Project Management for Scientists

Scientific Projects

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Outline

- Projects vs. Processes
- Project Management
- Cost - Schedule – Performance Triangle
- Project Management Functions
- Project Lifecycle
- Successful Projects
- Just Enough Project Management

Projects

1. Are only done once
2. Have a beginning and an (specific) end
3. Produce something unique (product, service, business process, scientific result)

Processes and Operations

1. Have no predetermined end
2. Repetitively produce the same product or service
3. Produce similar or identical products

Projects vs. Processes

- Require different skills and philosophies
- Challenges in project management:
  - Every project has different personnel needs
  - Final cost and schedule not known in advance
  - Organizational charts define authority for processes, but not for projects
  - Time frame of process control is too slow for project control

Project Management

- Project Management: Approaches to manage the complexities of unique and time-limited efforts
- Project Management approaches evolve
- Science of Project Management provides a foundation for the art of leadership
- Success in leading projects can be learned

Project Management Triangle

- Scope = science requirements, performance
- Resources = cost, budget
- Time (to completion) = schedule

One side cannot be changed without affecting the others!

PM Triangle (2)

- Increased scope ➔ increased time and cost
- Tight time constraint ➔ increased costs and reduced scope
- Tight budget ➔ increased time and reduced scope
- Project Management provides tools and techniques that enable the project team to organize their work to meet these constraints
- The tighter the constraints, the more important is project management

Scientist in PM Triangle

- Typically controls scope (project scientist)
- Schedule can be important
  - Competing projects
  - Environment (seasons, location of planets, etc.)
- Budget often fixed
- On-time, on-budget, on-requirements may not produce a successful project
- Don't forget the people!

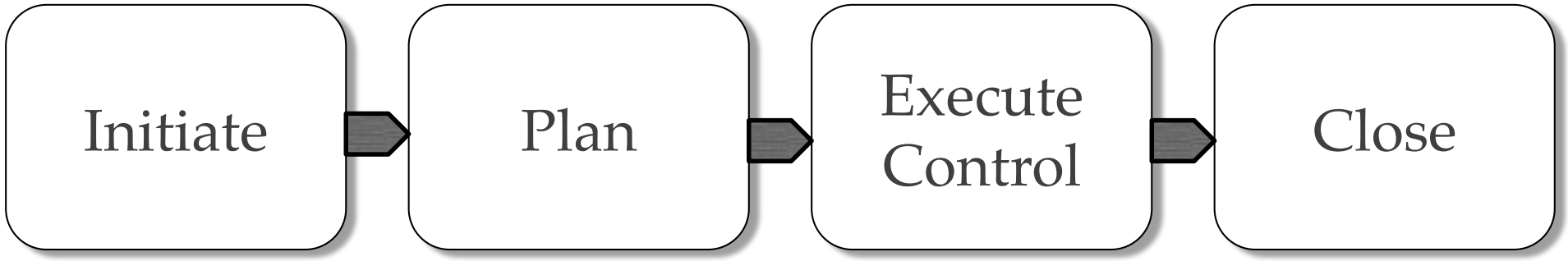
Prioritizing Constraints

- 3 constraints should not be treated equally
- One constraint might be more important, e.g.
  - Time because of externally set, unmovable date
  - Budget due to funding agency rules
  - Performance because of competition
- Agree on priorities of constraints
- Manage expectations on constraints, i.e. avoid unrealistic specifications, budgets, schedules

Project Management Functions

1. Project Definition
   - Define goals, constraints, success
   - Establish controls, processes, authorities and responsibilities
2. Project Planning
   - Plan to achieve goals within constraints
   - Cost, effort, and schedule estimates, check constraints
3. Project Control
   - Measure progress and compare to plan, validate estimates
   - Adjust PM Triangle, take corrective actions
   - Communicate progress

Project Life Cycle



- Linear progression with decision points at boundaries
- Each box has a given set of inputs and outputs

1. Initiate Project

What is the problem?

- Input: science requirement
- Activities:
  - Determine key players and their roles and responsibilities
  - Establish project document system
- Output: project charter

2. Plan Project

How are we going to get it done?

- Input: project charter
- Activities:
  - Review requirements
  - Clarify roles and responsibilities
  - Project kick-off meeting
  - Detailed project plan (budget, schedule)
  - Assess risks
  - Develop change control process
- Output: project plan

3. Execute & Control Project

Are we on track?

- Input: Project Plan
- Activities:
  - Manage technical performance
  - Communicate achievements and status
  - Manage cost, schedule, performance deviations
  - Control changes
  - Manage risks and problems
  - Manage team
- Output: Product

4. Close Project

- **How did we do? What did we learn?**
- Input: Product
- Activities:
  - Deliver
  - Lessons learned
  - Celebrate
- Output: happy team ready to do next project

Scientific project Life Cycle

1. Exploratory phase (largely definition)
2. Proposal phase (largely definition and planning)
3. Funded phase (largely execution and control)

Each phase can be treated as a project

Keys to Successful Projects

1. Agreement on the goals of the project among project team, customers, and management
   - Clear goals (clear science requirements)
   - Fuzzy goals lead to fuzzy project constraints
   - Everybody wants the same thing
   - Well documented origin and/or motivation of goals, signed off by everybody

Keys to Successful Projects

2. Plan that shows an overall path and clear responsibilities that can be used to measure the progress of the project
   - Project is unique, requires unique plan
   - Shows who is responsible for what and when
   - Shows what is possible
   - Details of resource estimates
   - Early warning system for budget and schedule

Keys to Successful Projects

3. Constant, effective communication among everyone involved in the project
   - Plans and charts do not complete projects
   - Projects are accomplished by people who agree on goals and how to meet them
   - Success comes from
     - Coming to agreements
     - Coordinating actions
     - Recognizing and solving problems
     - Reacting to changes

Keys to Successful Projects

4. A controlled scope
   - With fixed budget and schedule (time=money), scope is most likely to change in scientific environments
   - Changes in scope and their impact must be understood and agreed upon by everybody

Keys to Successful Projects

5. Management support
   - Projects are embedded in larger entities (e.g. institutes, departments, company)
   - Larger entity provides people, equipment, buildings, policies, etc.
   - Impossible to carry out projects without some help from larger entity

Successful Projects: Summary

- Five key factors can all be achieved with the science of project management
- Arts such as political and interpersonal skills, creative decisions, intuition, etc. should not be underestimated
- Science of project management is a prerequisite to practicing the art

Just Enough Project Management

- Amount must be in relation to size of project
- Just enough to get the job done
- Too much often as bad as not enough
- Must add value
- Must lead and not just push paper