ESD.36 System Project Management

L20: Class Summary

Instructor(s)

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Outline

- Class Summary
  - Learning Objectives revisited
  - SPM Framework: Preparation, Planning, Monitoring, Adaptation
  - 9 Key Takeaways
  - 14 Success Factors

- Last 30 minutes reserved for evaluation
  - Faculty will leave room - done at 4:00p.m.
Learning Objectives

- Introduce advanced methods and tools of Project Management in a product/system development context
  - Probabilistic CPM/PERT, Critical Chain
  - Design Structure Matrix
  - System Dynamics
  - Earned Value Management

- Understand how methods work (strengths, limitations)
  - Industry Examples
  - Case Studies, Risk Management, Real Options

- Learn from each other
  - Class Discussions
  - Project Assignments

→ Improve development projects at your workplace
Relationship with other SDM core courses (simple view)

- System Architecture (ESD.34) is about the “DNA” of the ARTIFACTS themselves – atomic unit: object
  - Concept, form, function, decomposition ...
- Systems Engineering (ESD.33) is about the PROCESSES to understand and design systems – atomic unit: process
  - QFD, Requirements Analysis and Verification, ...
- Integrating the Lean Enterprise (ESD.61J) is about the PEOPLE and ORGANIZATIONS – atomic unit: person
  - Principles of lean manufacturing, organizational models
- System Project Management (ESD.36) is about how to best utilize resources to implement a set of objectives – atomic unit: task
  - CPM, DSM, System Dynamics
System Project Management
ESD.36 Framework

Enterprise has chosen what product or system to develop

Next Project

Project Preparation

Project Planning

Project Monitoring

Project Adaptation

Project Learning

Project Control

Project Completion
9 Key Takeaways
Takeaway 1: Doing the right thing, not just doing things right

- Mid-America Airport, outside St. Louis
- Example: Turn large military base (Scott AFB) into profitable commercial airport
- Built terminal building, concourse, processing facilities, $308 million investment
- Opened in 1997
- No commercial flights until 2000

Lesson Learned:

- Negotiate initial set of requirements with true stakeholders
- A good technical solution does not guarantee success


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Takeaway 2: The “Iron Triangle” is real

Cost

Scope

Project

Schedule

- Why “iron” triangle?
  - Risk if all three are over-constrained!
  - Can have all three but must be consistent

Are there multiple initial feasible plans?

Is the mission feasible to begin with?
Takeaway 3: Importance of Project Organization and Individuals

Remember - Project Organization and Complexity

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Organization should be aligned with project
Takeaway 4: Managing only the critical path can be dangerous.

Critical path is important but can switch.
Takeaway 5: Padded schedules become a self-fulfilling prophecy.

Defining and managing to fixed deadlines can be counterproductive (micro-management) and inefficient.

Source: Avraham Y. Goldratt Institute
Takeaway 6: Planned Iterations can accelerate a project.
Takeaway 7: Unplanned Iterations generate rework

External factors; management responses; side effects

Out-of-Sequence Work, Worksite Congestion, Coordination Problems, Morale Problems

Average Employee Skill and Quality

Work Really Done

Customer Changes

Schedule Acceleration

Fatigue, Burnout

Overtime

Hiring

Apparent Progress

Beware of rework loop and unintended consequences.
Takeaway 8: Adding new personnel to a late project...

- ...can delay it even further
- Brooks' Law holds when
  - ... the experience dilution impact of new staff is significant (10-20% of experience level of existing staff), or when experience dilution is more moderate (50% of experience level of existing staff) but the time to gain experience is long compared to the remaining duration of the project

Sometimes the “help” will delay you further
Takeaway 9: Project Management Framework

Methods do not compete but complement each other. Integration remains a challenge.
Project Success Factors
Why projects fail ...

- Selected the wrong product (system) concept to develop
  - Market Risk, Technological Risk
- Human Dimension
  - Wrong person as project manager
  - Reward and Incentive systems not aligned
  - Dysfunctional Team Structure/Organization
- Upper management is non-supportive
- Inadequately defined tasks, goals ... (ambiguity is never removed)

- “Impossible” mission
  - Over-scoped, under-funded, not enough time
- Wrong corrective measures
  - kicks off vicious circles (SD) ... burnout, fatigue...
- Project “end game” is not planned, no post-project learning
What is a successful project?

- What are the assessment criteria?
- What does the comparison refer to (original objectives, changed ones, similar past projects)?
- Who assesses?
- When is the assessment/comparison made?

CRITERIA OF SUCCESS

Total Assessment = Result x Process

Result

- Result in the narrow sense
- Result in the wider sense

Criteria for project success

Performance

Quality

Time

Costs

Satisfaction

Image by MIT OpenCourseWare.
Were/are the following projects a success?

Boeing 787 Dreamliner?

Image of Boeing 787 Dreamliner removed due to copyright restrictions.

Boston’s Big Dig?

Source: Public domain.

An Image of Microsoft Windows 8 has been removed due to copyright restrictions.
14 Factors for Project Success

1. (Top) Management is supportive of project
2. Good external connections, especially with customers
3. Clearly defined (and stable) project objectives
4. Carefully execute the project startup-phase, especially for international projects
5. Sufficient project planning
6. Appropriate project control
7. Open and direct communications
8. Appropriate use of formal methods (CPM, DSM, SD...)
9. Suitable un-bureaucratic organization of the project
10. Project Manager (PM) needs to have sufficient power and control
11. Qualification, authority and experience of the PM
12. Management style of the PM should be adapted to the situation
13. Composition of project team
14. Motivation
PM Skill Balance

Analytical Skills
- Planning / Forecasting
- Technical Engineering
- Cost/EVM Analysis
- Risk Analysis

Soft Skills
- Visioning
- Intuition
- Risk Identification
- Motivation
- Negotiation
- Persistence

Project Leadership
Final Touches

- Please fill in online official MIT class evaluation
  - Looking for 100% response rate
- Term project evaluations will be posted by the TAs
  - project score is average of referee scores
  - some (brief) feedback provided
- Final class grade -- a week after the semester ends.
Thank you!

Happy Holidays!

From All TA’s