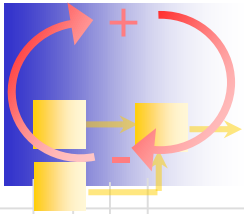
Project Scheduling Management

Lecture 1



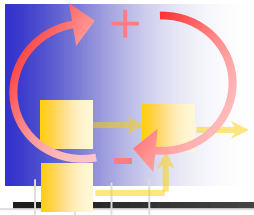
Class Introduction

Instructor

Dr. Huang Dan

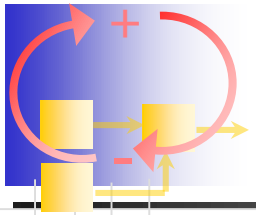
Sep 15, 2018

上海交通大學
Shanghai Jiao Tong University



Today's Agenda

- Welcome and Introductions
- Definitions – Initial Discussion
- Course Objectives
- Conceptual Schedule
- Team Project, Homework
- Questions?



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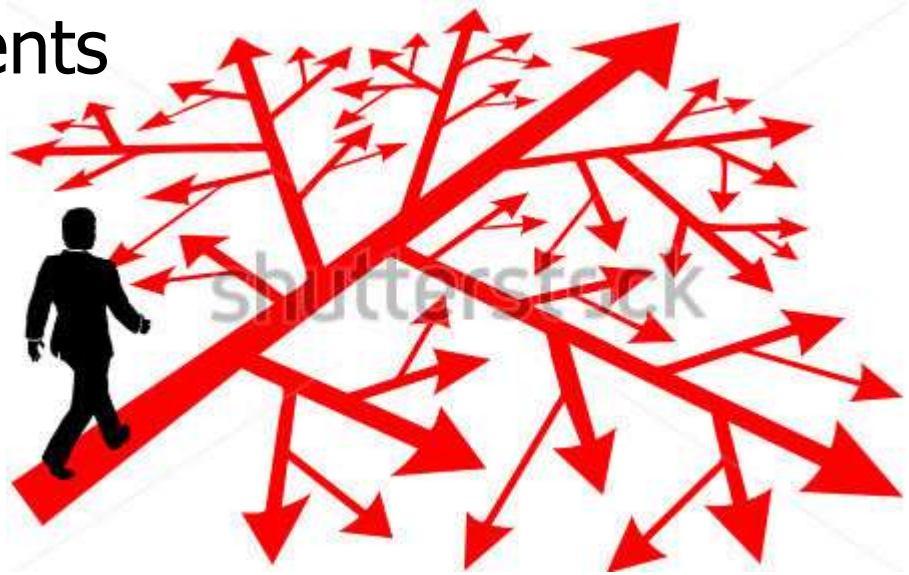
Why we need to learn PM?

- Complicated Relationships
- Enormous Information
- Demanding Requirements

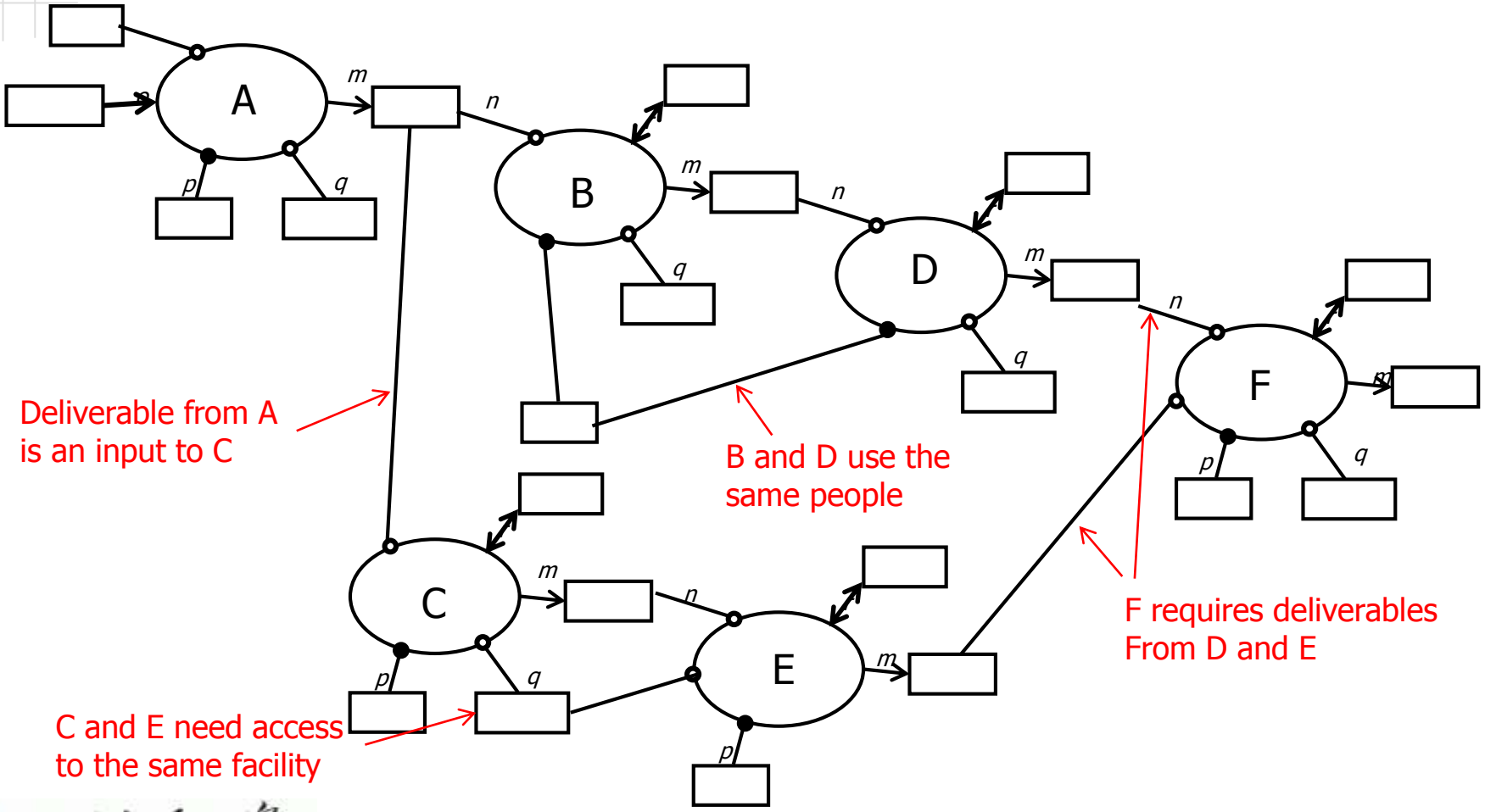


Project Definition

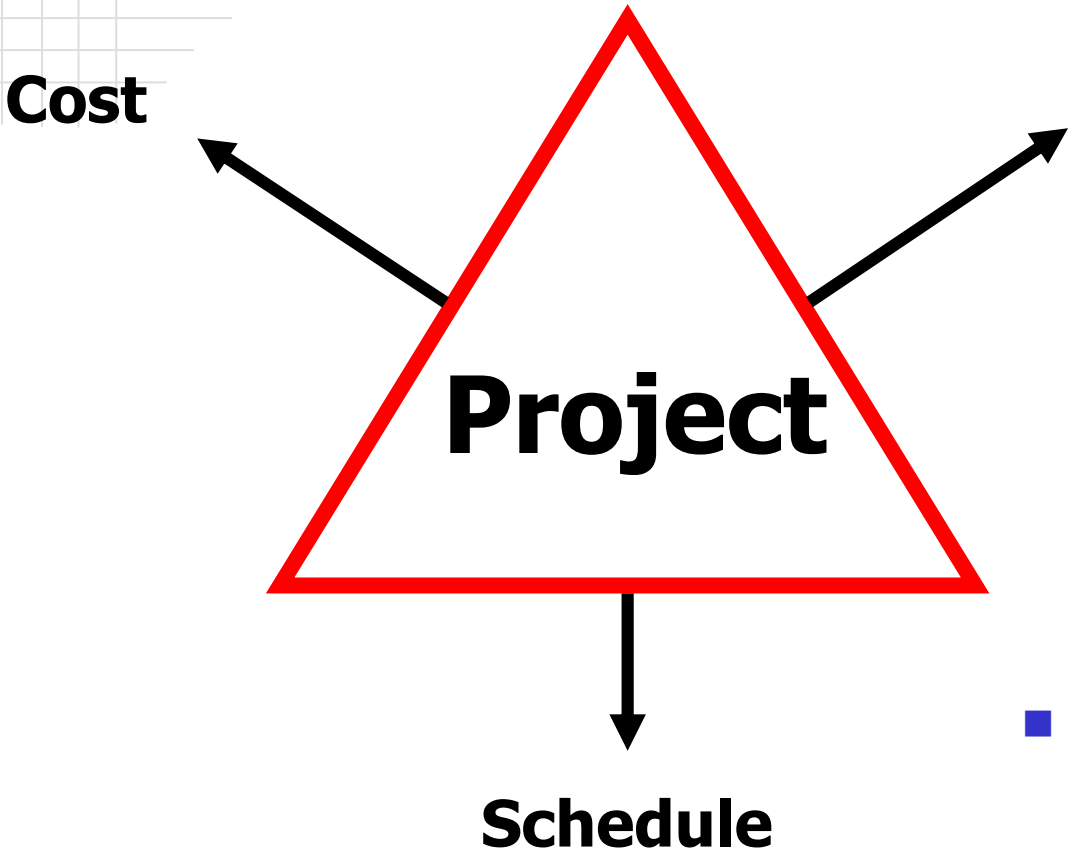
- A **Project** is a set of tasks that
  - Are related to each other
  - Have a specific objective to be completed within certain specifications
  - Have defined start and end dates
  - Have funding limits
  - Consume resources

  - Ongoing operations?

Project = set of related tasks



The "Iron Triangle"



- Why "iron" triangle?
  - Risk if all three are constrained !

Faster-Better-Cheaper???

The NASA New Millennium Program: Faster, Better, Cheaper

craft were small
16 projects unde
resulting success
spacecraft norm
advocates placed

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spaceREF

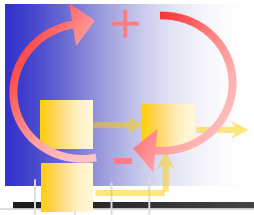
MISSIONS INTERNATIONAL SPACE STATION CALENDAR NEWS ARCHIVES SPACE WE

MERCURY VENUS EARTH MOON MARS JUPITER SATURN PLUTO ASTEROIDS & COMETS

NASA Responds to the Columbia Accident Report: Farewell to Faster - Better - Cheaper

By Keith Cowing Posted Monday, September 15, 2003

Howard E. Mccurdy, Faster, Better, Cheaper: Low-Cost Innovation in the U.S. Space Program, The John Hopkins University Press, 2001.

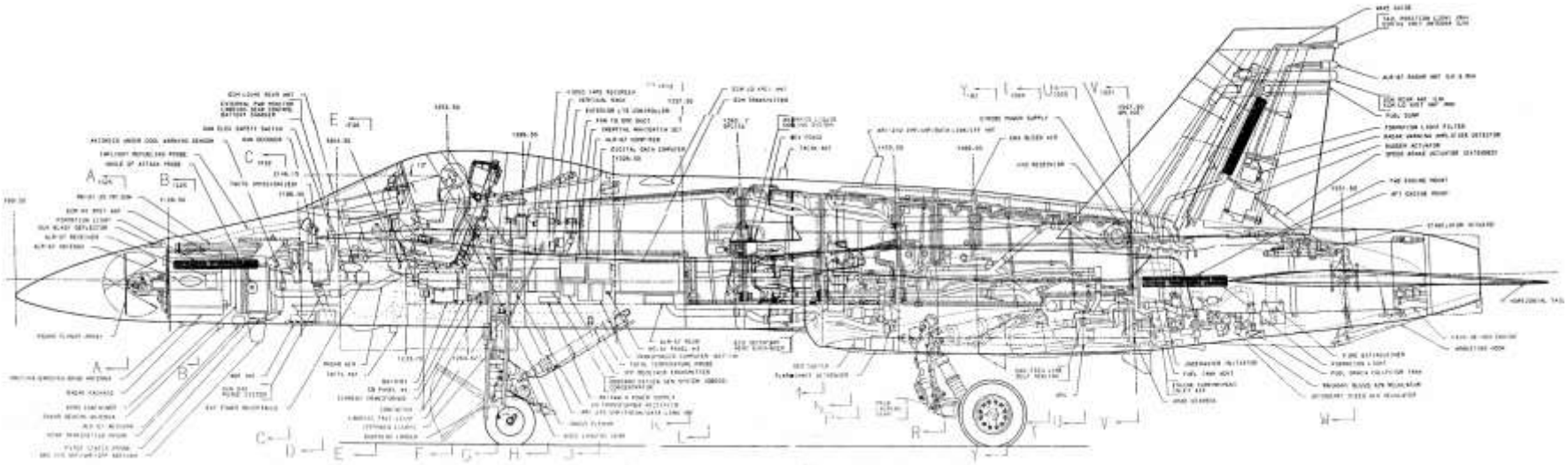


System Definition

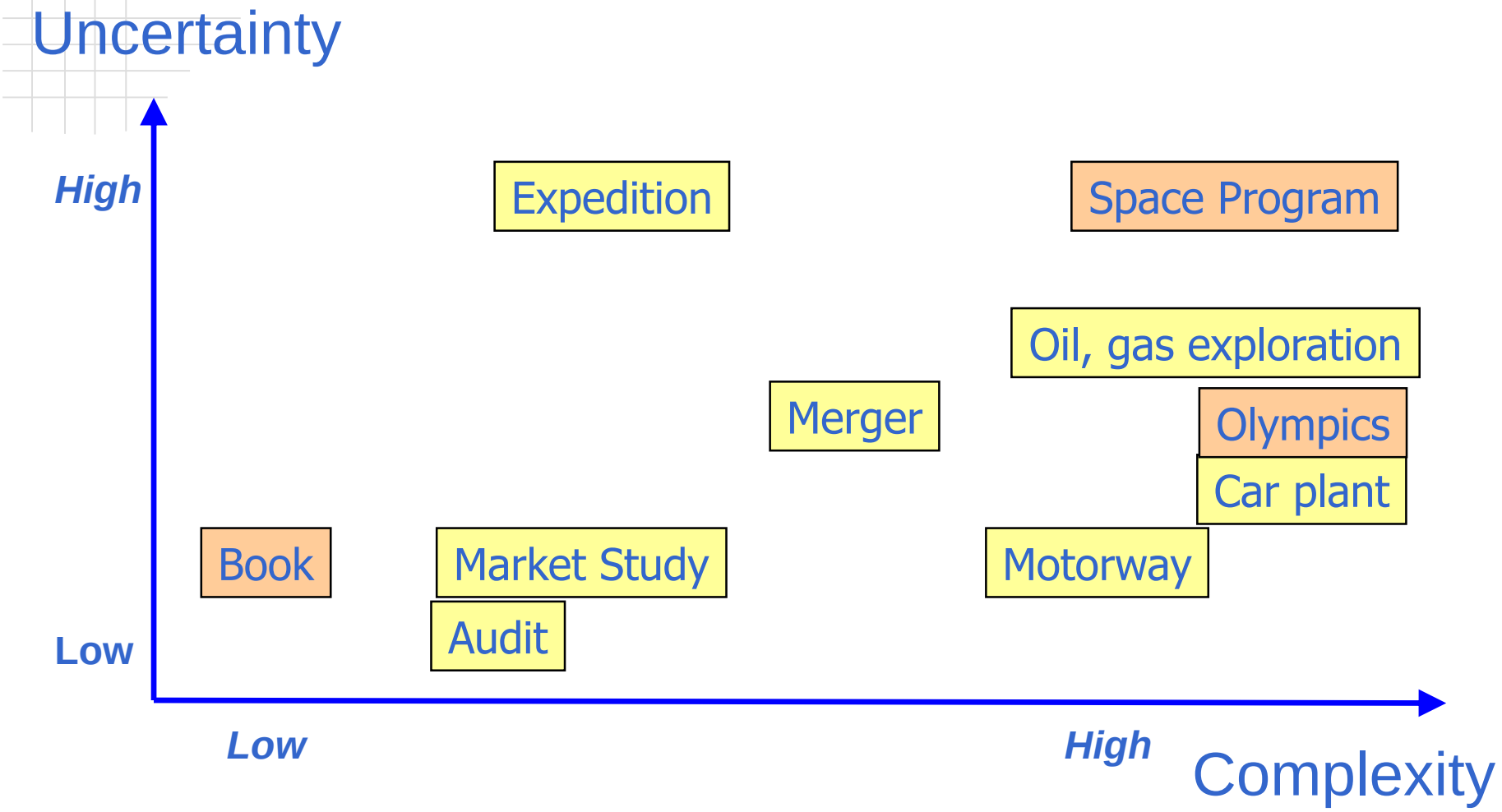
- A **System** is a set of physical or virtual objects whose interrelationships enable desired function(s).
  - more than the sum of its parts
  - Undesired (emergent) functions often exist
  - System complexity scales with the number of objects as well as the type and number of interconnections between them
  - Instantaneously available functions, versus "lifecycle" properties (scalability, flexibility, robustness …)
- A Product is a "System" sold for profit

Example System: F/A-18 Aircraft

- Clean sheet design ~ 1978 F/A-18 A/B
- Re-designs: C/D (1987), E/F (1999)
- Hardware, Software, Humans …
  - What is inside the system boundary?

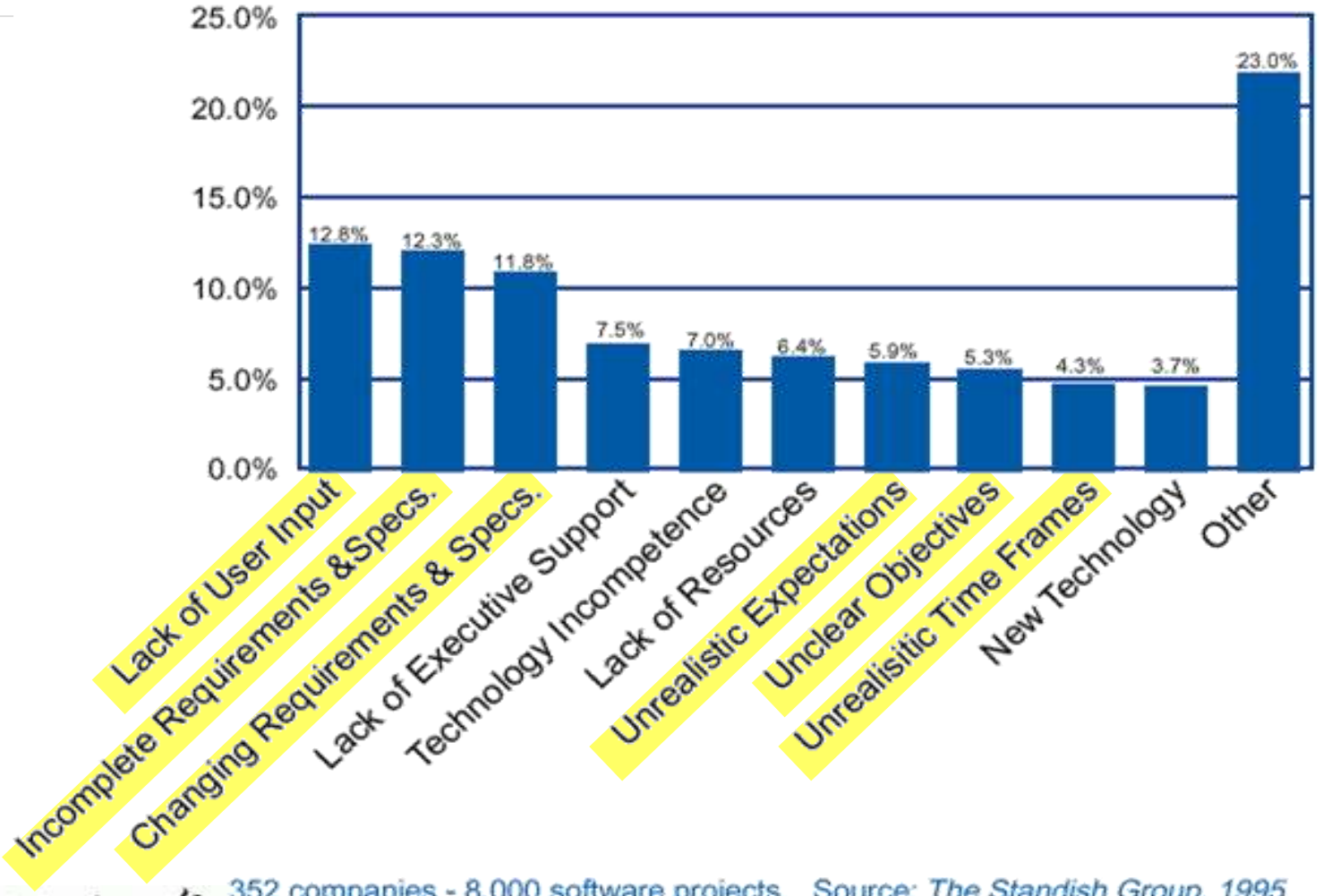


Complexity versus Uncertainty

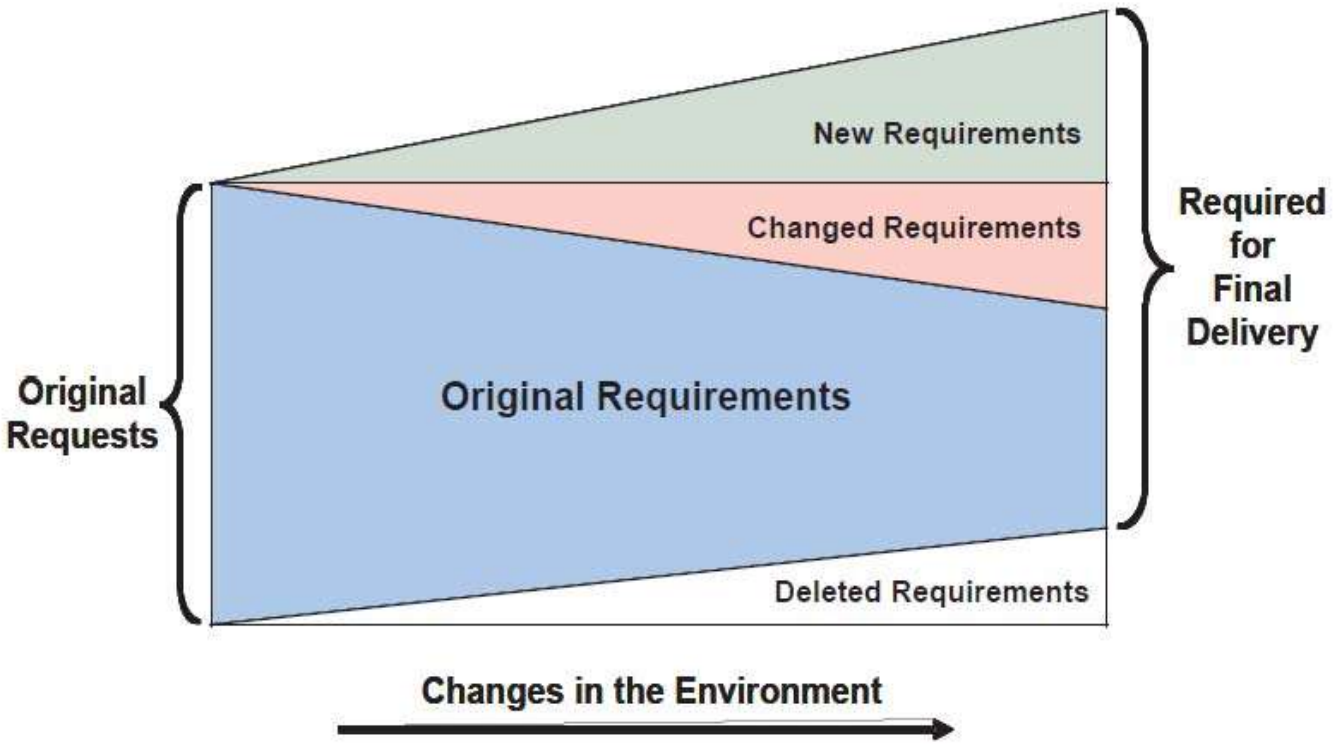


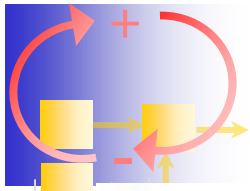
Why Software Projects Fail

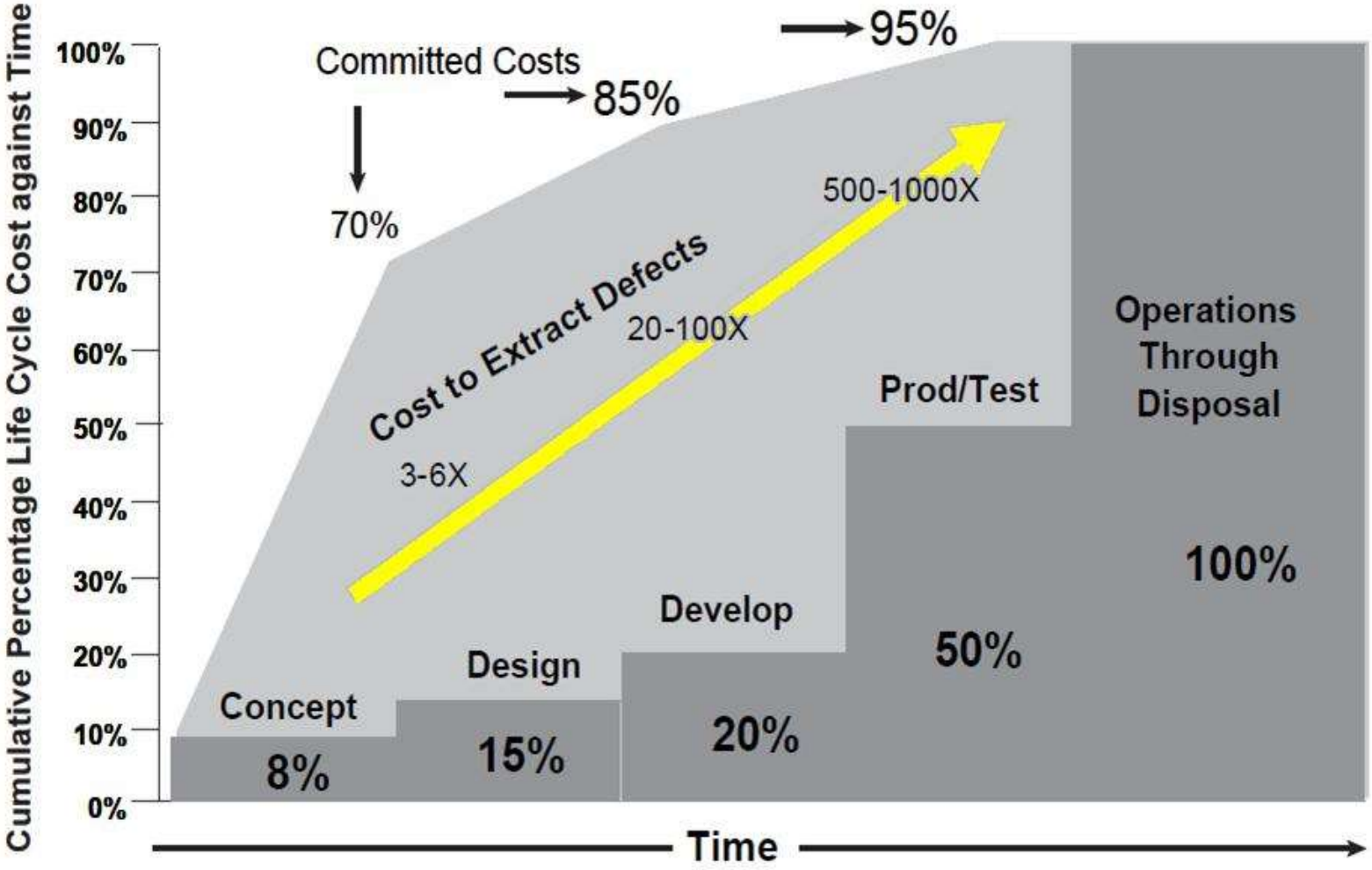
Overruns: 189% cost; 222% schedule

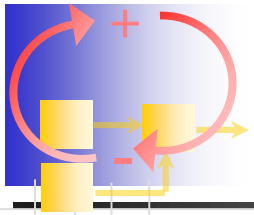


352 companies - 8,000 software projects. Source: *The Standish Group, 1995*


New Requirements
Changed Requirements
Original Requirements
Deleted Requirements
Original Requests
Required for Final Delivery
Changes in the Environment

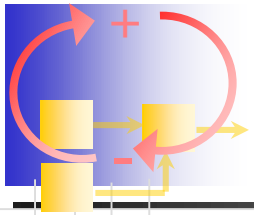



Cumulative Percentage Life Cycle Cost against Time
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Committed Costs
70%
85%
95%
500-1000X
20-100X
3-6X
Cost to Extract Defects
Concept
8%
Design
15%
Develop
20%
Prod/Test
50%
Operations Through Disposal
100%
Time



Project Management

- **Project Management** comprises a body of methods and tools that facilitate the achievement of project objectives
  - Within time
  - Within cost
  - Within scope
    - At the desired performance/specification level
  - While effectively and efficiently utilizing resources
  - While carefully managing risks and opportunities



History of Project Management

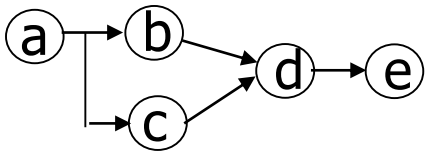
- Big Projects since antiquity
  - Pyramids (Egypt), Great Wall (China)
  - Enormous workforce, but little documented evidence of formal project management
- Formal Project Management
  - Henry Gantt (1861-1919) → bar chart 1910
  - 1957 Sputnik Crisis → revival of "scientific management"
  - Polaris (1958) → Project Evaluation and Review Technique (PERT)
  - DuPont Company (1960) → Critical Path Method (CPM)
  - 1960's NASA projects: Mercury, Gemini, Apollo
    - Work Breakdown Structures (WBS)
    - Cost and Schedule Tracking, Configuration Management

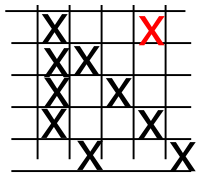
Comments about early PM

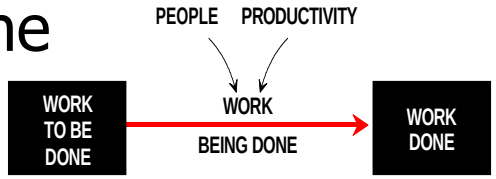
- Project decomposition necessary due to complexity
- Resource allocation and workload smoothing
- Schedule urgency .."before the decade is out" *JFK*
- Circumstances
  - Complex Relations between Government and Contractors
  - "Shielded" from Society, Competition, Regulations
  - Cold War Pressures for Nuclear Power, Space Race ..
- Other Innovations
  - Project Manager as a central figure
  - Beginnings of Matrix Organization
  - "Earned Value" – adopted by USAF (1963)
- Professionalization since 1969
  - Diffusion into other industries: computers, automotive …
  - Project Management Institute (PMI) founded – PMBOK
  - ISO 10006:1997 Quality in Project Management
  - Recent criticism about PM standards as "bureaucratic"

Fundamental Approaches

- How to represent task relationships?
- Network-based (graph theory) methods
  - CPM, PERT, ….
  - Task is a node or an arc
- Matrix-based methods
  - DSM - Tasks are columns and rows
  - Interrelationships are off-diagonal entries
- System Dynamics
  - Feedback loops, causal relationships
  - Stocks and flows simulation
  - Tasks that are done or waiting to be done are stocks – "amount of work"
  - Doing project work causes a "flow"





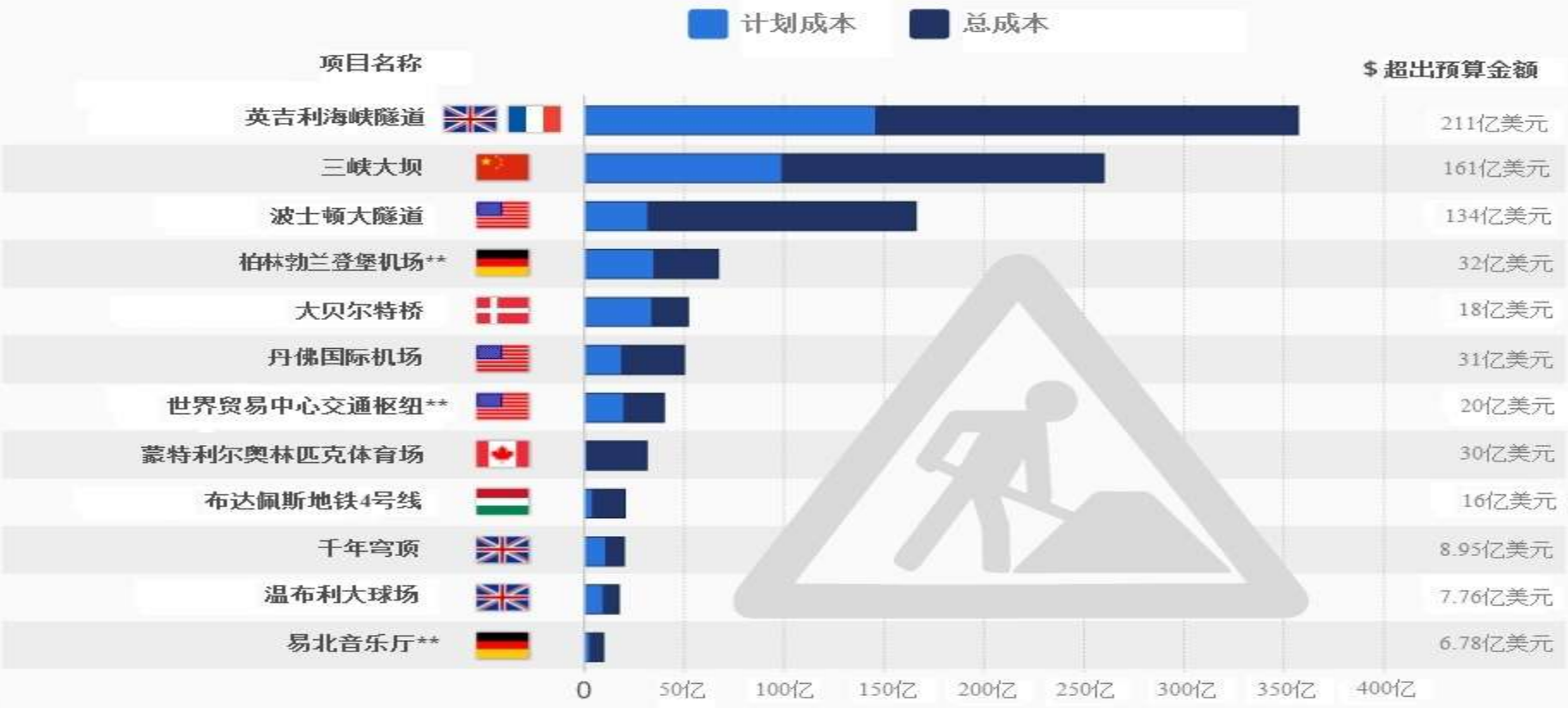


The Big Dig

The Big Dig

预算超支的建筑工程对比

超出预算的全球建筑工程（以美元计算）*



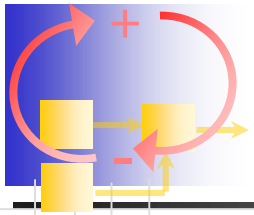
*转换为美元并扣除通货膨胀因素；**仍未完工的项目

数据来源：Podio，《明镜周刊》，《纽约时报》

Forbes statista

Boston Big Dig

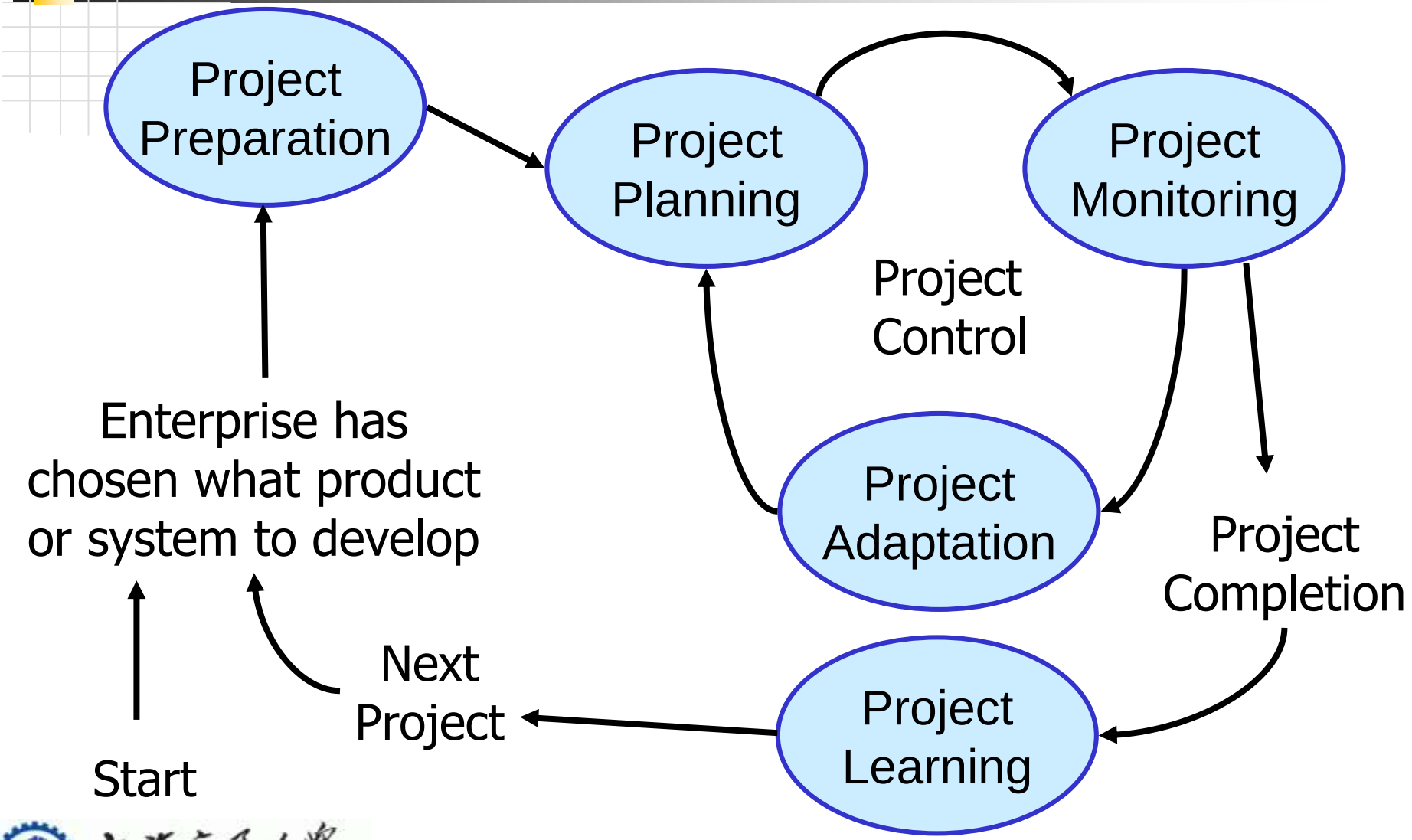
- Why this project?
- Risks involved?
- Success?/Failure?
- Outcome?



Functional View of Project Management

- Preparing
- Planning
- Monitoring
- Adaption
- Learning

System Project Management Framework



Course Objectives

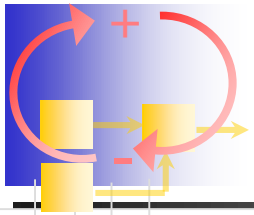
- Introduce advanced methods and tools of Project Management in a development context
  - CPM/PERT, Critical Chain, Design Structure Matrix
  - System Dynamics
  - Earned Value Management
- Understand how methods work (strengths, limitations)
  - Industry Examples
- Gain appreciation for organizational and human aspects
  - Case Studies
  - Managing International Projects, Portfolios of Projects …
- Learn from each other
  - Class Discussions
  - Project Assignments
- → Improve development projects in your career/firm

Conceptual Schedule

- Module 1
  - Project Preparation Planning Techniques
- Module 2
  - Project Monitoring and Adaptation
- Module 3
  - Organizational and Human Issues
- Module 4
  - Student Projects and Summary

Class Schedule

Week	Date	Contents	Notes	
			HW	Project
1	15 Sep	L1: Introduction		Project Assignment Out
2	22 Sep	L2: CPM & Critical Chain Method	HW1 out	
3	29 Sep	L3: Probabilistic Scheduling /DSM	HW2 out	
4	6 Oct	L4: System Dynamics		Project Proposal Due
5	13 Oct	L5: Cost and Risk Management	HW3 out / HW1 due	
6	20 Oct	L6: Project Soft Factors	HW2 due	
7	27 Oct	L7: Engineering Ethics		
8	3 Nov	L8: Student Presentations & Conclusions	HW3 due	Final Presentation due



Readings

- Required Readings
  - NO Paper Class Reader Packet
  - Readings sent out in pdf
  - Read ahead of lecture ~ 1-2 papers/chapters per session
    - Check your emails for reading assignments
- Optional Readings
  - Textbooks
  - Purchase only if you think useful beyond class
    - (e.g. PMI, amazon.com etc ….)

Readings

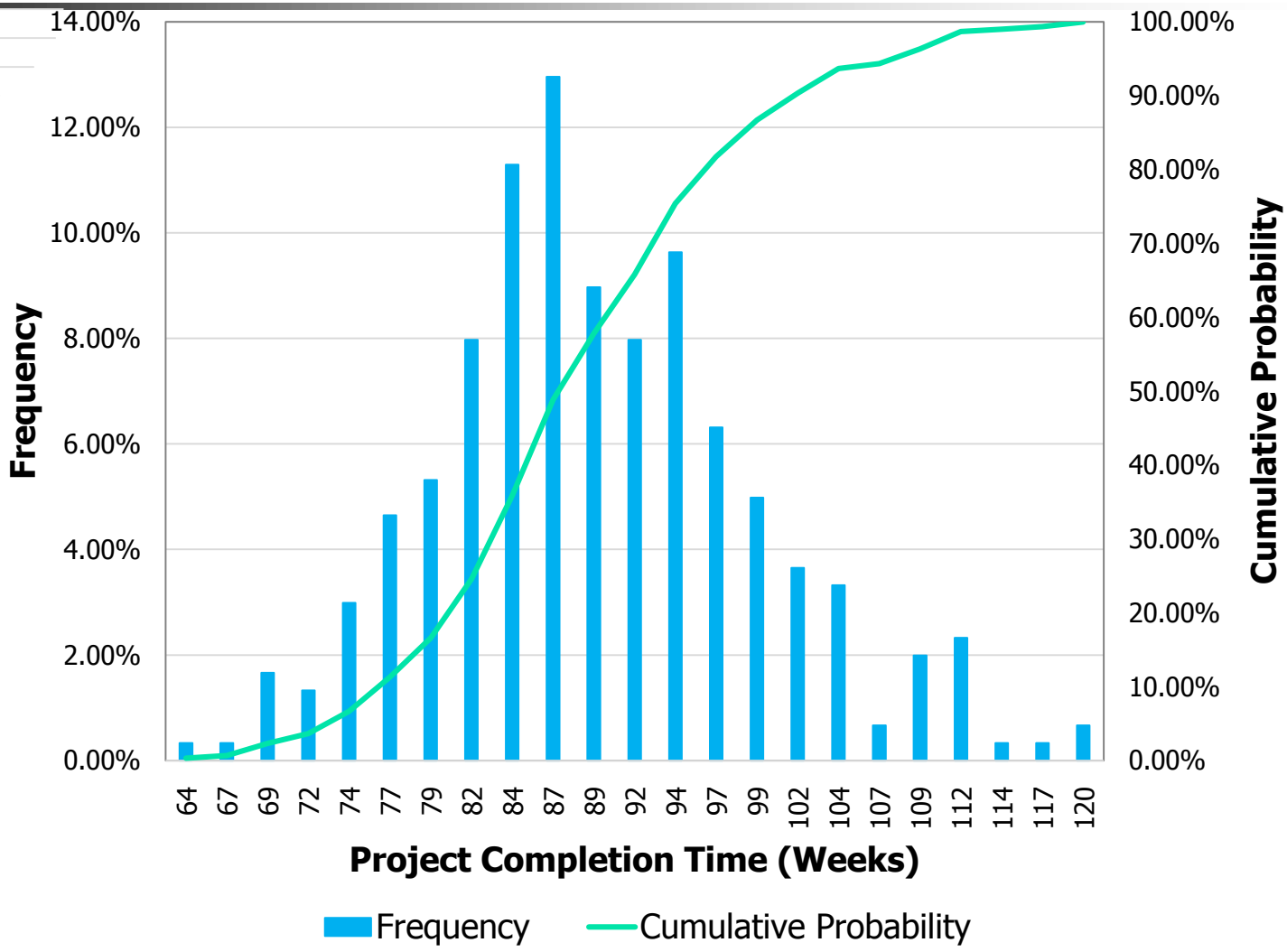
- McConnell, Steve ; *Rapid Development: Taming Wild Software Schedules*, Redmond, WA:Microsoft Press, 1996.
- Forsberg, Kevin ; Mooz, Hal , and Cotterman. Howard, *Visualizing Project Management, A Model for Business and Technical Success*, Third Edition, John Wiley & Sons, Inc. 2005.
- Goldratt, Eliyahu M. ; *Critical Chain*, Great Barrington, MA: The North River Press, 1997.
- Highsmith, James, *Adaptive Software Development: a collaborative approach to managing complex systems*, Dorset House Publishing, 1999.
- Kerzner, Harold, *Project Management: A Systems Approach to Planning, Scheduling, and Controlling*, 9th ed., New York: John Wiley & Sons, 2006.
- *Guide to the Project Management Body of Knowledge, A (PMBOK Guide)*, paperback, Third Edition , By: Project Management Institute, http://www.pmibookstore.org

Project Assignment

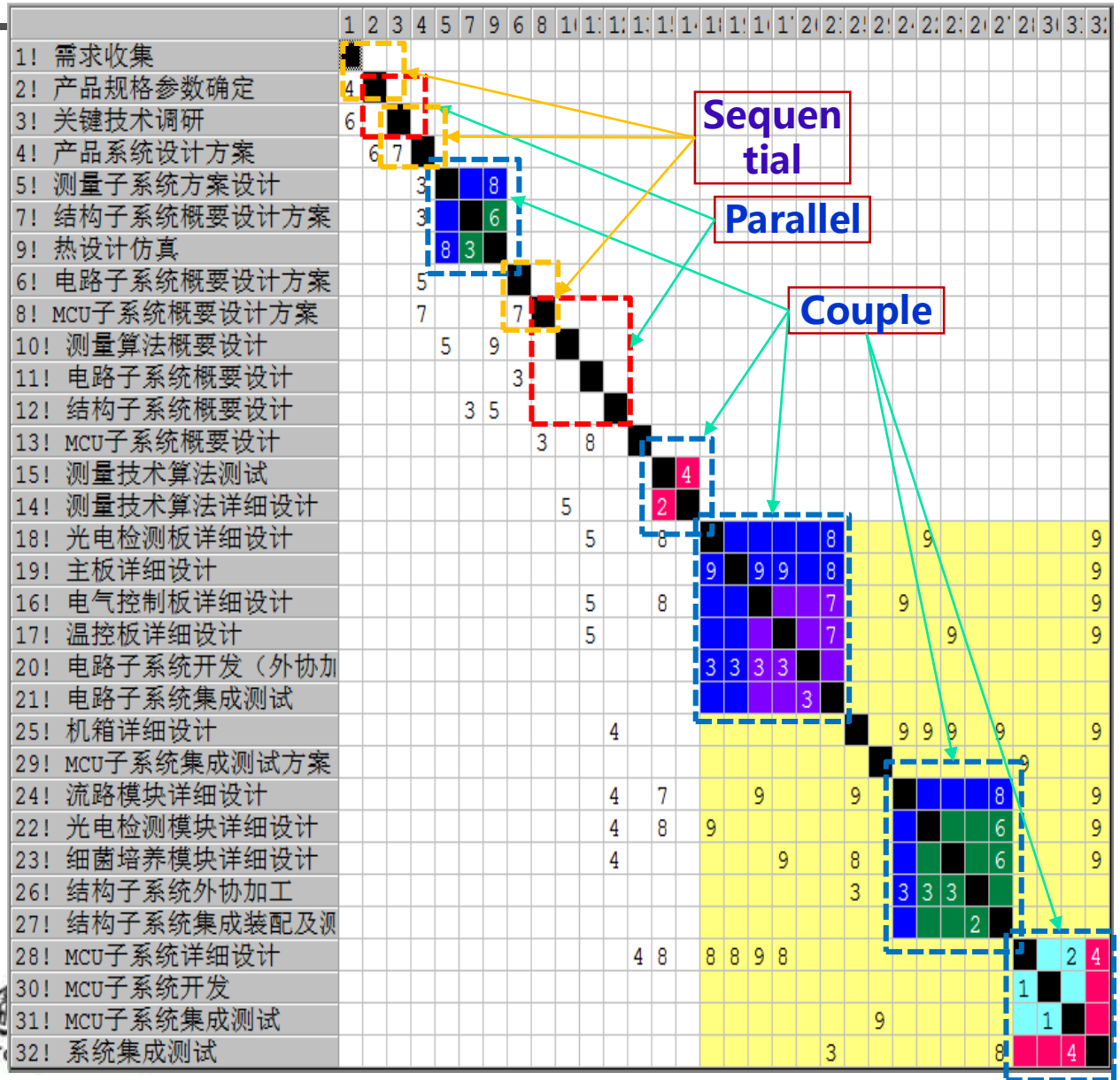
- Apply Design Structure Matrix (DSM) method, generally at your sponsor company site
- Survey of Methods & Tools in company
- Analyze Success or Failure of a significant Past Product/System Development Project – case write up
  - Work in teams of 6 (nominally)
  - 1-page project proposals due on
  - Get approval/feedback
  - Project Update due
  - Final presentation in class

Previous Project Examples

Project Completion Time Distribution

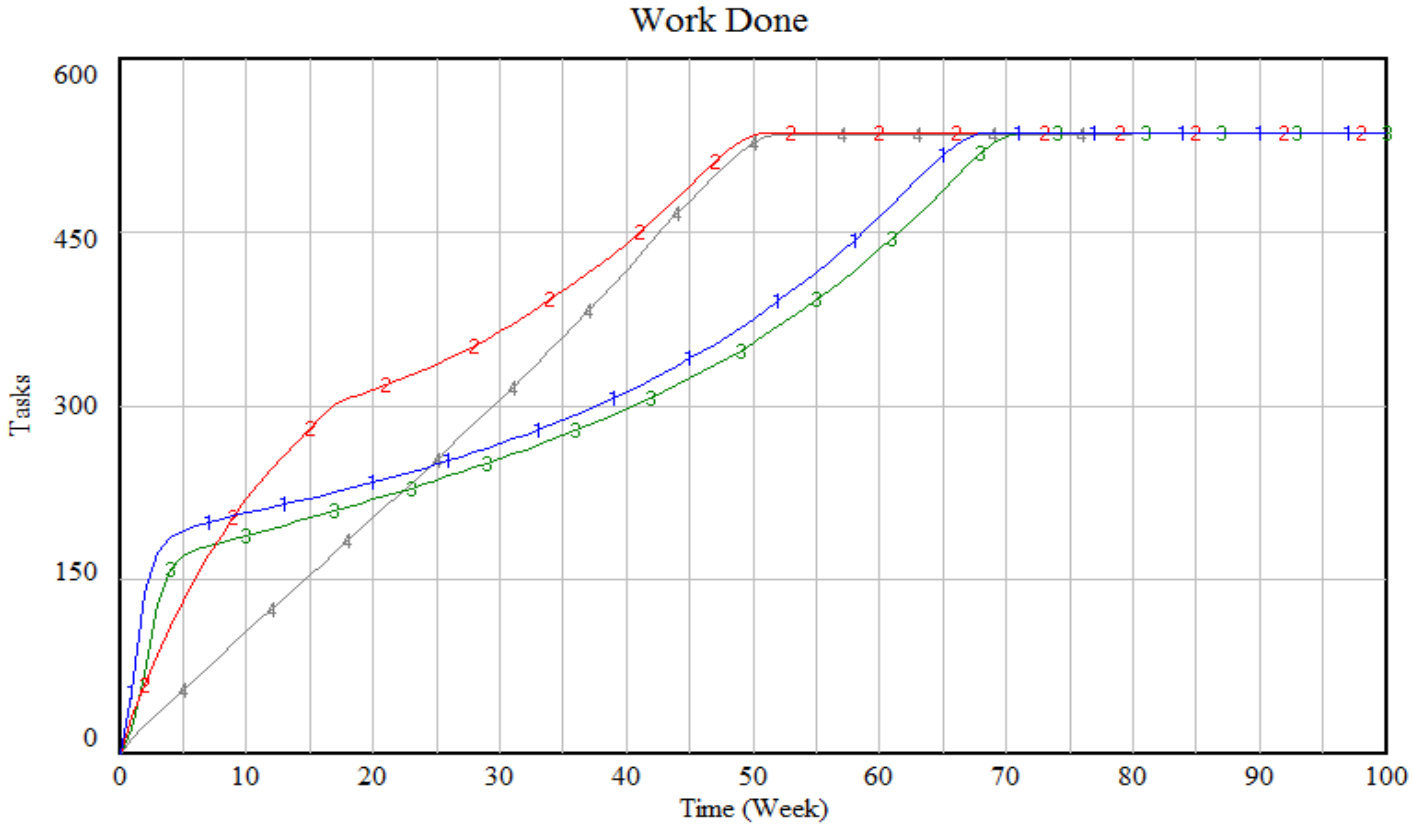


Updated Partitioned DSM



上海交通
Shanghai Jiao T

Model -- Overtime & Adding People



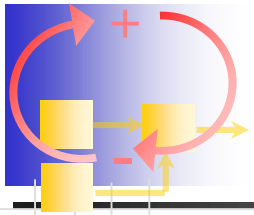
68 weeks
340 days

> 176days

Homework Assignments

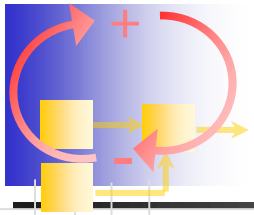
- 3 Individual assignments, but can cooperate (**acknowledge !**)
- Don't spend more than ~5-10 hours per HW !

HW	Topic
1	Create a project plan and find the critical path (CPM)
2	Create a DSM model and analyze the iterations
3	Setup project monitoring and cost control (EVM) & Financial analysis



Grading

- Homework 45%
- Project Assignment 30%
- Active Participation 25%
  - Total 100%
  - All project team members receive same project grade, work together
  - People do get A,B,C …even D … you want a good grade? … you have to earn it !



Remember

- Check your emails regularly. Take a look at what's already sent to you.
  - Homework
  - Readings for next class
  - Other things to share
- Laptops are NOT allowed in class sessions

Let's end on an uplifting note

- "Nothing is particularly hard if you divide it into small jobs." – Henry Ford