15.566 Information Technology as an Integrating Force in Manufacturing

American Crown and Software Development

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THE MIT VIEW OF THE FIRM

ORGANIZATION’S VALUE PROPOSITION

INFORMATION VALUE \[\leftrightarrow\] PROCESS VALUE \[\leftrightarrow\] MATERIAL VALUE

ORGANIZATION’S ARCHITECTURE

DEEP STRUCTURE OF BUSINESS PROCESSES

COMPUTER ACTIVITIES

HUMAN ACTIVITIES

TECHNOLOGY

MACHINES & MATERIALS

PEOPLE

ENVIRONMENT
Problems with software development (1/2)

• Computerworld magazine*
  – “Nearly one-third of all projects fail”
  – “More than half come in over budget”
  – “Only 16% of all projects come in on time and on budget”

• Key factor for success or failure:
  – “User involvement/input”

*Survey of 8000 projects from 385 companies.

Problems with software development (2/2)

• 70 % of IT and e-commerce projects either fail or are completed over budget with less functionality than planned (Standish Group Report, December 2001).

• IT now accounts for 50% of all business equipment spending (reference Bain & Co. Sept 2001 in Business Week).

• For example, the UK computer giant ICL confirmed that a multi-million pound crew-scheduling system it was developing for BA had to be junked after a two-year over-run.
Approaches to software development

- Traditional systems development life cycle
- Prototyping
- Packaged software
- End-user development
- Outsourcing
- Open source

Traditional systems development life cycle

Project definition
↓
Systems analysis
↓
Design
↓
Programming
↓
Installation
↓
Operation
Traditional systems development life cycle

- **Advantages**
  - For well-understood problems, produces predictable outcomes

- **Disadvantages**
  - Inflexible
  - Long delay before any useful results
    - May be obsolete by then
  - Often hard to know requirements until actual use

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**Prototyping**

1. **Project definition**
2. Identify basic requirements
3. Develop a working prototype
4. Use the prototype
5. **User satisfied?**
   - Yes
   - No
     - Revise and enhance prototype
     - Done
Prototyping

- Advantages
  - Especially useful when exact requirements are hard to know in advance
    - user interfaces
    - decision systems
    - electronic commerce?
  - Encourages user involvement
- Disadvantages
  - Hard to predict and control outcomes reliably
  - If repeated, significant reimplementations are needed, can be very expensive
  - May result in systems that are inefficient, unreliable, or hard to maintain
Packaged software

- **Advantages**
  - By amortizing development and maintenance costs over many organizations, it is possible to get superior solutions at much lower cost

- **Disadvantages**
  - Customizing software can be *very* time-consuming and expensive
  - May have to change organization to fit software, rather than vice versa

End-user development

1. User recognizes need
2. User acquires development tools
3. User implements solution
4. User uses the solution
5. User satisfies?
   - Yes
   - No
5a. User revises and enhances solution
6. Done
End-user development

• Advantages
  – Can be much faster
  – Improved requirements determination
  – Increased user involvement and satisfaction

• Disadvantages
  – Many problems can’t be solved within the limitations of the tools
  – Lack of quality assurance and standards for programs and data
  – Lack of sharing of programs and data

Outsourcing

• Contract out the performance of any or all of the above steps to another firm

• Advantages
  – Economies of scale
  – Flexibility
  – Predictability
  – Freeing up human resources and capital

• Disadvantages
  – Loss of control
  – Vulnerability of strategic information
  – Dependency
Open source

- Advantages
  - Usually lower cost
  - Sometimes easier to adapt “packaged” software to own needs
  - “Philosophically” appealing to many people
- Disadvantages
  - Usually lower quality support
  - Only a few kinds of software are currently available in this format (Linux operating system, Apache web server, etc.)