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
- Program Management
- Successful Projects
- Just enough project management

Projects

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

Famous Projects

- Human Genome Project
- Airbus A380 design
- Manhatten Project
- Space missions (Apollo, Viking, Voyager, …)
- SpaceShip 1, 2
- …

Processes and Operations

- Have no end (repetitively produce the same product or service)
- Produce similar or identical products
- Examples: manufacturing, business processes
- Subject of traditional management approaches

Projects vs. Processes

- Require different technical skills and management philosophies
- Different challenges in project management:
  - Every project has different personnel needs
  - Cost and schedule estimates
  - Organizational charts define authority for processes, but not for projects
  - Time frame of process control is too slow for project control

Project Management

Is a set of

- Methods
- Theories
- Techniques

to manage the complexities of work that is unique and temporary

Project Management (2)

- Project Management approaches evolve
- Project Manager alone cannot do it
- Science of Project Management provides a foundation for the art of leadership
- Success in leading projects can be learned

Excellent Project Managers

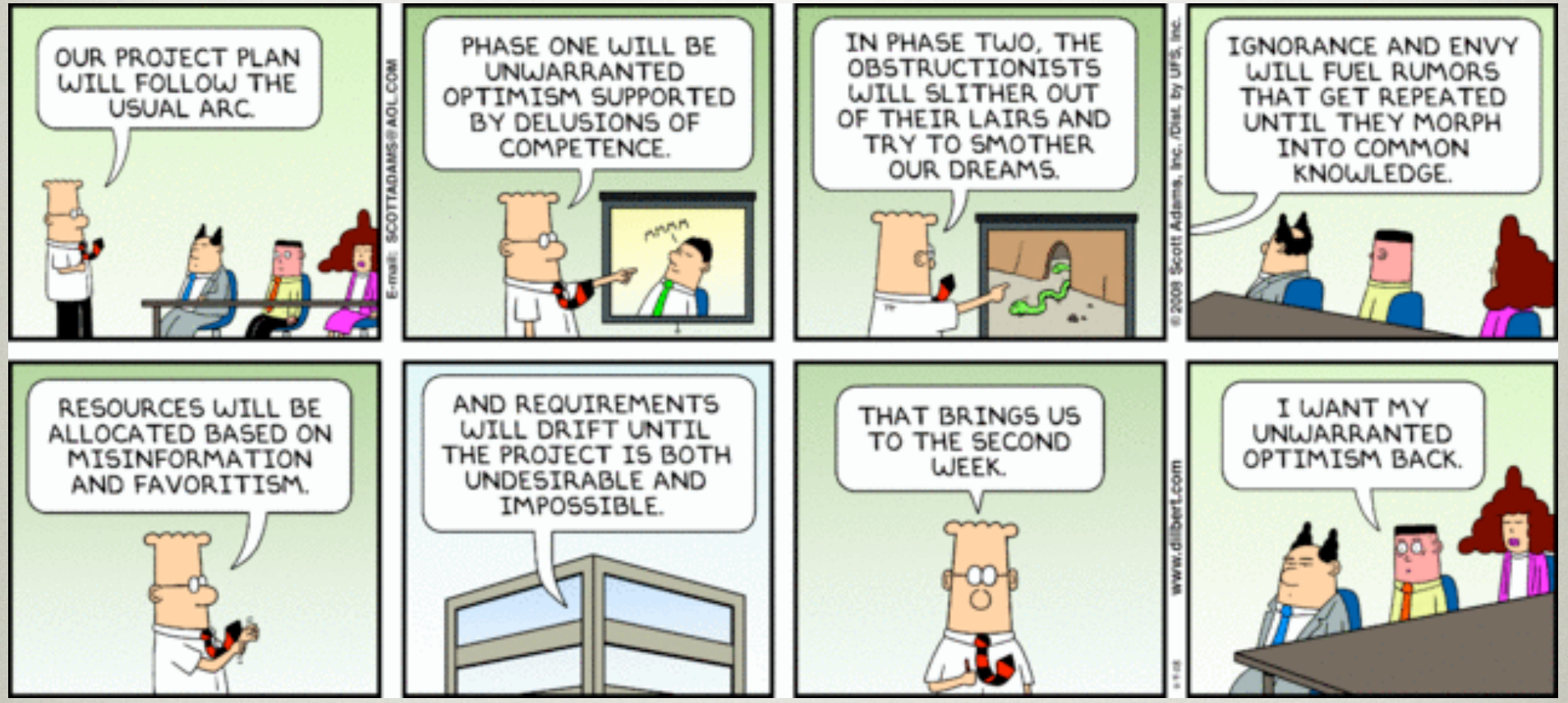
- Are outstanding leaders
- Have vision
- Motivate
- Bring people together
- Accomplish great things

Project Management Triangle

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

One side cannot be changed without affecting the others!

Unwarranted Optimism



PM Triangle (2)

- 3 constraints are often competing:
- increased scope ➔ increased time and cost
- tight time constraint could ➔ 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 make project considered to be successful
- 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
- Need to agree on priority of constraints
- Need to manage expectations on constraints, i.e. avoid unrealistic specifications, budgets, schedules

Project Management Functions

1. Project Definition
2. Project Planning
3. Project Control

1. Project Definition

- Define purpose, goals, constraints, definition of success
- Establish project management controls and processes, define authorities and responsibilities

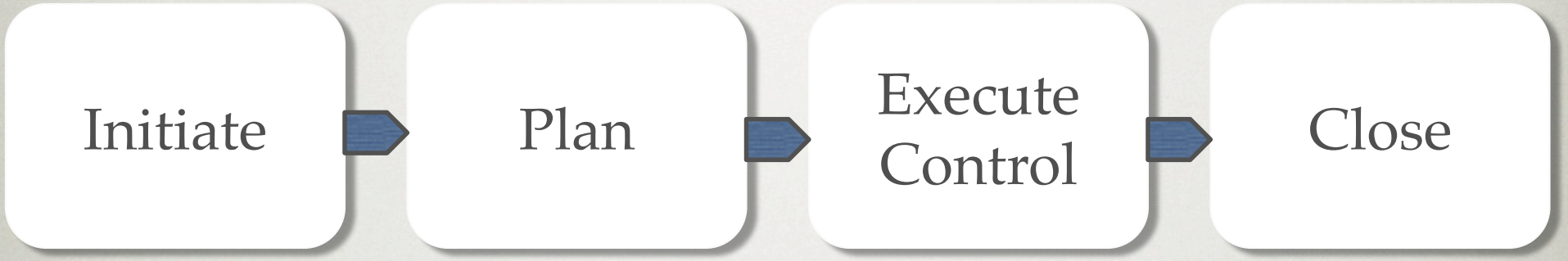
2. Project Planning

- Plan explains how project goals will be met given the constraints
- Cost and effort estimates
- Schedules
- Reality check of PM Triangle

3. Project Control

- Measure progress and compare to plan, validate estimates and equilibrium in PM Triangle
- Communicate progress
- Deviations from plan force corrective actions, lead to adjustments of definitions, plan and PM Triangle

Project Life Cycle



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

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

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

Execute and 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

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

- 3 phases:
  - Preproposal Project
  - Proposal Project (largely definition and planning)
  - Actual Project (largely execution and control)
- Each phase can be treated as a project

Program Management

- Manages multiple interdependent projects that together achieve a strategic goal
- Is concerned with doing the right projects
- Coordinates and prioritizes resources across projects, manages links between projects and overall costs and risks of the program
- Provides an environment where projects can be run successfully

Successful Projects

- On time
- On budget
- Fulfill scientific requirements

Successful Projects

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

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

Successful Projects

3. Constant, effective communication among everyone involved in the project
   - Plans and charts do not complete projects
   - Projects 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

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

Successful Projects

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

Successful Projects

- Five key factors can all be achieved through 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 of project management must be in relation to size of project
- Just enough project management to get the job done
- Too much project management can be as bad as not enough
- Project management must add value
- Project management must lead and not just push paper (project administration and bureaucracy)


IT'S BEEN A GREAT THREE-HOUR MEETING BUT I HAVE ONE QUESTION.
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CAN A BUSINESS-LED PROJECT MANAGEMENT PROCESS OPTIMIZE OUR STRATEGIC CORE ISSUES?
WAS THAT GIBBER-ISH?
I THOUGHT THAT'S WHAT WE WERE DOING.
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Why Project Management?

- Establishes single point of contact and accountability
- Focuses on meeting scientific needs and expectations
- Improves performance in time, cost, science capability
- Obtains consistent results
- Focuses on managing scope and controlling change
- Helps avoid disasters by managing risks
- Strengthens project teams and improves morale