ELEMENTS of PROJECT MANAGEMENT

INTRODUCTION: TWO SIDES OF PROJECT MANAGEMENT

Need to balance technical & interpersonal aspects of project management; integrate the human, technical & financial elements of a project.

- *Technical*: "craft" or "science" component of project management.
- *Interpersonal*: "art" or behavioral / relationship side of project management.

TERMINOLOGY

- *Activity / task*: Element of work having an expected duration & resource requirement.
- *Resource:* Any people / skills, equipment or material used to accomplish an activity.
- *Project*: A unique set of activities meant to deliver a defined outcome to meet customer needs within an established time frame using a specified resource allocation.
- *Program:* Linked multiple projects managed in a coordinated way.
- *Project management:* A formal management discipline whereby projects are planned executed & controlled according to a systematic, repeatable, & scaleable process.

CHARACTERISTICS OF PROJECTS

- *Singular purpose:* defined outcome or deliverable.
- *Temporary:* finite life with defined beginning & end.
- *Cross functional:* usually involves several departments & disciplines.
- *Unique:* non routine & often creating something never done before.
- *Constrained:* project requirements / objectives giving rise to trade-offs.

PROJECT MANAGEMENT PROCESS MODEL

- Project life cycle consists of a sequence of at least four basic project phases, a logical order of thought & segments of action making up the project management process.
  - *Definition phase* includes: project requirements (scope, time & cost objectives); description of work to be performed; agreed upon quality level; identified & prioritized risks.
  - *Planning phase* includes: specific tasks the project will entail; when tasks will be scheduled; who will perform tasks; what the budget will be; how identified risks & quality will be managed.
  - *Execution phase* includes: project end item is produced; risk & quality are managed; time, cost, & scope metrics used for project control; performance reports provided to key stakeholders.
  - *Delivery phase* includes: project end item delivered to & accepted by customer; post-project review / audit completed & lessons-learned documented; project resources redeployed.
- Other project life cycle models:
  - Vee Model: Often used in systems engineering projects
  - Spiral Model: Often used in software development projects

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PROJECT DEFINITION

- One does a project to obtain a result. It is important to first clearly define the desired result so "right project" is done. Therefore the first phase in project management process is to clearly establish project's defined outcome (scope).
- *Scope:* defined project outcome; what is expected to be delivered when project completed.
  - Identifies completion criteria in specific, tangible, & measurable terms.
  - Sets stage for creating a project plan.
  - Poorly defined scope most frequently mentioned barrier to project success.
- *Work Breakdown Schedule (WBS)*
  - System view of project: relationships between all project elements & project end item; outline of project with different levels of detail.
  - Often organized by project deliverable.
  - Subdivides work into smaller, more manageable components.
  - Framework for Developing schedule and budget and tracking life cycle cost & time performance.
- *Process Breakdown Structure (PBS)*
  - Process - oriented grouping of project activities defining total scope of project.
  - Each descending level represents an increasingly detailed description of project work tasks.
  - Often used for projects involving ill-defined deliverables.

PROJECT PLANNING

- *Project plan:* document describing how project's objectives are to be achieved including a time phased budget and resource schedule.
- *Task plan:* set of actions arranged in sequence thought likely to achieve an objective.
- *Network diagram:* preferred graphic tool to arrive at the flow of project task plan having primary input of WBS and key output the project task plan.
- *Initial steps*
  - Define *activities* (cost, resources & durations derived from WBS)
  - Determine activity *dependencies,* i.e. activity sequence providing orderly project completion and predecessor, successor, concurrent / parallel activities.
- Parallel tasks give rise to task slack and resource conflicts.
- Critical path method (CPM): a network analysis technique for defining a task plan to determine:
  - Critical path;
  - Scheduling flexibility on various paths in project network;
  - Minimum total project duration.
- Critical Path
  - Series of activities defining earliest time project can be completed;
  - Longest path through network diagram;
  - There can be more than one critical path;
  - Critical path can change as project progresses;
  - Knowing critical path allows project manager to proactively manage schedule.

- Project slack: Amount of time an activity can be delayed before it becomes critical.
- Categories of slack
  - *Total slack:* will not affect planned project finish date. With total slack, managers of following activities need to be notified their activity start will be delayed.
  - *Free slack:* will not delay early start of any immediately following tasks. With free slack, coordination with other activity managers unnecessary.
- Project management and slack
  - Slack represents flexibility to rearrange work & resources throughout project life cycle.
  - Absence of slack represents increased risk of not completing project on time.
  - The less slack available the more closely a project must be monitored.
- Resource responsibility matrix
  - Used where project size & scope may not warrant elaborate WBS or OBS.
  - Sometimes called linear responsibility chart or responsibility assignment matrix.
  - Provides means for all project participants to view their assignments.
  - Also useful for organizing & assigning responsibilities for subprojects of large complex projects.

MANAGING REQUIREMENTS: THE TRIPLE CONSTRAINT

- Balancing project's constraints:
  - Scope;
  - Cost;
  - Time.
- Managing involves making trade-offs among them.

HUMAN SIDE OF PROJECT MANAGEMENT

- Although technical aspects of project management are important, interpersonal issues often demand the most attention.
- Dealing with the human element is vital to project success.
- Project manager builds & maintains network of cooperative relationships among stakeholders.
- Stakeholder categories:
  - Core team: directly assigned to project.
  - Extended team*:* within & outside enterprise who are directly or indirectly involved.
- Engineering project teams:
  - Most technical problems beyond reach of single individual to solve.
  - Successful engineer must be comfortable in this highly interpersonal environment, and to advance, needs to excel in it.
  - Temporary in duration with specific focus.
  - Usually highly diverse with both core & affiliated members.
  - Examples of engineering project teams: improvement teams, problem-solving teams and product development teams.

- Leadership:
  - Ability to positively influence people to achieve results & have a meaningful impact.
  - Positive influence depends on trust*:* we are more likely to take at face value the actions & intentions of those we trust.
- Being trustworthy entails two qualities:
  - *Competence:* skills - the ability to make things happen when it really counts. This includes the following skills:
    - Interpersonal;
    - Organizational;
    - Task / technical.
  - *Character:* motives - personal values & principles; this includes the following traits:
    - Openness;
    - Sense of purpose;
    - Consistency / Integrity.