JPL

The Ten Commandments for Managing a Large Project

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The One Commandment for Managing a Large Project

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What is a Project?

- NASA and JPL reserve the word “project” to a specific entity, typically a flight project
  - Large scope (often >$100M)
  - Well-bounded scope, with modest external dependencies
  - Tight management organization
- Project Manager has virtually all authority
  - He/She (or delegates) is the only spokesperson for the project

The Three Commandments

- Keep Your Eye on the Ball
  - Define the Objective
  - Develop the Team - and Delegate!
  - Control Cost and Schedule - but Monitor Everything

The Nine Commandments

- Keep Your Eye on the Ball
  - Define the Objective
    1. Establish “Commander’s Intent”
    2. Define End-to-End Goals
    3. Reach Agreement with Your Boss
  - Develop the Team - and Delegate!
    4. Avoid Single-Agenda Champions
    5. Avoid Blind Followers
    6. Establish a Clear Org Chart, or Not
  - Control Cost and Schedule - but Monitor Everything
    7. Use Industry Wisely
    8. Use Reserve Wisely
    9. Control Requirements

What's Missing?

- Note that in a large project, the project manager does not need to be the "supreme technical expert"
  - However, there needs to be a Project "supreme technical expert"
    - Vested in Project System Engineer
  - Relationship is similar to orchestra conductor and concertmaster
- Small projects, and elements of a large projects, often combine these two roles
  - But it would be a mistake to combine them in a big project
    - Could easily divert the focus of the project manager

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1. Establish “Commander’s Intent” (1 of 3)

- Establish, in writing, a clear objective for the Project
  - “He had gone over his “commander’s intent” with his commanders a number of times. This is the concise expression of how you visualize the operation, and it is always written by the commander personally. In the absence of specific orders, it could be used as operating guidelines. By now he thought it was clear and well understood…”
    - Tom Clancy, with General Fred Franks Jr (Ret), “Into the Storm”
- NASA terms these “Project Level 1 Requirements”
- Should be no more than one page, maybe as short as few sentences

1. Establish a "Commander's Intent" (2 of 3)

- Two examples (from future DSN study*)
  - ….to replace the current DSN by 2016
    - Higher Reliability – suitable for support of CEV (Crewed Exploration Vehicle)
    - Higher Capacity – x40 of the telemetry capability of today's 70m subnet
    - Higher cost-efficiency – at ~60% of today's O&M cost (for x40 capacity)
  - …will have the following attributes
    - Support current missions, including eventual replacement of the capabilities of current assets
    - Support future missions (and their requirements) per IMS model. The IMS model indicates a significant growth, with some uncertainty, in mission requirements
    - Be modular, to enable gradual deployment to meet projected requirements
    - Be expandable and evolvable to meet currently unknown future requirements
    - Be highly reliable to meet human requirements
    - Offer lower O&M
- * Note that there is no funded project for the future DSN – this is currently a study

1. Establish a “Commander’s Intent” (3 of 3)

- Are they the same? Not really
- Are they crisp enough to have agreement on success? The first is, the second is less so
- Should minimizing development cost be included?
- But underlying the statements could be two very different projects
  - Either, a project that flows to a large, ultimate scope (e.g. number-of-antennas)
  - Or, a project where the scope is defined “on-the-fly”

2. Define End-to-End Goals

- Common mistake – focusing on the complex/interesting/unique part of the system
  - Neglecting the less-exciting, but nevertheless crucial, parts of the system
  - Examples: developed a great system, but neglect the data delivery to the customer, required last minute scramble to build the interfaces
- Consider
  - No substitute to a good Project System Engineer
    - Perhaps aided by a customer forum

3. Reach Agreement with Your Boss

- Identify your Boss/Bosses
  - Can be tricky!
  - Be careful of being "managed-by-committee"
- Reach Agreement
  - On content (i.e. of the "Commander's Intent")
  - On configuration management
    - This should be the only level of agreement that requires your boss's agreement
    - Otherwise, you risk your boss micro-managing the project

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Develop the Team - and Delegate!

- Let's assume that you'll recruit only the best people
  - Some could be too independent – these will not do
  - Some will be too dependent – these will not do
  - The team, ideally, should have those with the in-between temperament
- They need to be placed in an environment where they work best
  - Either in a well-framed, rigid, org chart
  - Or a cozy, friendly, looser org
  - They are advantages and disadvantages to either approach
- Then you must delegate!
  - You have no other choice in a large project

4. Avoid Single-Agenda Champions

- Avoid those who are so passionate for a specific agenda, that they will rather follow that agenda than the “commander’s Intent”
  - It’s O.K. for team members to be passionate about their agendas, as long as it does not in conflict with the “Commander’s Intent”
  - Agendas could be:
    - Technical (e.g. use of specific technology)
    - Programmatic (e.g. loyalty to specific processes)
    - Organizational (e.g. staff retention)
- Best would be to leverage that passion – find team members whose passionate agendas enhances the project objective

5. Avoid Blind Followers

- Those who bring no agenda, can hinder the team as well
  - Healthy debate and criticism for issues, other than the Level 1 Requirements, are crucial to project success
  - There is usually more than one way to meet the L1 Requirements!
- Example:
  - Let's assume that for the future DSN, one of the level 1 requirements is to minimize life-cycle-cost
  - Then a lively debate on the antenna technology is desired, should be encouraged!

6. Establish Clear Org Chart, or Not

- Organization could be based on either of the two extremes:
  - Rigid Org Chart, with well defined charters for all players
    - Risk: items falling in-between, “It’s not in my charter”
  - Loose Org Chart, with good team relationships, but less-defined charters
    - Risk: Items handled by multiple people, turf fights
- Ideal would be a combination organization
  - Key choice for the project manager, when building a team
  - Hypothesis: the bigger the project, the more rigid the org chart should be

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Control Cost and Schedule - but Monitor Everything

- The basic charge to the Project Manager is:
  - “Meet the level 1 requirements, within the agreed cost and schedule”
- Avoid the temptation to control everything
  - There’s just not enough time – rely on the team you selected
  - Apply limited control through application of reserve and through control of major “make-or-buy” decisions
- But make sure you monitor status in great detail
  - Especially any deviations from plans

7. Use Industry Wisely

- Large Projects must rely on industry
  - Benchmarking for best practices
  - Contracts to industry as a very effective method of reducing (mass) production costs and operations/maintenance costs
    - "Make-vs.-Buy"
  - (Caution) May get some internal team members out of their comfort zone
- Caveat
  - Avoid the temptation to over-manage/micro-manage industry
  - Make sure that industry is integral part of the team, not outsiders
- For the future DSN, we estimated that 80%-90% of the development funds will be spent in industry contracts
  - And nearly 100% of the O&M cost

8. Use Reserves Wisely

- A good practice is to allocate most of the funding early to the project elements
  - Part of delegation of responsibility
  - Minimizes the temptation to micro-manage
- But reserves stay at the Project Manager level
  - Allocated to solve problems
  - Deliberately. Slowly. Carefully. Trying to keep reserves as percent of funds-to-go
- Most common mistake
  - Use of reserves to accept additional requirements

9. Control Requirements

- As Level 1 requirements are parsed into lower levels, additional requirements tend to creep in
  - From team members
  - From your boss
  - From customers/users
- Requirements cost money – push back unless the agreement (#3) between you and your boss is modified
  - Especially avoid the temptation to spend reserves pre-maturely
  - It's O.K. to return money at the end of the project!

There is no Instant Path to Successful Project Management

Many of these principles are addressed in a JPL Project Management Class

But there is no substitute to experience.

Most successful project managers improved while gradually rising through the project ranks.

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