities, displaying a large number of dependencies may result in a cluttered or unreadable chart. Because the horizontal bars of a Gannt chart have a fixed height, they can misrepresent the time-phased workload (resource requirements) of a project. A related criticism is that all activities of a Gannt chart show planned workload as constant.

## 2.19. Program Evaluation and Review Technique (PERT)

"The Program Evaluation and Review Technique, commonly abbreviated PERT, is a model for project management invented by Booz Allen Hamilton, Inc. under contract to the United States Department of Defence's US Navy Special Projects Office in 1958 as part of the Polaris mobile submarine-launched ballistic missile project. This project was a direct response to the Sputnik crisis." [18]

PERT is basically a method to analyze the tasks involved in completing a given project, especially the time needed to complete each task, and identifying the minimum time needed to complete the total project.

The technique was developed in the 1950s, primarily to simplify the planning and scheduling phases of large and complex projects. It was able to cover uncertainty by making it possible to schedule a project not knowing precisely the details and durations of all the activities. It is more of an event-oriented technique rather than a start- or completion-oriented, and is used in projects where not cost but time is a major factor.

A PERT chart is a tool that facilitates decision making; the first draft of a PERT chart will number its events sequentially to allow the insertion of additional events later. Two consecutive events in a PERT chart are linked by activities which are conventionally represented as arrows in the diagrams. The events are presented in a logical sequence and no activity can commence until its immediately preceding event is completed. The planner decides which milestones should be PERT events and also

decides their proper sequence. A PERT chart may have multiple pages with many sub-tasks. PERT charts are one of the tools used in the Earned Value Management Technique (EVMT), used by many corporations today to track earned value.

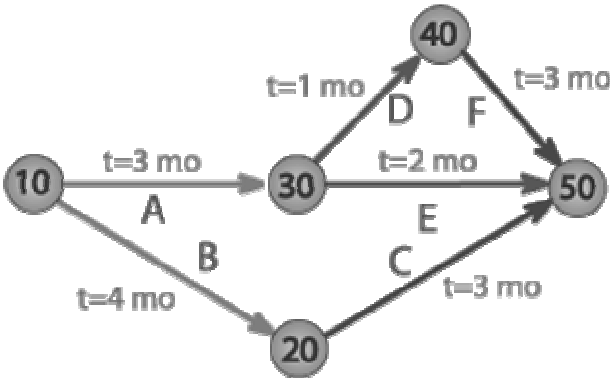



Figure 2.7 - Sample PERT chart

## 2.20. Critical Path Method (CPM)

The critical path method, abbreviated CPM, is a mathematically based algorithm for scheduling a set of activities. It is a very important tool for effective project management.

It was developed in the 1950s in a joint venture between DuPont Corporation and Remington Rand Corporation for managing plan maintenance projects. Today, it is commonly used with all forms of projects, including construction, software development, research, product development, and engineering and plan maintenance. Any project with interdependent activities can apply this method for scheduling.

The essential technique for using CPM is to construct a model of the project that includes the following:

1. A list of all activities required to complete the project (also known as work breakdown structure)
2. The duration that each activity will take to complete
3. The dependencies between the activities

Using these values, CPM calculates the starting and ending times for each activity, determines which activities are critical to the completion of a project (called the *critical path*), and reveals those activities which are less critical with "float time".

In project management, a *critical path* is the sequence of project network activities with the longest overall duration, determining the shortest time possible to complete the project. Any delay of an activity on the critical path directly impacts the planned project completion date. A project can have several, parallel critical paths. An additional parallel path through the network with the total durations shorter than the critical path is called a sub-critical or non-critical path.

These results allow managers to prioritize activities for the effective management of project completion. Originally, the critical path method considered only logical dependencies between terminal elements. Since then, it has been expanded to allow for the inclusion of resources related to each activity. The capability allows for the

exploration of a related concept called the critical chain, which determine the project duration from both time and resource dependencies.

Since project schedules change on a regular basis, CPM allows continuous monitoring of the schedule, allows the project manager to track the critical activities, and ensures that non-critical activities do not interfere with the critical ones. In addition, the method can easily incorporate the concepts of stochastic predictions, using the Program Evaluation and Review Technique (PERT) and event chain methodology.

Both CPM and PERT are derivatives of the Gannt chart and, as a result, are very similar. There are originally two primary differences between CPM and PERT. With CPM a single estimate for activity time is used that does not allow for any variation in activity times - activity times are treated as if they are known for certain, or deterministic. With PERT, multiple time estimates are used for each activity that allows for variation in activity times - activity times are treated as probabilistic. The other difference is related to the mechanics of drawing the project network. In PERT, activities are represented as arcs or arrowed lines between two nodes, or circles, whereas in CPM, activities are represented as the nodes or circles.

The advantage of CPM and PERT over the Gannt chart is in the use of a network to depict the precedence relationships between activities. The Gannt chart does not clearly show precedence relationships, which is a disadvantage that limited its use to small projects.

There are drawbacks of this technique, as estimations are used to calculate times. If one mistake is made, the whole analysis could be flawed, causing major problems in the organization of a project.

## 2.21. Budgeting

Project budget estimates can be calculated with parametric formulas, and determined through apportioning. While these high-level estimates are useful in the process of selecting projects, they are not accurate enough for managing a project. Once the project is approved, there is a need for a detailed, accurate cost estimate.

The detailed cost estimate becomes the standard for keeping costs in line. Everyone involved in the project - customer, management, project manager, and team - is better served when a cost target is realistically calculated from a detailed plan. The team understands how the goal was created and customers and management can be more confident that the project will stay within project budget. Forecasting cash flow enables the project's funding to be planned and available when needed. And finally, during the course of the project, this detailed cost information will help in controlling the project, monitoring the progress, identifying problems, and finding solutions.

Completing the project within budget is known to be one of the key success factors for projects. Yet, for many project managers, especially those managing internal projects, it is maybe the biggest success factor. There are several reasons why this occurs, and it does vary by industry, but most of the reasons have to do with

organizational management structures and organizational budgeting and cost control policies.

The project budget estimates all of the costs the project will incur, when they will be incurred, and itself is a key component of the overall project plan. The project budget is important for the following reasons:

- Since the project schedule is a main driver for the project budget, the budget can serve as an excellent cross-reference for the validity of the schedule and vice versa. By looking at the schedule from a cost perspective, we can see resource or budget issues that were not obvious before. Inversely, the schedule input is key for validating the project budget, because the budget needs to account for all the time a resource is required on the project.
- By measuring project progress against a cost baseline, we can better measure the true performance of the project along the way, and in most cases, identify issues and risks much sooner. This is the basis for an advanced project controlling technique called *earned value management*.
- The budget impacts stakeholder expectations in several ways. The initial budget sets the expectation on what the total project costs should be. If the budget is not developed properly, then the project manager is bound to have an expectation issue. If the project budget is pre-defined and serves as a cost ceiling for the project, then it helps to set stakeholder expectations regarding project schedule and scope.

- The schedule drives the timing of resource needs. Especially in organizations where resources are shared across projects or centrally managed, the accuracy of the schedule is key to efficient resource management.
- With more projects accountable to a project selection process and to financial return on investment expectations, it is increasingly important to establish the cost baseline for the project and monitor closely.

The actual process of developing a budget is straightforward. The general challenges lie more with omissions and the foundation the budget is based upon.

The first step in building a project budget is to identify the costs. The well-known cost sources are:

**Labour costs –** One of the key budget cost items. Budget should reflect a line item for each person or role. Costs are based upon resource rates and estimated work durations. When dealing with external labour, these costs are a key component of the business relationship and normally easy to obtain. However, it can be difficult getting rates for internal resources. In most organizations, either the human resources or finance department should have standard labour rates for internal resources based on role.

**Equipment –** Tools that the project team requires completing the work of the project.

**Materials –** Items that are needed to build the product. The information is generally found in the product specifications document. In dealing with vendor relationships, one would either acquire or confirm material costs by reviewing vendor responses to the formal procurement documents.

**Licenses and Fees –** Costs such as software licenses, building permits, and so on.

**Training –** Cost of any training the project team will need to do their work and any training the users may need to use the final product.

**Travel –** Travel and lodging costs to be charged to the project that will be incurred by any project team member while doing the work of the project.

**Operational costs –** Costs associated with the maintenance and support of the final product. In addition, there may be costs to dispose of whatever the project is replacing.

**Disposal costs –** Costs associated with the disposal or removal of whatever the project is replacing.

**Overhead costs –** Common overhead costs incurred by any project. Items typically included are facilities, administrative assistance, security, and technology infrastructure. Depending on the organization, these costs may not be allocated to

individual projects or there may be a pre-determined percentage or amount that is used by all projects.

**Cost of "change" –** "A focal point of project planning is to consider the change impact that the project will have. This category would include any costs (change management programs, initial productivity loss) that can directly be attributed to the change factor. These costs should have been considered during the project selection phase as part of a cost-benefit analysis or return on investment analysis. In addition, these costs may be accounted for in the other budget categories." [19]

There are three levels of precision in project estimating, known as top-down, budgetary, and bottom-up.

**Top-down budgeting:** Information that is used in estimates comes from previous experiences or random judgement. Top-down estimates, by definition, are not very precise and of limited use to project managers trying to control the project once it begins. Most top-down estimates are constraints – a limit to what the project manager can spend.

**Budgetary estimating:** When the project objective is clearly defined, categories of resources and expenses are known, and overhead information is available, budgetary estimating is appropriate. While this estimate is not as precise as a detailed, bottom-up estimate, often a budgetary estimate is "close enough" in the planning phase. If the type of labour is known as well as other direct costs, such as materials and travel,

and indirect costs, including labour and general and administrative overhead, reasonably accurate project budgets can de developed.

**Bottom-up / detailed budgeting:** The most precise estimate is derived by estimating the cost of each WBS task, summing all the estimates, and then adding a reserve for risks to produce the project budget. Bottom-up estimating involves three simple steps:

1. Calculating the total cost of each project task
2. Summing all tasks to get the total project budget
3. Adding an amount for unforeseen contingencies

Knowing when money will be spent is almost as important as knowing how much will be spent on each particular task. Companies that depend on operations to generate the cash to fund projects need to control the rate at which money goes into the project.

Once the project's schedule and costs have been estimated, generating a cash flow projection is pretty simple  by using any project management software after all the data has been entered.

"Estimating will never be a science that produces 100% accurate results. Complete accuracy requires the project manager to forecast the future and to be in control of all project variables – two requirements that will never be met. But estimates can be sufficiently accurate to support good business decisions." [20]

## 2.22. Project Control

Controlling a project blends the art and science of project management – building a strong and committed team at the same time a progress against the plan is being made. Controlling also involves discovering and solving problems while they are still small, measuring progress, and ensuring continuous agreement on goals and expectations. The key to these control activities is communication; making sure that the right people has the right information at the right time. Strong communication among all stakeholders is what allows a project to evolve in an ordered way, instead of veering out of control.

Officially, PMI defines the controlling processes as "The processes that ensure that project objectives are met by monitoring and measuring progress regularly to identify variances from the plan so that corrective action can be taken if necessary. While accurate, this definition does not clearly communicate all the aspects of project control that is needed to be understood, and does not emphasize the most important aspect – prevention." [21]

One of the fundamental principles of project control is prevention. The best way to keep the project on track is to prevent – or at least minimize – variances from occurring. This takes the entire array of project management skills, but a very few key activities include investing in planning, communicating effectively, monitoring risk factors continuously, resolving issues aggressively, and delegating work clearly.

Another aspect of project control is *detection*. It can be thought of detection as a "radar system" or "early warning system". Project control should provide early detection of variances. The sooner we can act on a variance, the more likely we are to get the success factor back on track. The key for early detection is to have the tracking systems and work processes in place that allow for the timely measurement of project results. Common examples of detection methods are performance reporting and review meetings.

While the prevention aspect has a strong action orientation too, this principle goes hand-in-hand with early detection. For project control to be effective, the detection of a variance must be able to trigger on appropriate and timely response. The three most common action types are corrective actions, change control procedures, and lessons learned.

## 2.23. Earned Value Management (EVM)

Earned Value Management (EVM) is a project management technique that measures forward progress objectively. EVM has the unique ability to combine measurements of technical performance, schedule performance, and cost performance within a single integrated methodology. EVM provides an early warning of performance problems while there is still time for corrective action. In addition, EVM improves the definition of project scope, prevents scope creep, communicates objective progress to stakeholders, and keeps the project team focused on achieving progress.

Essential features of any EVM implementation include a project plan that identifies work to be accomplished, a valuation of planned work, called planned value (PV), and pre-defined "earning rules" to quantify the accomplishment of work, called Earned Value (EV). EVM implementations for large or complex projects include many more features, such as indicators and forecasts of cost performance (over or under budget) and schedule performance (behind or ahead of schedule). The most basic requirement of an EVM system is that it quantifies progress using PV and EV.

"If the implementation of EVM is not scaled to match the size and complexity of the project at hand, it may be either too lightweight or too costly. The benefits of any implementation should far outweigh its cost of implementation and maintenance. Thus, EVM is a project management discipline that should pay for itself many times over.

EVM has no provision to measure project quality, so it is possible for EVM to indicate a project is under budget, ahead of schedule and scope fully executed, but still have unhappy clients and ultimately unsuccessful results." [22]

## 2.24. Managing Project Changes

For many people, project control equals "managing project changes", and managing project changes equals preventing "scope creep". While this belief is not completely accurate, the perception cannot be ignored. The ability to manage and control the change elements on a project, particularly the project scope, is a key to project success and a key performance indicator for a project manager. To manage project

changes effectively, a project manager must utilize all of her skills and demonstrate project leadership. In addition to being an insightful measure of individual project management maturity, it is not uncommon for organizations that are in the early stages of adopting project management business approaches to look at how well project changes are being managed to determine whether project management is making a difference or not.

A project change is a change in any of the critical success factors (scope, schedule, costs, quality, and project acceptance criteria). Being aware of there is a change is not a big deal. In fact, for many projects, changes – especially scope expansions – are expected and usually encouraged. The big deal is uncontrolled change. Because a change in any of the critical success factors impacts the other factors, which will then impact project performance and the project's ability to achieve the success criteria, which will then impact stakeholder perceptions and satisfaction levels.

Any time a change occurs, the project needs a way to recognize the change, evaluate the impact of the change, communicate the change, and make planning adjustments is the change is accepted. The mechanism is commonly referred to as a project change control system.

Change control does not mean prevent changes at all costs. Conversely, project changes should be expected, planned, and well managed. The two keys here are selecting the proper project approach – known as methodology – and setting up a project change control system. For projects with an innovation focus or a volatile set

of requirements, an iterative development-type approach that expects deliberate scope expansions or scope clarification should be utilized.

Minimizing scope changes is the great balance of managing project changes. One the one hand, a plan is prepared for changes and a system is set to manage those changes when they occur; on the other hand, a big effort is spent to influence those factors that are responsible for project changes, especially scope changes, to minimize their occurrence.

A project manager must be continuously alert and mindful to anything that could impact the critical success factors. In particular, he/she needs to understand what can cause unplanned scope changes to occur, and then work to prevent their occurrence.

At the heart of managing project changes well is a project change control system. The specifics of project change control systems can vary depending on industry, organization, and project importance, but there are essential principles, guidelines, and components that every change control system should possess.

**Principles**

"Effective project change control systems follow these key principles:

- Any proposed scope change is documented, evaluated, and approved before it is implemented.
- The appropriate stakeholders are involved in the evaluation and approval process.

- Any change request is thoroughly assessed for impact to other critical success factors, especially project schedule and budget.
- The appropriate management level approves any change request before it is implemented.
- All project changes are documented and communicated to all stakeholders.
- The rules are firm, the roles and responsibilities are clearly defined, and the workflow process meets the needs of all stakeholders." [23]

**Guidelines**

"In addition to the principles above, these guidelines should be considered for an effective project change control system:

- The project plan should be updated to reflect the acceptance of any change to the critical success factors. A new performance baseline should be established.
- The change control system should consider multiple process paths based on estimated impact of the change request and the thresholds negotiated with management. This allows the appropriate stakeholders and management levels to be involved when needed and at the right time.
- Especially on proposed scope changes, make sure the right stakeholders are involved, understand the need and impact of the proposed change, and agree to the action plans before proceeding.
- If the project involves contractual arrangements, project's change control process should be aligned with the change control process used to manage the contract with the vendors." [24]

## 2.25. Managing Project Risks

Managing project risks is the ultimate in proactive project management. The goal of project management is to achieve the project's critical success factors, including meeting the targeted business objectives and client expectations. The goal of managing project risks is to identify and prepare for any potential threat to the project's critical success factors before it actually occurs. As a result, risk management is the essence of managing projects. Nothing impacts the decisions we make regarding general project approach, level of planning rigour, staffing, project control procedures, and overall contingencies more than the risks facing the project.

A proactive management philosophy underlies the key principles of project risk management. By effectively managing project risks using these principles, a project manager remains in control of the project at all times, enables better project decisions, and provides the project the best opportunity for success.

Risk management is the means by which uncertainty is systematically managed to increase the likelihood of meeting project objectives. The key word is *systematic*, because the more disciplined the approach, the more we are able to control and reduce the risks.

Not surprisingly, risk management influences the project plan and changes assumptions in the project rules as shown in figure 2.8.

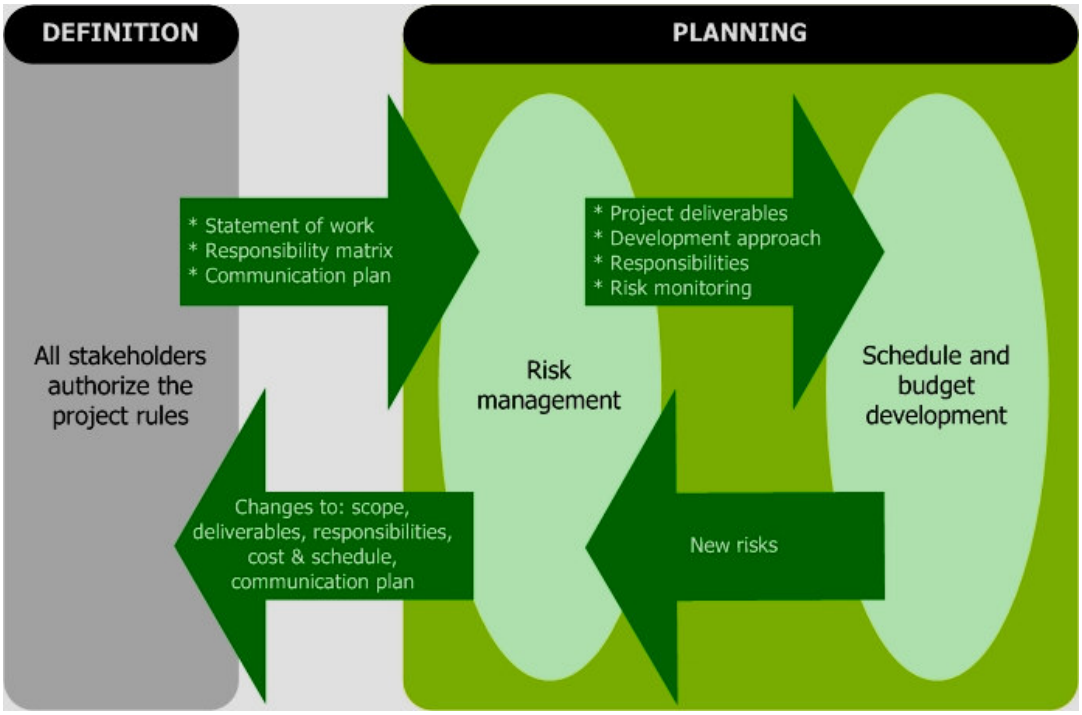



Figure 2.8 - Risk Management *Source*: Verzuh, Eric (2005)

Identifying the risks to the project is the critical step in managing project risks. The best way to start this process is also the best way to leverage the lessons from the past which can be achieved by using a *risk profile*. A risk profile – also referred to as a checklist or risk assessment form – will list the common sources of project risks that one needs to consider.

For each risk factor that has been identified, the likelihood that the risk event will occur should be determined. The goal is to quantify the uncertainty as much as possible. Common methods include numeric scales (1-5 or 1-10) and subjective scales (High, Medium, and Low). Likewise, it is necessary to determine the potential impact the risk event would have on the project critical success factors if it occurs. Like the

probability element, the goal is to quantify the potential impact as much as possible. Generally the same type of scale is used here too.

After determining the probability and impact levels, the next step is tabulating a final ranking for each risk factor by combining (multiplying) the two values. This step will show the highest priority, most important risks and the ones that we need to focus the initial efforts. The last step is documenting a response plan for each risk and reviewing it with the key stakeholders to increase the awareness, to get their feedback and acceptance of the planned approaches.

One common problem associated with project risk management is terminology and the proper labelling of risks. The definition of terms closely related to project risk is reviewed and the distinctions are clarified in table 2.3.

Risk management begins and ends with attitude. Scepticism and critical analysis expose lurking dangers. The rational assessment, balanced by historical data, judges the probability and severity of the risk. Next, positive, creative problem solving forms a strategy to remove the hazard, and vigorous, energetic execution overcomes the obstacle. Finally, persistent, systematic vigilance reveals new perils, and the cycle begins again.

| Term | Definition | Notes |
|---|---|---|
| **Risk** | An uncertain event that could negatively impact the project critical success factors | A threat<br>Probability of occurance must be between %0 and %100 |
| **Issue** | An active problem that could impact the project critical success factors | A risk event that has actually occurred |
| **Constraint** | A limit that must be planned around | Factual<br>Constraints can introduce other risks |
| **Assumption** | Factor considered to be true, real, or certain | Assumptions can include accepted risks and can introduce other risks |
| **Dependency** | An external event that must occur for the project to accomplish its objectives | Identified during planning along with risks, constraints, and assumptions |
| **Defect** | A discrepancy between the actual and the expected. Defects can become project risks if not identified and corrected | Detailed planning efforts are important here<br>The key source for many unknown risks |

Table 2.3 - Summary of Risk-related Terms *Source*: Horine, Gregory M. (2005)

## 2.26. Managing Project Quality

Quality is one of the critical success factors for any project and one of the key tenets of modern project management. Yet, project quality is often misunderstood and poorly managed. If the project delivers a technically sound and zero-defect product, but, on the other hand, it is over budget and the customer is not satisfied, then surely it is not possible to consider that the project has quality.

PMI describes quality as "conformance to requirements and fitness of use". Simply translated, this means that the project produces what it said it would and that what it produces satisfies real customer needs.

While there are aspects of managing quality that are unique, mainly verifying that the work is complete and correct, most elements of managing project quality are fused tightly with other aspects of project management, especially requirements (scope) management, expectations management, risk management, team management, and procurement management.

In the same way it is said project management is risk management, it can also be said that project management is quality management too. After all, most of the best practices now recommended for project management have quality concerns as their foundation.

"While project quality management is tightly integrated with all aspects of managing a project, there are a few aspects that are unique to this endeavour. The unique elements of managing project quality include:

- **Focusing on quality-based requirements:** Ensuring that all of the quality and compliance standards that the project is accountable for are identified, both from the customer and other governing stakeholders.
- **Focusing on a value-added requirements:** Working to understand the requirements, often unspoken if not probed, that go beyond the base functional requirements and that will have the greatest impact on the customer satisfaction level of the final solution.

- **Focusing on product and process:** Quality management addresses both product quality and process quality, especially the *project management* process.
- **Focusing on verification:** Determining the game plan for ensuring that all of the requirements will be met to the satisfaction of the relevant stakeholders." [25]

## 2.27. Project Execution

During the execution phase of the project, the project team carries out the project according to the base project plan. Following the work breakdown structure, the schedule, and other project plan elements, the team works to achieve project milestones and to meet the project objectives. The project manager deals with changes to the project or deviations from the plan as they occur during project execution.

The activities in this phase are actually carried out in parallel rather than sequentially. The project manager must control these activities and ensure that they focus on the completion of the project according to its performance goals.

## 2.28. Managing Communications

Projects are made up of people getting things done. Getting the right things done in the right way requires communication among all the stakeholders. Project managers spend a great deal of time communicating. This includes setting and getting

agreement on goals, coordinating people, discovering and solving problems, and managing expectations.

What this means is that from the statement of work through risk management and detailed planning, every project management technique is a method of communicating.

Communication is a vital skill for project managers. They need to be able to write and speak well, lead meetings effectively, and resolve conflicts constructively. They also need to listen well, so that they really understand what is being said.

"Project team members have four major communication needs:

1. **Responsibility** – Each team member needs to know exactly what part of the project he/she is responsible for.
2. **Coordination** – As team members carry out their work, they rely on each other. Coordination information enables them to work together efficiently.
3. **Status** – Meeting the goal requires tracking progress along the way to identify problems and take corrective action. The team members must be kept up to speed on the status of the project.
4. **Authorization** – Team members need to know about all the decisions made by customers, sponsors, and management that relate to the project and its business environment. Team members need to know these decisions to keep all project decisions synchronized." [26]

The communications of a project include all means and manners that the project interacts with all its stakeholders. It does not only include the standard, formal communication items such as status reports, progress review meetings, presentations, financial reports, issue and risk logs and role-responsibility matrix, but can also include organizational change management communications such as project website, organizational change management plan, awareness campaigns, newsletters and public relation notices.

Project communications are not only important for the obvious reason – keeping individual stakeholders properly and consistently informed on the status, progress and impact of the project – but they are a key determinant factor to the overall success of the project.

The quality and effectiveness of communications will have a tremendous effect on stakeholder perceptions regarding the project and project manager's role as a leader. Good communications will reduce the conflicts among the stakeholders which were caused by time, fiscal and resource constraints, lack of information or non-existent issues.

## 2.29. The Change Management Process

Every kind of project faces changes. The specific change management process should fit the size and complexity of the project; special attention should be paid to the number and diversity of the stakeholders. But every change process is based on the same fundamental model shown in Figure 2.9.

There are two parts to the change management process: the steps leading up to the initial approval of a product and the process for controlling changes to that product.

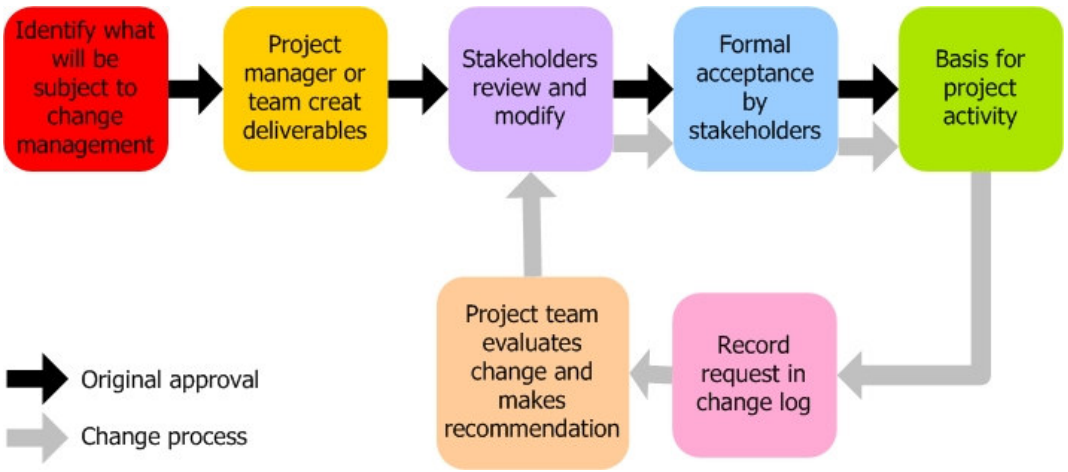



Figure 2.9 - The essential change management process *Source*: Verzuh, Eric (2005)

Change management planning occurs during the project definition stage. The members of the change board should be selected and the frequency of the meetings determined. The intermediate products that will be subject to change management need to be identified and a configuration management structure created.

## 2.30. Configuration Management

Configuration management prevents unpleasant situations by limiting the changes to control documents and other project deliverables. It is a subset of change management, which focuses specifically on how to implement approved changes. The items that should be subject to configuration management come from a wide variety of sources and include any product that might have multiple versions during the project like electronic files, computer programs or prototypes.

Configuration management is practiced most robustly in the manufacturing of complex products, such as automobiles and aircraft. Each revision or upgrade to a component of the product is formally controlled by the product's configuration management process. The fundamental process for configuration management is the same at any level of complexity: identification of the items that will be controlled, setting up the control structure, and assigning responsibility for control.

## 2.31. Managing Vendors

As more and more organizations try to focus on their core competencies and reduce their fixed operating costs, while simultaneously attempt to execute more projects, it is very likely that projects will involve collaboration with other organizations.

While the specific process for establishing working relationships with other organizations depends largely on the industry, many project managers lack considerable exposure to procurement and vendor management. Often, this is due to organizational structures and the common use of procurement specialists due to the legal and contractual nature of this activity.

The key project management skills needed for procurement and vendor management include the following:

- Managing expectations
- Defining a project
- Proficient negotiating
- Vendor selection and evaluation
- Effective verbal and written communications
- Managing virtual and cross-cultural teams
- The ability to identify risks and develop appropriate responses
- Contract knowledge
- The ability to manage a contract
- Understanding when and how to use legal assistance
- Managing changes
- Strong interpersonal skills

Since contract knowledge is a key project management skill for procurement and vendor management, it is essential to go a little into details. First of all, the four conditions that make a contract a legally binding agreement are:

- It must be voluntarily entered into
- It must contain mutual considerations
- It must be created for legal purposes
- It must be signed by authorized parties

The three common contract types are as follows:

- Time and materials (T&M)
- Fixed price (FP)
- Cost reimbursable (CR)

| | T&M | FP | CR |
|---|---|---|---|
| **Advantages** | Quick to create.<br>Brief duration.<br>Good choice when hiring people to augment staff. | Less work for buyer to manage.<br>Seller has strong incentive to control costs.<br>Buyer knows total project price.<br>Companies are familiar with this type.<br>Can include incentives. | Simpler scope of work.<br>SOW is easier than an FP one.<br>Lower cost than FP because the seller does not need to add as much for the risk.<br>Can include incentives. |
| **Disadvantages** | Profit in every hour billed.<br>Seller has no incentive to control costs.<br>Good only for small projects.<br>Requires most day-to-day oversight by the buyer. | Seller may under-quote and make up profits with change orders.<br>Seller may reduce work scope if it is losing money.<br>More work for the buyer to write the SOW.<br>Seller will increase the price to cover risk. | Must audit seller's invoices.<br>More work for buyer to manage.<br>Seller has only moderate incentive to control costs.<br>Total project price is unknown. |
| **Best to use when…** | You need work to begin right away.<br>You need to augment staff. | You know exactly what needs to be done.<br>You don't have time to audit invoices. | You want to buy expertise in determining what needs to be done. |
| **Who has the risk?** | The buyer | The seller (cost), or both the buyer and seller if not well defined. | The buyer |

Table 2.4 - Summary of Contract Types *Source*: Horine, Gregory M. (2005)

## 2.32. Outsourcing

This method of balancing a project involves carving out a portion of the project and handing it to an external firm or multiple firms to manage and complete. This option is especially attractive if this portion of the project requires specialized skills not possessed by internal staff.

"Three types of outsourcing are:

**Positive:** This moves a large portion of the work to experts whose skills should result in greater productivity and a shortened schedule.

**Negative:** This shifting of responsibility creates more risk. The project manager will have less control over the progress of the work and, if the outside specialists prove to be less than competent, it may be too late to alter the team. Even if it succeeds, an outside firm will leave little of its expertise with the firm at the end of the project.

**Best application:** Outsourcing is at the high end of the risk/return spectrum. When it works, it can be a miracle of modern business methods; when it does not, it can result in real catastrophes. The keys to successful outsourcing are finding qualified vendors and coming to clear agreements before the work begins. These agreements must be built using various tools such as responsibility matrixes, work breakdown structures (WBS), network diagrams, and Gannt charts." [27]

## 2.33. Terminating a Project

As it is to all things, termination comes to every project. At times, project death is quick and clean, but more often it is a long process; and there are times when it is practically impossible to establish that death has occurred. The skill with which

termination is managed has a great deal to do with the quality of life after the project. The termination stage of the project rarely has much impact on technical success or failure, but it has a great deal to do with remaining attitudes toward the project. It also has a great deal to do with learning about the things that lead to success or failure.

The process of termination is never easy, always complicated, and, as much as we might wish to avoid it, almost always inevitable. The problem is how to accomplish one of the several levels of what is meant by project termination with a minimum of trouble and administrative dislocation.

A project can be said to be terminated when work on the substance of the project has stopped or slowed to the point that further progress on the project is no longer possible, when the project has been indefinitely delayed, when its resources have been deployed to other projects, or when project personnel become persona non grata with senior management.

The project may end because it has been successful and achieved its goals, or it may also be stopped because it is unsuccessful or has been replaced. Changes in the external environment or extraordinary cost escalation in the technology and materials can kill projects too.

When a decision is made to terminate a project by extinction, the most noticeable event is that all activity on the substance of the project stops. A great deal of

organizational activity might remain to be done. Arrangements must be made for the orderly release of project team members and their reassignment to other activities if they are to remain in the parent organization. The property, equipment, and materials belonging to the project must be disbursed according to the dictates of the project contract or in accord with the established procedures of the parent organization. Finally, the Project Final Report, also known as the *project history*, must be prepared. Most projects are "in-house" and are carried out by the project team for use in the parent organization. If a project is a major success, it may be terminated by institutionalizing it as a formal part of the parent organization. When the project is made a more or less full-fledged member of the parent, it lives its first years in a protected status, carrying less share of overhead cost. As the years pass, it is expected gradually to assume the economic responsibility of full adulthood.

When the project success results in termination by addition, the transition is dramatically different from termination by extinction. In both cases the project ceases to exist, but there the similarity stops. Project personnel, property, and equipment are often transferred from the dying project to the newly born division. The metamorphosis from project to department, to division, and even to subsidiary is accompanied by budgets and administrative practices that conform to standard procedure in the parent firm.

Termination by integration is the most common way of dealing with successful projects, and the most complex. The property, equipment, material, personnel, and functions of the project are distributed among the existing elements of the parent

organization. The output of the project becomes a standard part of the operating systems of the parent company, or the client. Most of the problems of termination by addition are also present when the project is integrated. In the case of integration, the project may not be viewed as a competitive interloper, but the project personnel being moved into established units of the parent organization will be so viewed.

The fourth type of project termination, termination by starvation, is in fact not a termination. It is "slow starvation by budget decrement". Budget cuts or decrements, are not rare. Because they are common, they are sometimes used to mask a project termination.

"There may be a number of reasons why senior management does not wish to terminate an unsuccessful or obsolete project. In some firms, it may be politically dangerous to admit that one has championed a failure, and terminating a project that has not accomplished its goals is an admission of failure. In such a case, the project budget might receive a deep cut, large enough to prevent further progress on the project and to force the reassignment of many project team members. In effect, the project is terminated, but the project still exists as a legal entity complete with sufficient staff to maintain some sort of presence." [28]

## 2.34. The Termination Process

The termination process has two distinct parts. First is the decision whether or not to terminate. Second, if the decision is to terminate the project, it must be carried out.

Decision-aiding models for the termination decision fall into two generic categories. First, there are models that base the decision on the degree to which the project qualifies against a set of factors generally held to be associated with successful (or failed) projects. Second, there are models that base the decision on the degree to which the project meets the goals and objectives set for it. In figure 2.10, a sample decision support system (DSS) can be seen in detail.

The decision criteria, constraints, weights, and environmental data are unique to each organization, as are the specifics of using the decision model. Once it has been decided to terminate a project, the process by which it will be terminated must be implemented. The actual termination can be planned and orderly, or a simple cut off job. The former is apt to have significantly better results, and so it is suggested that the termination process be planned, budgeted, and scheduled just as is done for any other phase of the project life cycle.

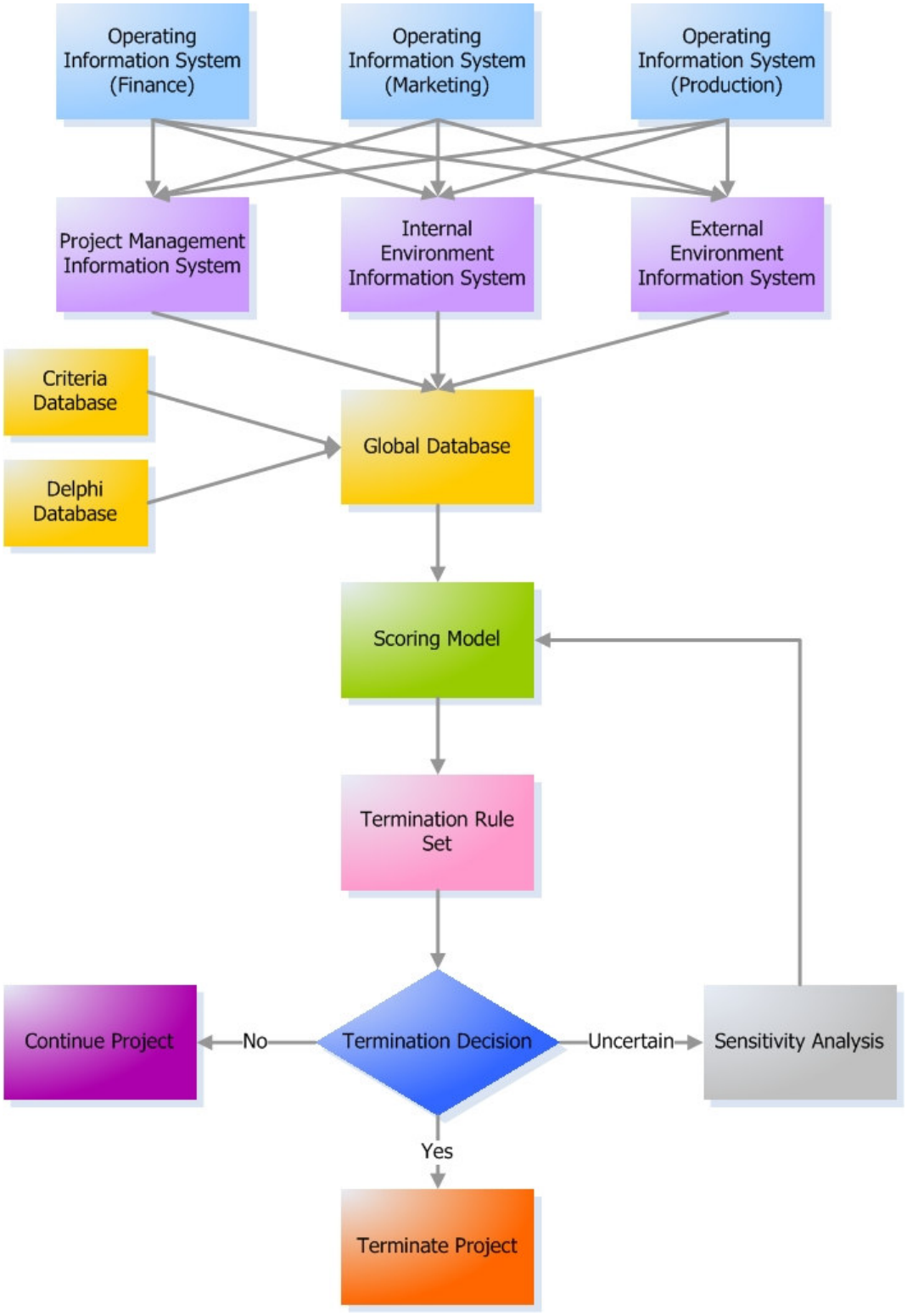



Figure 2.10 - DSS structure for a project termination decision *Source*: Shafer and Mantel (1989)

In some organizations, the processing of the project closeout is conducted under the direct supervision of the project manager, but this often raises dilemmas. For many project managers, termination signals the end of their reign as project leader. If the project manager has another project to lead, the issue may not be serious: but if there is no other project and if the project manager faces a return to a monotonous life in a functional division, there may be a great temptation to stretch out the termination process.

The project manager also has another option: to ignore the termination process entirely. The evaluation has already been conducted and praise or censure has been delivered. Rather than dealing with termination, the project manager may let the project administrator handle things. Project team members may well have similar feelings and reactions, and may seek new jobs or affiliations, before the project actually ends, thereby dragging out some final tasks interminably.

Special termination managers are sometimes useful in completing the long and involved process of shutting down a project. In such cases, the project manager is transferred to another project or reassigned to a functional position. The termination manager does not have to deal with substantive project tasks and therefore may be a person familiar with the administrative requirements of termination and the environment within which the project will be operating (if it continues to live). If personnel performance evaluations are required, and they usually are, they must be prepared by the project manager or whoever supervised the work of each individual team member, not by a specially appointed termination manager.

If technical knowledge is required during the termination process, a member of the project team may be upgraded and assigned responsibility for the termination.

## 2.35. The Final Report – A Project History

Good project management systems have a memory; the embodiment of this memory is the *Project Final Report*. The final report is not another evaluation; rather, it is the history of the project. It is a chronicle of the life of the project, a compendium of what went right and wrong, or who served the project in what capacity, of what was done to create the substance of the project, of how it was managed. Since we learn from experience only if the experience is preserved and studied, the PMBOK emphasizes the importance of keeping and reviewing past experience as prelude to new experience.

The elements that should be covered in the final report are: project performance, administrative performance, organizational structure, project and administrative teams, and techniques of project management. When considering these elements it is also beneficial to consider where the source materials can be found. For the most part, the required information is contained in the project master plan, the document that includes the proposal, all action plans, budgets, schedules, change orders, and updates of the above. In addition to the master plan, all project audits and evaluations also contain required input data. Almost everything else required by the final report is reflective, based on the thoughts of the project manager and others involved in the project.

For each element covered in the final report, recommendations for changing current practice should be made and defended. Insofar as is possible, the implications of each potential change should be noted. Commonly ignored, but equally important, are comments and recommendations about those aspects of the project that worked usually well. Most projects, project teams, and project managers develop informal procedures that speed budget preparation, ease the tasks of scheduling, improve forecasts, and the like. The final report is an appropriate repository for such knowledge. Once reported, they can be tested and added to the parent organization's list of approved project management methods.

The fundamental purpose of the final report is to improve future projects. It is ultimately focused on the project itself and on the process by which the project was conducted. Data on the project and its outcomes are available in the many interim reports, audits, and evaluations conducted during the project's life. But data on the process come largely from the project manager's recollections.

## 2.36. Project Closing

Project closing is the last phase of the project life cycle. The project is considered complete when the project manager has verified that all objectives have been met and the customer has accepted the deliverables. In addition, the project manager still has a few tasks to do after the project has apparently been completed.

Project close activities are always important, regardless of the size of the project, yet projects are seldom closed out correctly. This is due primarily to the fact that the

people who did the work may have already been assigned to other projects. That is just the nature of working in a matrix with part-time team members. But it is also true that many project managers either do not know what to do to close a project properly or just do not take the time due to the crush of other work.

Project close is a powerful mechanism for improvement. Regardless of whether a project hit the mark or missed it in some way, it contains the seeds of success for future projects.

We can look at the project close as a three-step model: hand off, recycle, and celebrate.

**Hand Off**

At this point, it is necessary to make sure that the formal acceptance document has been signed and returned by the customer. For internal customers, such as a business unit acting as the customer, it is not likely to get formal, written acceptance.

**Recycle**

This step contains capturing lessons learned and putting them to use to help future project teams.

In hindsight, every project could have been managed a little differently, perhaps a little better, had the project manager and team had more experience with the specific

customer, technology, or situation. Capturing lessons learned on the project is a great way to provide this information to future teams.

By gathering lessons learned and making them available to others, we can avoid learning things "the hard way". Establishing and intranet site for lessons learned, emailing everyone on the project team, and encouraging the project team to attend future project planning sessions are the means to recycle the information gathered during the project.

**Celebrate**

The final task for the project manager is to reward team members and have a little celebration to bring closure to the project and to the team.

The sponsor should let the team know how much their efforts are appreciated and the difference the project will make to the organization.

# CHAPTER III

## THE EBSO PROJECT and THROUGHOUT ANALYSIS

As a sample application for my master thesis, I chose to work on one of the projects that EBSO has held this year. The project is funded by European Union and tries to get attention of the industrial organizations in certain industry regions to the environmental issues.

The main reason of the project is to inform the organizations about the environmental commitments, regulations, and instructions which will be obligatory prior to joining to the European Union. In addition to this, strategies should be set and long-term plans should be made in order to achieve the desired results.

To begin analyzing success criteria and overall performance of the project from the point of methodology, I sent a survey to EBSO and wanted them to fill the survey in a certain amount of time. In the following pages, information gathered from the project team can be seen in detail and then analyzes and proposals will be discussed.

## I. PROJECT DEFINITION

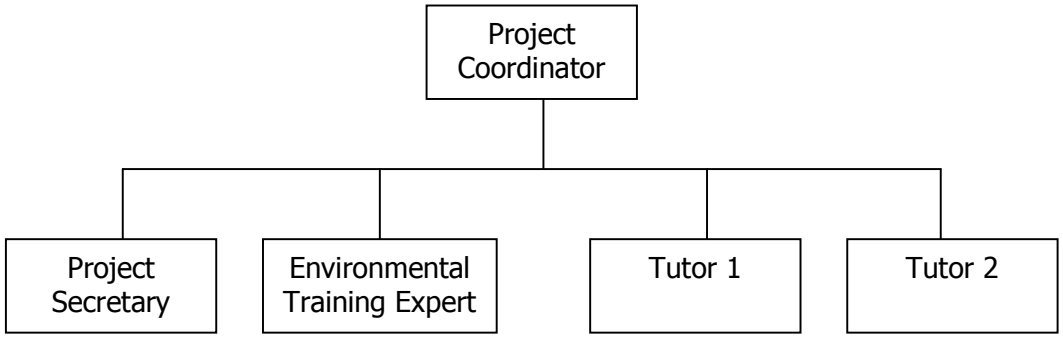
| | |
|---|---|
| **Name of the project** | Forming consciousness for environment among the industrial organizations during continuing progress |
| **Reason for the project** | After the meeting in EBSO on 23-24 June 2006 with 50 organizations, it was found out that:<br><br>▪ The participants are not well informed about the regulations and instructions,<br>▪ There is a need for making an analysis of the sectors that would be affected by these regulations and instructions,<br>▪ It is necessary to set the strategies and plans after determining the priorities |
| **Goals** | The major goal of the project is reducing the pollution in the Aegean region caused by the industry. In order to do this, a special effort should be spent for the contribution to the training of the companies in the four industrial regions which have activities in textile, food, metal processing, and organic and inorganic chemicals. |
| **Success criteria** | ▪ By the year 2010, the pollution in the rivers caused by industry will be %25 reduced.<br>▪ By the end of year 2008, the number of industrial organizations which are producing according to the ISO 14000 regulations will be increased %25 compared to 2006.<br>▪ By the end of year 2008, ten training courses will be organized<br>▪ Data would be collected from 150 organizations to be used in further research<br>▪ After the seminars, %80 of the participants said that they are well informed about the pollution<br>▪ %95 of the participants said that they are more aware about the pollution<br>▪ 300 people are trained about environmental systems |
| **Constraints** | Although not stated in the project proposal, in order to have meaningful results from the data collection, the sample size should be at least %20 of the real population. |
| **Assumptions** | ▪ Financial power of the organizations are enough to apply these technologies<br>▪ Organizations will respond to the survey and participate in the training seminars. |
| **Project team** | Project coordinator<br>Project secretary<br>Environmental training expert<br>Tutors (2) |
| **Finance** | Project budget is covered by European Union and EBSO |
| **Related parties** | Project executer: Ege Bolgesi Sanayi Odası (EBSO)<br>Project local partner 1: Ege Üniversitesi Çevre Sorunları Araştırma ve Uygulama Merkezi<br>Project partner institutions: EBSO Environmental Committee, EBSO University-Industry Cooperation Committee,<br>Izmir Directorate of Environment and Forestry |

## II. PROJECT PLANNING

### a) Work Packages

- Forming the environmental education centre
- Data collection
- Information meetings about the current situation
- Training
- Evaluation, final report

### b) Project Team




### c) Activity Plans and Relationships

| Activity | Definition | Depends on | Duration (month) |
|---|---|---|---|
| A | Forming the environmental education centre | - | 1 |
| B | Press meeting | A | 1 |
| C | Forming the project team | - | 1 |
| D | Procurement of the centre equipment | A | 1 |
| Y | Pre-seminars | A, B, C, D | 1 |
| E | Data collection | D, Y | 2 |
| Z | Field studies | Y | 1 |
| F | Data evaluation and reporting | E, Z | 1 |
| G | Four information seminars | F | 1 |
| H | Designing the training programs | F | 2 |
| I | Litter management training | H | 1 |
| J | ISO 14001 training | I | 1 |
| K | European Union regulations training | J | 1 |
| L | Final report | K | 1 |

## d) Project Schedule

| | 1. Semi-year | | | | | | 2. Semi-year | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Activity** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| Forming the education centre | | | | | | | | | | | | |
| Press meeting | | | | | | | | | | | | |
| Forming the project team | | | | | | | | | | | | |
| Procurement of equipment | | | | | | | | | | | | |
| Pre-seminars | | | | | | | | | | | | |
| Data collection | | | | | | | | | | | | |
| Field studies | | | | | | | | | | | | |
| Reporting | | | | | | | | | | | | |
| Information seminars | | | | | | | | | | | | |
| Designing the training programs | | | | | | | | | | | | |
| Litter management training | | | | | | | | | | | | |
| ISO14001 training | | | | | | | | | | | | |
| EU regulations training | | | | | | | | | | | | |
| Final report | | | | | | | | | | | | |

## e) Project Resources

### Finance

%90 of the project budget is covered by European Union funds, and %10 by EBSO

### Personnel

Project coordinator

Project secretary

Environmental training expert

Tutors

### Place

Project office is provided by EBSO

**Materials**

Stationery

**Hardware**

1 notebook computer

1 desktop computer

1 projector

1 printer/scanner/fax

**Software**

Microsoft office applications are used, any other special project management software was not used.

## f) Project Budget

| EXPENSES | Unit | # of units |
|---|---|---|
| | | |
| **1. Human Resources** | | |
| 1.1 Salaries (gross amounts, local staff) | | |
| 1.1.1 Technical | Per month | |
| 1.1.1.1 Project Coordinator | Per month | 11 |
| 1.1.1.2 Training Centre Personnel | Per month | 0 |
| 1.1.1.3 Training Centre Personnel | Per month | 12 |
| 1.1.1.4 Trainer1 | Per day | 30 |
| 1.1.1.5 Trainer2 | Per day | 30 |
| 1.1.2 Administrative/ support staff | Per month | |
| 1.1.2.1 Secretary | Per month | 11 |
| 1.2 Salaries (gross amounts, expat/int. staff) | Per month | |
| 1.3 Per diems for missions/travel | | |
| 1.3.1 Abroad (staff assigned to the Action) | Per diem | |
| 1.3.2 Local (staff assigned to the Action) | Per diem | 15 |
| 1.3.3 Seminar/conference participants | Per diem | |
| | | |
| **2. Travel** | | |
| 2.1. International travel | Per flight | |
| 2.2 Local transportation | Per flight | 4 |
| | | |
| **3. Equipment and supplies** | | |
| 3.1 Purchase or rent of vehicles | Per vehicle | |
| 3.1.1 Office car rental | Per month | 12 |
| 3.2 Furniture, computer equipment | Per unit | |
| 3.2.1 Office furniture | Per unit | 1 |
| 3.2.2 Personal computer (for the office) | Per unit | 1 |
| 3.2.3 Laptop computer (for the trainings) | Per unit | 1 |
| 3.3 Machines, tools | Per unit | |
| 3.3.1 Printer, fax, telephone | Per unit | 1 |
| 3.3.2 Projector | Per unit | 1 |
| 3.4 Spare parts/equipment for machines, tools | | |
| 3.5 Other (please specify) | | |
| | | |
| **4. Local office** | | |
| 4.1 Vehicle costs | Per month | 12 |
| 4.2 Office rent | Per month | |
| 4.3 Consumables - office supplies | Per month | 12 |
| 4.4 Other services (tel/fax, electricity/heating, maintenance) | Per month | 12 |
| | | |
| **5. Other costs, services** | | |
| 5.1 Publications | Per unit | |
| 5.1.1 Reports (Questionnaire and Interview Results) | Per unit | 5 |
| 5.1.2 Project results | Per unit | 5 |
| 5.2 Studies, research | | |

| | | |
|---|---|---|
| 5.3 Auditing costs | Per month | 1 |
| 5.4 Evaluation costs | | |
| 5.5 Translation, interpreters | | |
| 5.6 Financial services (bank guarantee costs etc.) | | |
| 5.7 Costs of conferences/seminars | Per unit | 4 |
| 5.8 Visibility actions | Per unit | |
| 5.8.1 Poster | Per unit | 50 |
| 5.8.2 Brochure | Per unit | 1000 |
| 5.9 Questionnaire Preparation and Application | per unit | 2 |

## III. PROJECT CONTROL and EXECUTION

### a) Resource Consumption Ratios

### Time

The project is scheduled to start on 30 November 2006, and to end in November 2007. So far, %75 of the project schedule has been completed.

### Finance

So far, % 31 of the project budget has been consumed.

### b) Control and Reporting Activities

- Technical report
- Final report
- Data collection report
- Information emails sent to project partners

**c) Managing Risks**

The success of the project mainly depends on the feedback gathered from the participants. The probability of the incorrect data, inadequate feedback and inconsistent participation forms the greater risks in the project.

During the preparation of the questionnaire, project partners agreed on informing the participants about the project before the actual project starts in order to have a more accurate data collection. For this reason, it was decided that information seminars would be held.

During these information seminars, below matters were emphasized:

- The goal and scope of the project were planned according to the needs of industrial organizations
- All the information gathered from the organizations would be kept confidential and would not be shared with any other organizations
- The questionnaire must be filled by the environmental engineer, production engineer and the quality manager in the organization

For the successful execution of the project, collection of the questionnaires had vital importance. Therefore, all the organizations that were in the survey were informed in detail about the scope of the project and they were often contacted to make sure the data collection is done well.

After the information seminar was held, the project team realized that most of the companies from the same industrial region did not attend the seminar, so additional seminars were held in these industrial regions.

**d) Corrective Actions**

224 organizations attended the seminars and they were expected to send the questionnaires afterwards. However, a very low feedback was gathered from the organizations.

In order to get accurate information, the deadline for collecting the questionnaires was changed to a further date. The organizations were contacted by phone to send the questionnaires and %20 of the sample size sent the documents.

After careful studying, 20 organizations were selected and the project team visited these companies to fill the questionnaires.

The field study – which was not in the master project plan in the beginning – was carried out, and as a result, 68 companies responded which was %30 of the sample size.

**e) Managing Changes**

Due to the delays in legal protocols, the project started one month later, in January 2007. Considering that the duration of the project is 12-months, one month delay is a big change in the project.

Another big change is in the project budget, the 44.630 € total fund from the European Union was transferred to the project's account three months late.

The feedback gathered from the participants was so low that information seminars had to be arranged which caused a delay in the project schedule.

The project "Forming consciousness for environment among the industrial organizations during continuing progress" can be considered as a successful project from the point of achieving goals and satisfying the project partners. However, many project management issues including some of the most basic ones have been left out in the project and therefore the overall performance is quite low from the point of proactive project management.

In order to contribute to the subject and improve the project performance, here are the propositions for the project that is being studied:

- As a very basic project management issue, critical path has not been studied in the beginning of the project and the critical activities have not been emphasized. Therefore, the delay in the project schedule was not visible in the beginning of the project although special attention was given to particular activities.

- The main anchor of the project was the awareness and feedback of the participants, but the quality of the communications was unfortunately based on the surveys only. Instead, a project website could be prepared and awareness campaigns could be held strictly. Cooperation with similar institutions (other than the project partners) should have been made for the sake of the project.

- Due to weak communications, the feedback ratio from the participants was always low and although the project budget was enough to support better communication, only published work was used.

- Lack of methodology can be seen in every phase of the project. The main planning system of "design – implement – test" was not used properly and in correct order. We can see that great attention was given to implementation rather than design which is quite unusual in projects like this. A high percentage of projects are either cancelled or misled because of the lack of proper planning. Having this in mind, if a special attention was given to planning, the results of the project would be more satisfactory for both the project partners and the related parties.

- Activities and work packages were linked to each other sequentially rather than concurrently. Thus, the delay in the project schedule was surely inevitable. If we examine the activities carefully, it will be obvious that most of them (including the various training programs) could be held concurrently, so that extra time could be created for other supporting activities. For instance, considering that they already designed the training programs and hired the related tutors, it does not make any sense to execute the training sessions separately in 3-months period. Similar example can be given for forming the education centre and procurement of the materials.

- Scope expansion has never been mentioned, planned or encouraged although in projects like this which are based on education and training, are usually expanded after certain amount of time when there is an opportunity in the schedule to integrate new modules.

- A systematic risk management approach has not been executed and the real risks that the project might face have not been studied enough. A special attention had to be spent for the identification of the risks and forming the risk profiles and risk logs. Considering that schedule and budget development is based on risk management, probability and impact levels should have been studied carefully. Risk management terminology and proper labelling were missing.

- Since the risk factors and impacts have not been studied well, there was a lack of corrective actions, change control procedures and lessons learned sessions.

- Although the project stayed within the budget which is one of the success factors in projects like this, the usage of the financial resources was not balanced considering that only 31% of the budget was used at the time that project schedule has reached to 75%. In other words, more financial resources could be allocated *on time* to increase the awareness and quality of the results.

- Further research in the project is quite limited due to the small number of participants and their inadequate willingness for improvement.

Despite the many incorrect and missing project management activities, the main idea behind executing such a project was accomplished and the project partners are relatively satisfied. Staying within the project budget was one of the success criteria; however, other success factors such as schedule and scope were not as satisfactory as the budget commitment.

# CHAPTER IV

## CONCLUSIONS

As seen in the EBSO example, the use of projects and project management continues to grow in the society and its organizations. We are able to achieve goals through project organization that could be achieved only with the greatest of difficulty if organized in traditional ways.

Project management is hard work. It requires persistence, dedication, and patience. The art of project management is applying the science to achieve success. When we are armed with the basic tool set of techniques to define, plan, and control projects, we have the components of every successful project.

The biggest trend favouring project management is the increasing pace of change; we embrace change as it increases our quality of life. We may resist or resent change, particularly when it is forced upon us in the form of new regulations or new competition. However, change cannot be denied and its pace is faster than ever.

The emphasis of change increases the importance of project management, because a rapid rate of change brings a greater need for projects. In response to a rapidly changing world, companies might reengineer themselves, innovate, develop new products, or form alliances with other bodies.

The global civilization is changing rapidly and that change is accomplished through projects and is being led by project management professionals. Projects enable us to adapt to changing conditions; reengineering a process or an organization, assessing a company's direction in a new market, bringing out a new product, or adapting new technology are all necessary changes accomplished through projects. In this increasingly project-oriented environment, project management has become a critical job skill and career path. Professionals at every level of organization become more valuable when they understand and apply the discipline of project management.

The purpose of the thesis is to emphasize the importance of project management both as a science and fundamental skill. Gaining the necessary skills will give every chance of steering a project from its planning steps through to its successful completion. The main point is to understand that the project environment is different from that of a traditional organizational environment, and therefore, there is a great need to apply modern project management techniques when dealing with a complex project. The proper way of managing projects is pretty obvious; following the steps in the correct order and fulfilling the project expectations in every stage of the project. Recognizing the unique problems of the projects leads to a better understanding of the potential challenges and will give the problem-solver the opportunity to deal with them.

## NOTES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