Project Management for Scientists

Project Organization & Control

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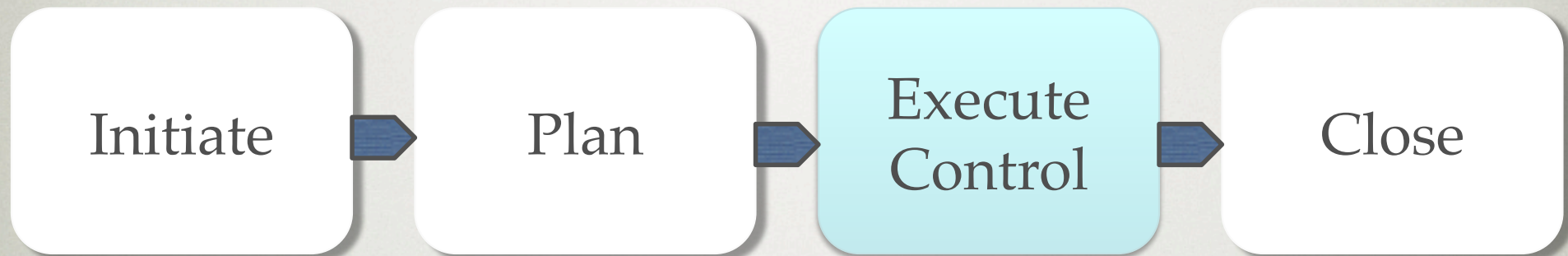
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Outline

- Recap

- Resource Allocation

- Balancing

- Control Activities

- Change Management

Where We Are in the Cycle

Initiate → Plan → Execute Control → Close

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

WHAT WE HAVE: PROJECT PLANS

- (Science) requirements

- Work Breakdown Structure (WBS)

- Baseline schedule

- Baseline budget

- Resource plan (this lecture)

- Communication plan (future lecture)

- Risk analysis and mitigation plan (future lecture)

- Change control plan (this lecture)

What We Have: Project Team

- Enthusiastic and well-informed sponsor
- Project team with roles, authorities, and responsibilities

Resource Allocation

- After initial resource assignment and scheduling, many resources are used >100%

- Can be avoided by changing resource assignments and/or changing schedule (leveling)

- Resource leveling is last step in making realistic schedule

- Resource leveling: optimize the use of people and equipment assigned to project

- Some of it can be made automatically

- Also avoid under-allocation (people become inefficient)
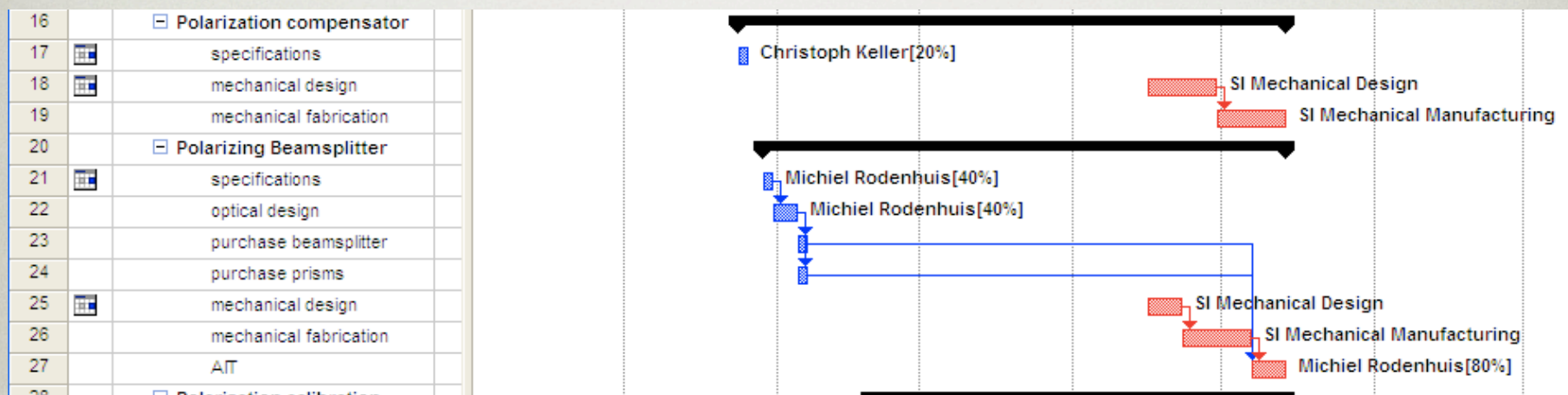
Project Management Triangle

- Scope = science requirements, performance

- Resources = cost, budget

- Time (to completion) = schedule

One side cannot be changed without affecting the others!

Critical Path

- Consecutive tasks where delay in any of those tasks delays project as a whole

- Typically shown in red in Gantt chart software

Balancing Act

- Balance project scope against 3 constraints
  1. Time: will not get project done within time allotted by project (baseline) plan
  2. Money: can deliver desired outcome on schedule, but it will cost too much
  3. Resources: project cost is ok, but schedule call for people, equipment that are not available, even though the money is there to hire/buy
- Balancing required if one or several constraints are violated

Balancing

- Balance at project level
  - Make changes that will deliver on time, within budget, and all requirements fulfilled
  - Authority to do that within project
- Balance project constraints
  - Change requirements, budget, and/or schedule
  - Requires agreement of all stakeholders
- Balance at sponsor level
  - Choice of which projects to pursue, how to spread limited resources
  - Requires sponsor agreement or above

Balancing at Project Level

- Reestimate Project

- Change Task Assignments

- Add People to Project

- Increase Productivity

- Outsource

- Overtime

Reestimating Budget

- Optimist's choice

- Potential to reduce pessimistic estimates

- Positive: legitimately reduced estimates make project cheaper and/or faster

- Negative: Wishful thinking since estimates are not better

- Best: always check estimates, check estimating assumptions; do not reduce to please; increase facts supporting cost and schedule

Change Task Assignments

- Straightforward resource allocation maneuver
- Add resources to tasks on critical path
- Positive: reduced project duration at the same cost
- Negative: Too many cooks as too many people on a single task work less efficiently, therefore increased cost
- Best: 3 things to consider when moving resources:
  - Both tasks need the same resource type
  - Critical path may change after resource change
  - Not all task durations are reduced by adding people

Add People to Project

- Obvious approach to reducing the project duration

- Either increase number of simultaneous tasks or number of people per task

- Positive: reduced project duration

- Negative: increase in cost of coordination and communication, requires (rare) qualified resources

- Best: some tasks are suitable to be done by more people; other concurrent tasks are very independent and can be done by different people

Increased Productivity

- Some people are more productive than others
- High performers can reduce schedule and cost
- Positive: highly cost and schedule effective, better results
- Negative: other projects will suffer and team is often overqualified
- Best: mix top and average people
  - Create experts by putting same people on similar tasks
  - Use WBS to identify tasks that benefit most from top talent
  - Involve top people in project management tasks

Outsource project (Parts)

- Part of project is handed over to outside company

- Good when required skills are not available within team

- Positive: greater experience increases productivity, schedule

- Negative: responsibility move increases risk

- Best: high risk, high return

  - Find qualified company

  - Clear agreements before work starts using project management approaches

Overtime

- Easiest way to add more labor to project

- More efficient than adding more people

- Positive: no additional coordination, communication required, less distractions in workplace

- Negative: overtime costs more, less efficient, burnout

- Best: overtime is perceived as above and beyond normal

  - Apply sparingly and show benefits to project

  - Only when leading to big paybacks

Balancing Project Constraints

- Reduce project scope (reduced low-priority science)

- Fixed-phase scheduling (always meet schedule)

- Fast-tracking (non-traditional task overlapping)

- Phased product delivery (early, partially useful product, full product later)

- Do it twice (quick-and-dirty first, then solid product)

Controlling Projects

- Plan is clear, thought-out, manageable
- Execution means
  - Work is being done
  - Problems arise
  - Constraints are violated
  - Information deluge
  - Not enough time to get everything done
  - Changes occur
- Challenge to stay in control

Control Activities

- Manage scientific/technical performance

- Manage cost, schedule, resources

- Control changes

- Manage risks and problems

- Manage project team

- Communicate achievements and project status

Change Control

- Every project faces changes in requirements, cost, schedule, resources

- If not carefully controlled, project goes out of control

- Once approved, requirements, cost, schedule, etc. become controlled

- Changes to 'controlled' requirements etc. must pass through change management process

Change Management Process

- Identify potential change, submit change request

- Document and analyze change request

- Evaluate change and impact on project plan

- Obtain formal approval on change

- Implement and document change

- Review and close change

Configuration Management

- Subset of change management

- Makes sure everybody uses the same version of documents, plans etc.

- Configuration management for any project part where different versions occur during life of project

  - Project control documents

  - Electronic files

  - Prototypes, experiments,