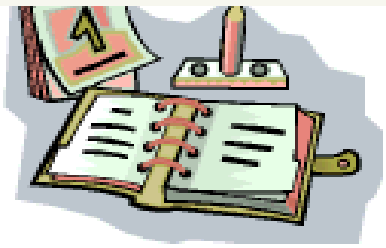
Project Management

- Principles and Practices



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N O T I C E

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Instructor's Background

Ranjit K. Roy, Ph.D., P.E., PMP, (Mechanical Engineering, president of **NUTEK, INC.)**, is an internationally known consultant and trainer specializing in quality engineering. Dr. Roy has achieved recognition for his down-to-earth style of teaching of Taguchi's experimental design and other quality improvement techniques like Quality Operating Systems (QOS), Production Problem Solving, Project Management, etc.

Dr. Roy began his career with The Burroughs Corporation as a senior project engineer following the completion of graduate studies in engineering at the University of Missouri-Rolla in 1972. At General Motors Corp. (1976-1987) Dr. Roy assumed various engineering responsibilities, his last position being that of reliability manager. While at GM, he consulted on a large number of documented quality improvement projects of significant cost savings.

Dr. Roy established his own consulting company, Nutek, Inc. in 1987 and currently offers consulting, training, and application workshops on product and process design improvement. He is the author of the textbooks **A Primer On The Taguchi Method,** published by the Society of Manufacturing Engineers in Dearborn, Michigan, **Design of Experiments Using the Taguchi Approach: 16 Steps to Product and Process Improvement** published (January 2001) by John Wiley & Sons, New York, and of **Qualitek-4** software for design and analysis of Taguchi experiments. Dr. Roy is a fellow of the American Society for Quality and an adjunct professor at Oakland University, Rochester, Michigan. Dr. Roy is listed in the **Marquis Who's Who** in the world.

Project Management - Principles and Practices

Course Outline

In today's fast-paced business world, organizations that practice sound project management principles secure competitive advantage over those who rely on experience alone. Today, to get products and services to the market faster with a cost advantage, the projects must be time-based as well as cost-based. Project Managers who understand how to use the tools of Project Management are taking leadership roles in the constant drive toward operating improvement.

This comprehensive 4-day seminar is an in-depth and participative course providing project managers with the skills, knowledge and tools needed for project success. Seminar attendees learn the essential steps in setting up project plans, scheduling work, exercising appropriate control and monitoring progress to achieve desired project goals. Through class exercises and realistic simulations, attendees learn how the principles are put into practice. This course conforms to the Project Management Book of Knowledge (PMBOK by Project Management Institute) and reviews most materials included in the Project Management Professional (PMP) exam. The topics covered in this session are considered among the best practices in the field. Upon completion of this course, the participants return to their own organizations prepared to meet time, budget and performance objectives of their own projects.

Course discussions during the cover the following PMBOK areas:

- Cost Management
- Scope Management
- Time Management
- Communication Management
- Human Resource Management
- Procurement Management

Benefits from the Session:

The participant will learn the skills necessary for planning, scheduling, controlling and assessing risk in projects. Projects planned following the guidelines discussed in this course will reduce the time it takes to get a new team up-to-speed, making your organization realize the benefits of a team's synergy more quickly, develop better solutions, generate more innovative ideas, and secure greater buy-in. By attending this session, you will develop working knowledge to calculate project duration and express it in terms of confidence intervals using *critical path method* and PERT.

Who should attend this seminar/workshop?

- Managers and executives responsible for diverse projects
- Anyone seeking a structured project management method
- Project managers currently experiencing difficulty keeping projects on track
- Support function managers and supervisors who want a better understanding of the project management process
- Individuals who want to prepare themselves for a project management exam

Content

Day 1

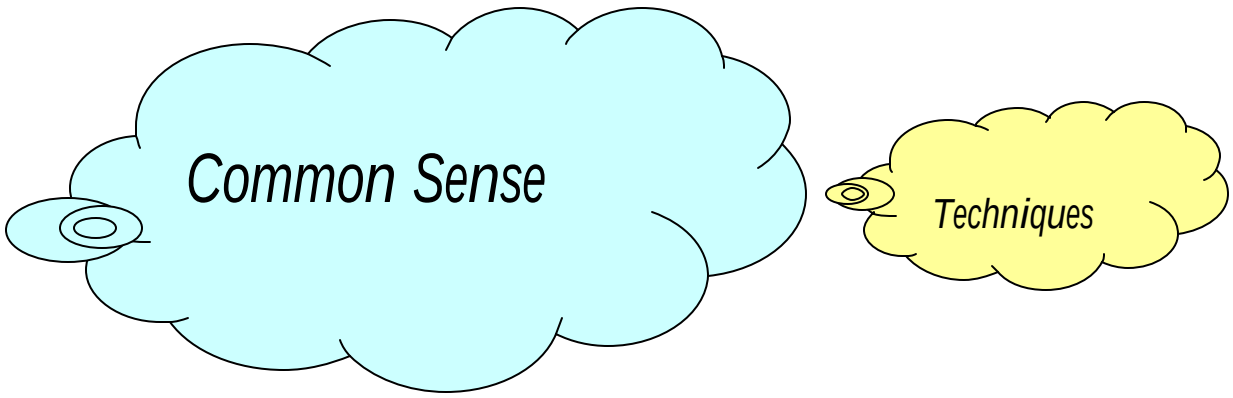
Day 2

Day 3

PM Overview & Introduction

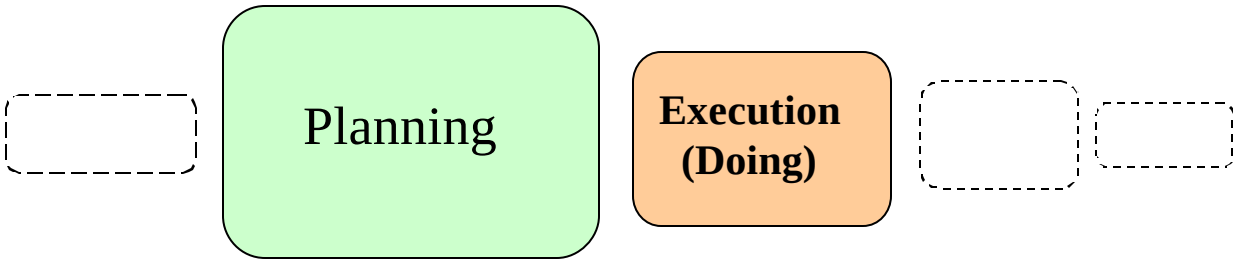
"Project Management is all about how to successfully lead, conduct and manage a project"

It takes lots of common sense and a few techniques!

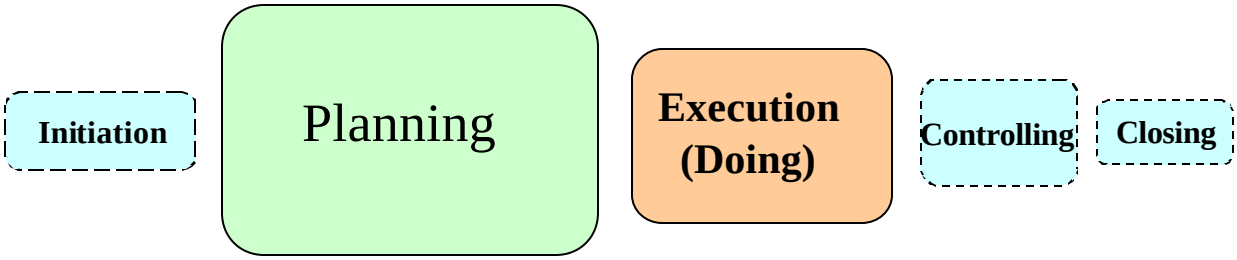


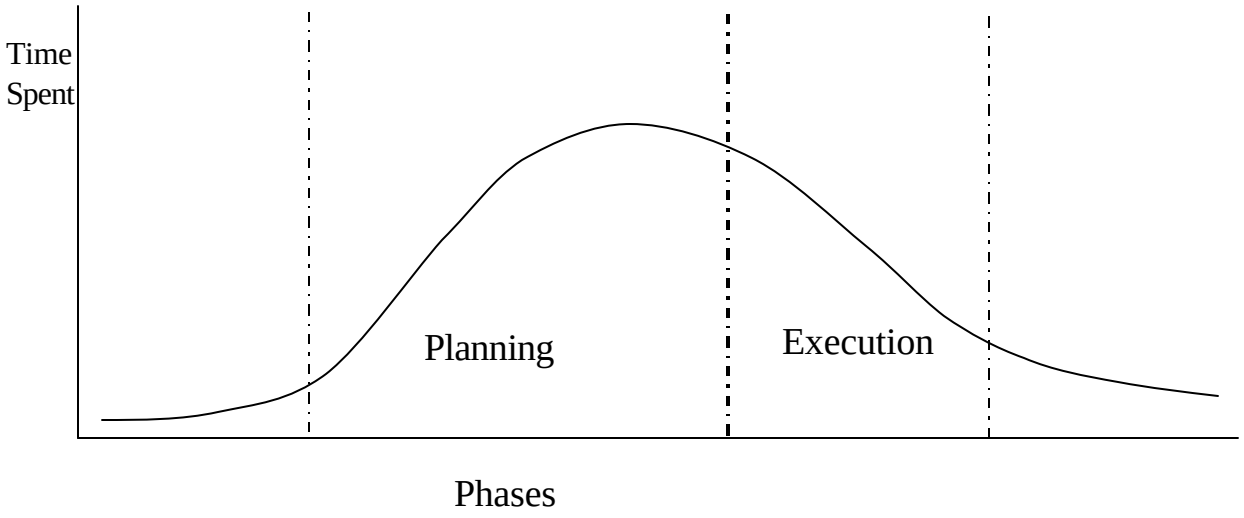
- Common sense items are too numerous
- All projects will make use of some of them
- Larger industrial projects make use of many of the techniques we will discuss in this class
- But, industrial projects are too specific and technical for diverse applications
- Simple & small projects are easy to understand by all, but do not usually make use of techniques
- Thus, the most of our examples in the class will be simpler projects that all attendees can relate to

Minimum Planning Activities (Phases)



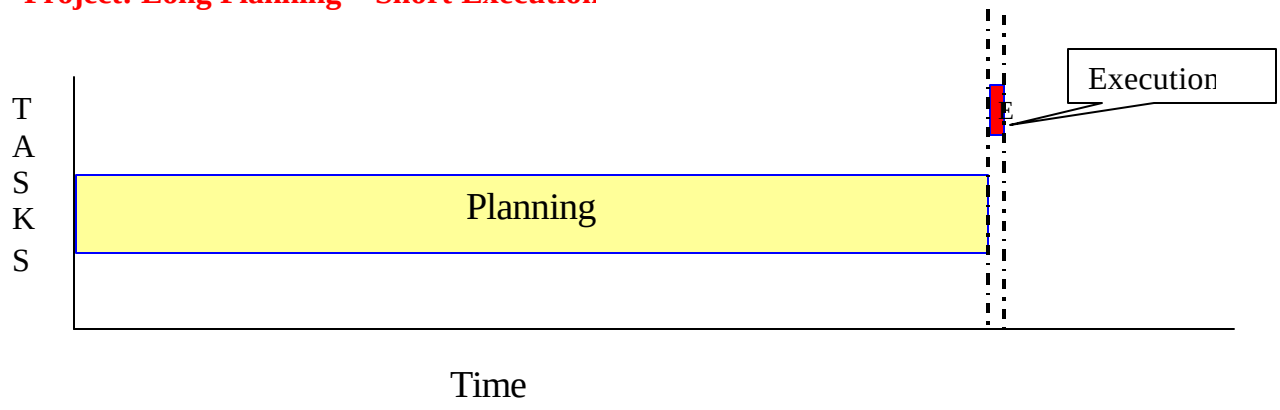
With a few more activities





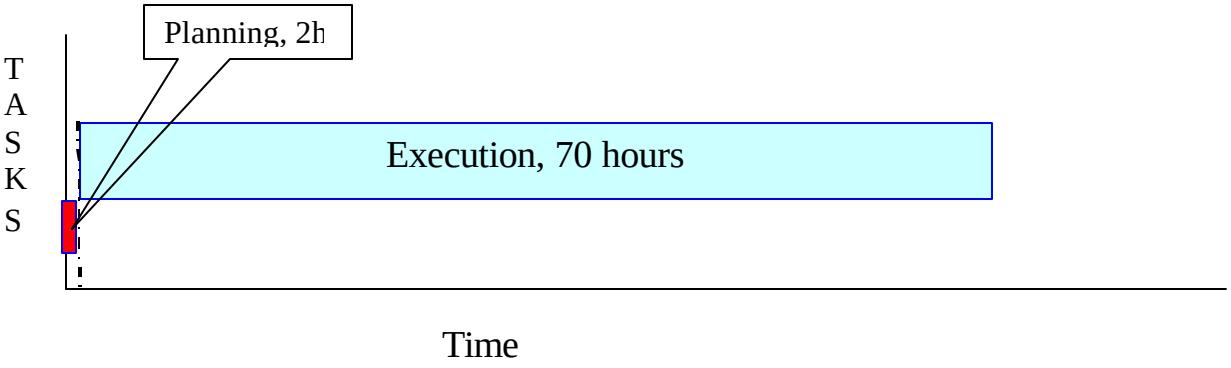
1. Wedding Ceremony & Reception (300 – 500 days of planning, 1 day of ceremony)

Project: Long Planning – Short Execution



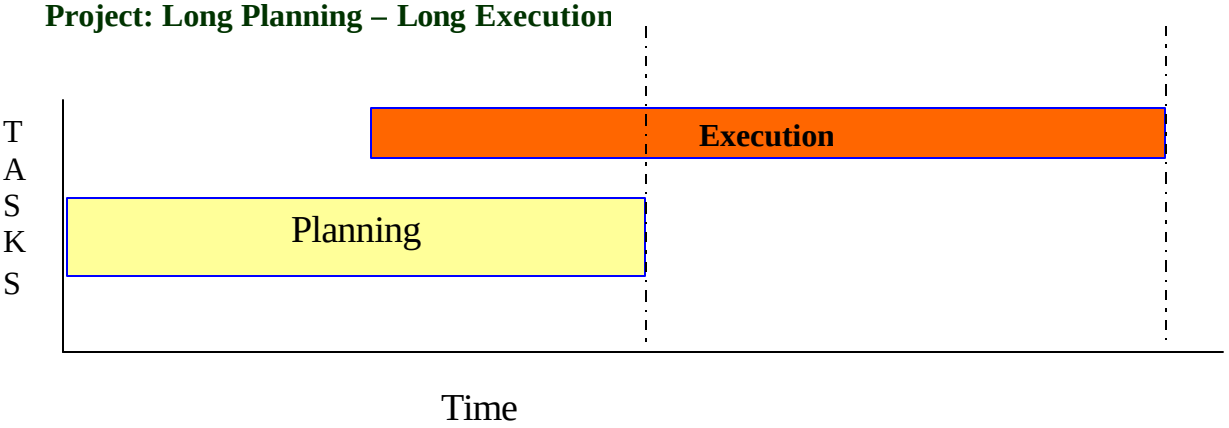
2. Powering Powerless Michiganders (Friday Aug. 14, 2003, 4:15PM, 2.2 Million households lost power; Power restored by Sunday night. Planning 2 hours, Execution 70 hours)

Project: Short Planning – Long Execution

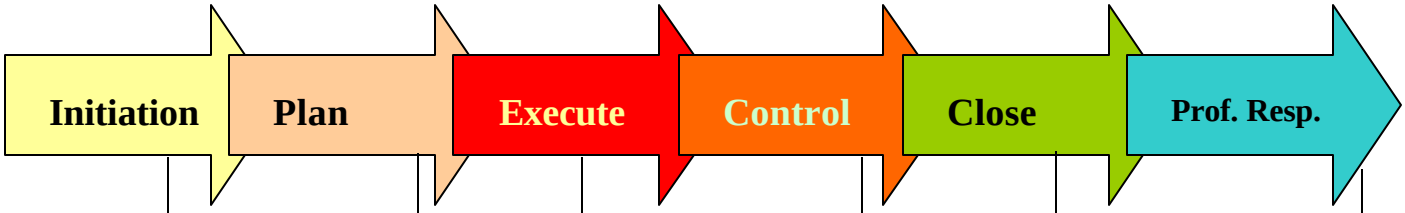


3. Lunar Exploration Project (Years to plan, years to execute)

Project: Long Planning – Long Execution



Project Management Tasks



Initiating the project

- Determine Project Goals
- Determine Deliverable Products and Services
- Determine Project Management Process Outputs
- Document Project Constraints
- Document Assumptions
- Define Project Strategy
- Identify Performance Criteria
- Determine Key Resource Requirements
- Estimate an Appropriate Project Budget
- Create a Comprehensive Document for Final Approval

Planning the project

- Refine Project Requirements
- Create the Work Breakdown Structure (WBS)
- Develop the Resource Management Plan
- Refine Project Time and Cost Estimate
- Establish Project Control
- Develop a Formal and Comprehensive Project Plan
- Obtain Project Plan Approval

Executing the project

- Commit Project Resources
- Implement the Project Plan
- Manage Project Progress
- Communicate Project Progress
- Implement Quality Assurance Procedures

Controlling the Project

- Measure Project performance
- Refine Control Limits on Performance
- Take Timely Corrective Action
- Evaluate the Effectiveness of the Corrective Actions
- Ensure Compliance with Change Management
- Reassess Project Control Plan
- Respond to Risk Event Triggers
- Inspect Project Activities Periodically

Project Closeout

- Obtain Final Acceptance of Deliverables
- Document Lessons Leaned
- Facilitate Administrative and Financial Closure
- Preserve Essential Project Records
- Release Project Resources

Prof. Responsibilities

- Maintain Individual Integrity and Professionalism
- Contribute to the Project Management Knowledge Base
- Enhance Individual Competence
- Balance Stakeholders Interest
- Respectfully Interact with Team Members and Stakeholders

Project Management - Principles and Practices

Source of Knowledge for Project Management

- Project Management Institute (PMI), a professional organization founded in 1969, is the main source of guidance in the practice of project management.
- All who practice project management benefit from the Guide to the Project Management Body of Knowledge (PMBOK) published by PMI.
- PMBOK represents the standard and accepted guidelines for project management
- Use PMBOK as a master reference.
- PMBOK contents will be discussed later in this session.

Although people of all ages have managed and accomplished projects for thousands of years, it has been recognized as discipline only a few decades ago. Today the practice is standardized and there are numerous computer aides to support the project success.

Projects of type:
Ancient projects – The Egyptian pyramids, the Trojan horse, the Great Wall, Alexander's conquest of the east, etc.

Projects of recent pasts – Wright Brother's flight, construction of rail road, the Statue of Liberty, the Taj Mahal, the Eiffel Tower, and the Empire State Building, etc.

Projects of more recent time – The Moon Landing Mission, The Dessert Storm, The Operation Iraqi Freedom, DTE Energy's ability to bring Power back to Detroit, MI Aug. 14, 2004, 4:15PM), one of the large but short-lived project (72 hours, 2.2 M people out of power), etc.

These projects were all completed by people at different times using their own method of workings at different schedules and cost. Today's project managers benefit from the best practices of the past and use of standardized techniques allowing project completion with high efficiencies in cost, time and scopes.

What is a Project and what are its Characteristics?

A project is plan that needs to get done in a set timeframe & within a deadline. Projects come in all sizes and may involve one or more people.

"A project is a temporary endeavor undertaken to provide a unique product and service."
– the Guide to the PMBOK

"A project is a problem scheduled for solution."
- J. M. Juran

A project is composed of multiple tasks including a plan, proposal, or scheme to meet a designated performance, time, and cost requirement.

A project has specific:
- goals
- time frame
- final outcome or result
- budget
- resources
- plan (what gets done when)
- evaluations (option to be evaluated on their own)

Project Types and Characteristics:
Projects come in all sizes – building a deck in your backyard, planning a wedding reception, moving into a new office, creating and implementing a new customer support database, or building a rail transportation system to connect two airport terminals, etc.

A project could be a one-man show or involve thousands of people. Also, like a well-written story, a successful project has a beginning, middle, and end. A project often originates with an idea or concept by someone or a group people to accomplish something. The middle part of the project always has lists of things to do, a plan, or strategies for completing tasks, & schedules for getting the job done. The end of a project, of course, results in achieving what all wanted and what all team members can be proud to have accomplished.

Beginning

Middle

End

What is Project Management?

"Project Management is the application of knowledge, skills and technique to project activities in order to meet or exceed *stakeholders* need and expectation from a project." - *Guide to the* PMBOK

Project management is:

- facilitating the planning, scheduling, and controlling of all activities that must be done to achieve project objectives
- providing leadership toward achieving the project goals

"Leadership is the art of getting others to want do something that you believe should be done."

- *Vance Packard*

Project Management:
Now that we know what a project is, we can proceed to understand what we mean by project management.

The terms manage and management are defined as follows (- The Tormont Webster's dictionary):

Manage –

1. To *direct* or *control* the use of a tool, machinery, etc.
2. To exert authority to discipline or persuade…..
3. To direct or *administer* the affairs of (an organization, estate, etc.)
4. To carry on or supervise business affairs …

Management –
The act, manner, or practice of *managing*, *handling*, or *controlling* something. …

Kind of Work A Project Manager Needs to Do

A project manager is the conductor of the 'show'. He/she organizes, runs, and brings the project conclusion by doing the following:

1. Define project goals
2. Determine desired results
3. Ensure work completion within budget
4. Establish schedule
5. Select teams and establish individual role
6. Secure machines & tools
7. Monitor ongoing progress
8. Resolves conflicts and problems
9. Communicate progress to stakeholders
10. Boost team members morale
11. Brings project to completion
12. Close the project by documenting the lessons learned

Example Project:
To see what a project manager needs to do, consider this example.

Project: Boost morale and teamwork by arranging for a company picnic

Budget: $15 per participating employee

Time frame: May 15 – August 30th. (Assume today's date is April 15)

1. Goal: Organize a picnic for all team members to bolster company morale and raise team spirit

2. Results expected: Enjoy food, have fun, and get to know your fellow workers on personal level.

3. Working within budget: Do not exceed budgeted cost for food, transportation, game/activity equipment, trophies, and other freebees.

4. Setting up schedule: Form the planning team eight weeks prior to the event, send out invitations six weeks in advance, order food two weeks before the event, buy other nonperishable goods a week in advance, send reminder for picnic every week for the last three weeks, etc.

5. Selecting Team: Select a group of co-workers to form a team. In doing so, you will look for people who have experience and enthusiasm to do special tasks to arrange the picnic. Assign tasks to each individual, that is, decide who will bring chicken, who will bring drinks, who will take care of games, and who will prepare the food.

6. Securing Machines & Tools: Make sure that the picnic location is reserved and that grills for barbeque are available.

7. Monitoring Progress: Check with team members to see if they are on schedule with ordering supplies. On the day of the picnic, take notes of how the food was, was there sufficient supplies, etc.

8. Resolving Conflicts and Problems: "Sally can't bring the supplies to the picnic; she's in bed with an allergy attack." Make arrangement for some one else to swing by Sally's house.

9. Communicating Status: Tell the boss that everything is progressing well and that he can relax.

10. Boosting Team Morale: Meet with team members for a dinner outing to see how everyone is doing.

11. Bringing Project to Completion: Talk with team members the day before the event to check on their status. On the day of the picnic, arrive at the picnic location early. Welcome all and introduce team members with each other when appropriate (This is necessary in today's business with remote locations).

12. Closing the Project (Asses what went right and what went wrong): People enjoyed the food very much. The picnic location being close to water was a great attraction for many. The charcoal for the grill was not of good quality; we must be selective in buying charcoal next year.

One-Person Projects

Many projects are one-person projects. Individual jobs qualify as projects, as they still definite starting points, target end dates, specific performance requirements, & definite scopes of work and budgets. But, managing these projects may not be classified as project management as there are no coordination activities with other people. For one-person projects, all you need is a **to-do list**.

Project Management Is Not Just Scheduling

A common misconception is that project management is synonymous with scheduling. If that were true, project management computer programs for project management would make all projects successful. Scheduling work is a tool used in project management. What is more important is the leadership and development of a shared understanding of the project goals and constructing a good Work Breakdown Structure (WBS) to identify all the work to be done.

Organizational Structure Suited for Project Management

Organizational Structure Suited for Project Management
Three main organizational structures are most commonly used. Often times, a combination of the three types is utilized. - The Projectized Organization o Project manager with supreme authority o Fully dedicated personnel o Difficulty securing special skills for short time o Personnel reallocation at end of project - The Traditional Organization o Set up based on people skills o Specialization is encouraged o Skill changes are difficult in response to support for project needs - The Matrix Organization (Weak & Strong) o Introduced in 1970s o Attempt to combine best of projectized with traditional structure

Matrix organization is the most desirable structure for successful. In this type, all employees are organized strictly by skills. In traditional organization, there exists some flexibility in organizing by skills. For example, an engineering analysis group may have a number of employees for specific computer support, while a mechanical test lab may have an electrical engineer. In matrix organization, people of the same skill report to the same functional managers who are responsible for providing the manpower needed by the project manager and take care of the administrative needs of the employees the provide for the project.

Project managers also have an organization. Specifically, the project manager is responsible for work that is done by the individuals assigned to the project. Since project managers are not responsible for administrative work needed for their employees, they can concentrate their time and effort on forming the right teams to get the job done.

Since people report to project managers and are responsible for their work to both functional managers and project managers, there is a need for BALANCE OF POWER.

Strong Matrix Organization – In this set up, project managers are responsible for have more people than the functional manager. This may result in more people assigned to a project than needed. Also, employee skill may be underutilized.

Weak Matrix Organization – In this type of organization, the balance of power is tilted toward the functional managers; the organization tends to be similar to a traditional organization with separate project managers. The functional managers assign and monitor work, while the project managers simply expedite the projects.

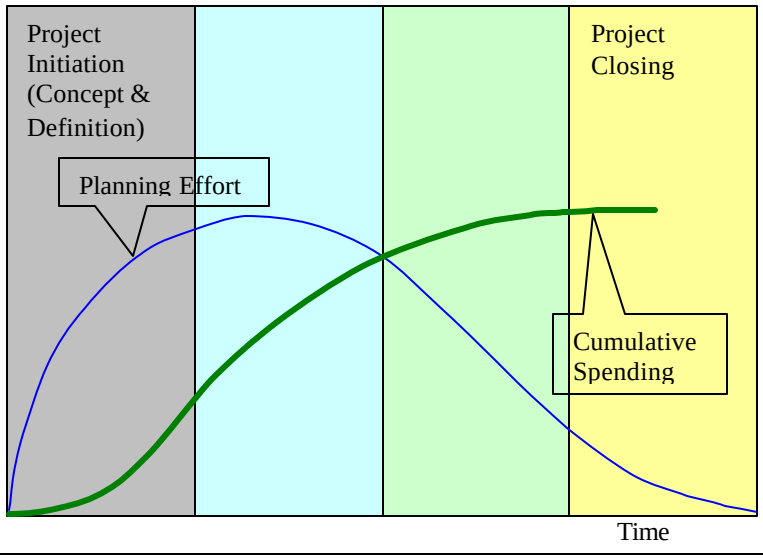
Balance Matrix Organization – In this type of organizational structure, balance of power is adjusted depending on the time spent by each employee. For example, the company could institute a standard rule that if an employee spends more than a month on the project, all work will be done under the direction of the project manager.

Project Office and Project Management Office - These terms are often used by companies with larger projects. A project office maintains office supplies and other necessities in a common location to be shared by all projects. A project management office is a separate location for the employees in the project to be housed.

- *In early 70's General Motors' five passenger car divisions planned to develop future vehicles working in a common location called Project Center in Warren, MI*

The Phases and Project Life Cycle

All projects, large or small, go through similar phases. The project life cycle defines the beginning and end of a project and various milestones within it. Different people have defined the middle phases differently. PMI describes the project life cycle in terms of process groups like: initiating process (concept and definition), planning process, execution process, controlling process, and closing process.



PMI views projects as a process and describes the project life cycle in terms of six major processes: like *initiation process, planning process, executing, controlling process, and closing process.*

Steps in Managing a Project

Project Initiation
- Define project
- Develop solution

Project Planning
- What needs to be done?
- Who will do it?
- How will it be done?
- When must it be done?
- How much will it cost?
- What is needed to do it?

Project Execution

Project Controlling and Monitoring
- Are we on target?
- What must be done if not?
- Should the plan be modified?

Project Closing
- What was done well?
- What did we learn?
- How should it be done next time

PM Phases & Tasks

Detail the list of tasks that needs to be done in each step of the project's management. These are the items a project manager has to address. The topics and methods that support accomplishing these areas will be the subject of discussions in the upcoming modules.

You can use the following as a check list while progressing through project phases.

Project Initiation Tasks (10 Tasks)

1. Determine Project Goals
2. Determine Deliverable Products and Services
3. Determine Project Management Process Outputs
4. Document Project Constraints
5. Document Assumptions
6. Define Project Strategy by Evaluating Alternative Approaches
7. Identify Performance Criteria
8. Determine Key Resource Requirements
9. Estimate an Appropriate Project Budget
10. Create a Comprehensive Document for Final Approval

Project Planning Tasks (7 Tasks)

1. Refine Project Requirements (vision, mission, scopes and objectives)
2. Create the Work Breakdown Structure (WBS)
3. Develop the Resource Management Plan
4. Refine Project Time and Cost Estimate
5. Establish Project Control (Manage & Control Changes)
6. Develop a Formal and Comprehensive Project Plan
7. Obtain Project Plan Approval

Project Execution Tasks (5 Tasks)

1. Commit Project Resources
2. Implement the Project Plan
3. Manage Project Progress
4. Communicate Project Progress
5. Implement Quality Assurance Procedures

Project Control Tasks (8 Tasks)

1. Measure Project Performance
2. Refine Control Limits on Performance
3. Take Timely Corrective Action
4. Evaluate the Effectiveness of the Corrective Actions
5. Ensure Compliance with Change Management
6. Reassess Project Control Plan
7. Respond to Risk Event Triggers
8. Inspect Project Activities Periodically

Project Closing Tasks (5 Tasks)

1. Obtain Final Acceptance of Deliverables
2. Document Lessons Leaned
3. Facilitate Administrative and Financial Closure
4. Preserve Essential Project Records
5. Release Project Resources

Professional Responsibilities (5 Tasks)

1. Maintain Individual Integrity and Professionalism
2. Contribute to the Project Management Knowledge Base
3. Enhance Individual Competence
4. Balance Stakeholders Interest
5. Respect and Interaction with Team Members and Stakeholders

The Guide to the PMBOK describes NINE knowledge areas that help you accomplish the tasks necessary (listed below) to manage the projects. Project managers need these collections of knowledge to be successful. Each of these knowledge areas operates as a sub-process in each of the major project processes. For example, the knowledge area of *cost management* is helpful to estimate the cost of management in the project planning process. Project quality management in the knowledge areas helps you monitor the progress and performance of the project. The nine PMBOK knowledge areas are summarized below.

1. Integration Management

Project integration helps you with project planning, execution, and control. It also identifies procedure you need to establish for project change control.

2. Scope Management

Project scope definition is very important for the success of the project. This area of knowledge helps you develop scope statement, boundaries of project, etc.

3. Time Management

This helps develop a project schedule that can be met and establish method to ensure that the schedule is met. (It is not to be confused with personal time management)

4. Cost Management

You will need the information here for estimating cost of resources (people, material, equipment, travel, etc) for the project.

5. Quality Management

It offers tools for quality planning and assurance. It also describes current practices for evaluation and monitoring of quality requirements.

6. Human Resource Mana..

This area helps you with finding people for the project and defines their roles and responsibilities. It also helps you structure the appropriate reporting relationships.

7. Communication Mang...

Deals with ways to plan, execute and control gathering and disseminating of all information relevant to the needs of the project stakeholders.

8. Risk Management

It describes the systematic process by which to identify, analyze, and respond to the project risk. It assures increase probability of project success.

9. Procurement Manage..

It helps with methods for procurement of goods, issuance of bids, selection of vendors, administering and closing contracts.

Project Success and Failure Data

A Standish Group (www.standishgroup.com) report from 1994 shows that:

- 17 % of software projects done in the US meet project goals
- 50% require changes to target completion dates
- 33% are cancelled
- $250 Billions are spent on software development projects each year
- $80 Billion is lost on cancelled projects

- The failure rate is similar for product development projects
- An estimated 30% of product development projects require rework

The single common reason for project failure is inadequate PLANNING.

When principles and tools of project management are followed correctly, the project success rate can significantly increase.

Many organizations require that all projects be lead by certified project managers. For many others, projects are completed by people not skilled in project management. In absence of planning, projects are managed by the seat-of-the-pants approach. Often this is the case as all senior management do not understand what project management can do for the project. So, convincing the upper management to adopt formal project management can be a challenge. As you learn more about project management, you will be able to form your own rationale to justify implementing project management in your area of work.

Project is a Balancing Act

All projects have four common constraints:

C = Cost or budget
T = Time to finish
P = Performance objective
S = Scope

These constraints bear a relationship like: $C = f(P,T,S)$, where f represents a function. This is read as "Cost is a function of Performance, Time, and Scope"

Often projects fail because sponsors demand that the project be finished within certain time, within budget, and accomplish certain desired objective (scopes) while achieving specific performance level. This would be like my spouse asking "Can we build three-level deck like our neighbor's with our $300 savings before our daughter's graduation party next month?" You can't have it all. You can only satisfy three of the four constraints in a project.

Here is a good example of **how the balance of scope, cost, time, and performance** compromises may result in severe consequences if not done right.

The Detroit News

February 27, 2003

NASA culture is culprit in disaster:
Overconfidence, safety flaws must be addressed to avoid another tragedy.

In a 248 page report based on the investigation of the shuttle Columbia accident (Feb. 1, 2003, seven crew members died), the Columbia Investigation Board blamed NASA administration for failure to implement independent safety programs that could have prevented the accident.

In response, NASA administration stated: "NASA had conflicting goals of cost, schedule and safety. Unfortunately safety lost out."

Practice & Learn: Review and solve Exercise Q 0.1 - Q 0.5.

Exercises

Q 0.1 what would you call a temporary endeavor you undertake to create something new or to solve a problem?

a. Development Task
b. Program
c. Project
d. Charter

Q 02. Which project management phase takes the most effort (not time) on the part of the project manager?

a. Execution
b. Closing
c. Planning
d. Approval

Q 0.3 A project scope defines:

a. Total budget of the project.
b. The magnitude or size of the job.
c. Project manager's commitment to the project.
d. Manpower committed to the project.

Q 0.4 What is PMBOK?

a. It's a special kind of analysis
b. It is a test administered by Project management Institute (PMI)
c. It is the body of knowledge available for project management
d. Project management book of rule

Q 0.5 What is a common problem that a working project manager will face?

a. Run short of time all the time.
b. You won't know what priorities to set
c. Your management may think you are not putting full effort.
d. Your work is likely to take precedence, and managing will suffer.