Reusability as a Strategic Management Practice in the Computer Industry

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- Sean Barnum
- Gina Austin
- Yonca Daim
- Zareer Cursetjee
- Sarunya Premjai
- Anil Khanna
- Manivannan Thavasi
- Gerard Rousseau

Introduction

- **Environment**
  - **Fast paced**
  - **Constant change**
  - **Very competitive**
  - **Flexibility is critical**
- **Problem**
  - Standard practice of repeated custom development takes too long and costs too much
- **Solution**
  - Strategic Reuse - the ***strategic*** practice of development through the creation and application of reusable components
- **Purpose**
  - Present a brief overview of strategic reuse and the issues surrounding it in the computer industry

Methodology

Literature Research

- Internet
- Professional Publications
- Technical Research Papers
- Professional Books
- Commercial Publications

Field Study

- Interviews
- Non-formal data analysis
- Case *Summaries*

- Boeing
- CBSI
- EDS
- Intel
- Lattice Semiconductor
- Meetinghouse Tech
- Tektronix

Literature Search

- Methods of Implementation
- Goals/Benefits
- Success Factors
- Diffusion Levels
- Diffusion Factors
- Case Summaries

Literature Search

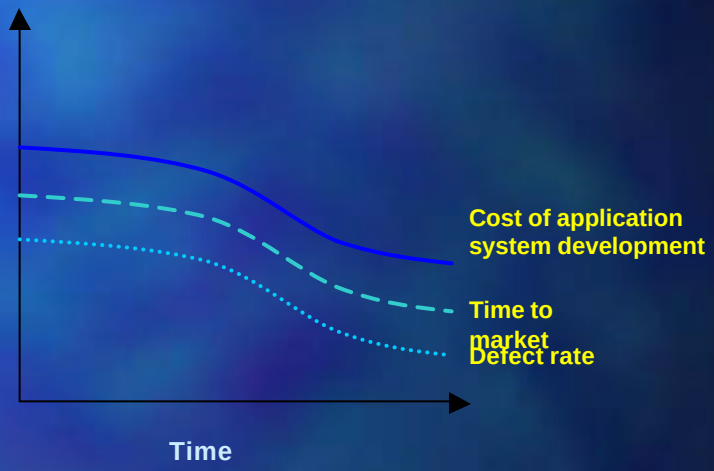
- **Methods of Implementation**
  - Object-oriented software
  - CASE tools
  - Model-based development
  - Frameworks/Libraries
  - Components
  - Patterns
  - Intellectual Property Libraries
  - Modular manufacturing processes for mass-customization.
  - Modular documentation

Reuse as a Strategic Management Practice in the Computer Industry

Literature Search

Goals / Benefits

- Lower product cycle time
- Increased product quality
- Lower cost
- Increased productivity
- Improved interoperability
- Rate of innovation
- Employee job satisfaction

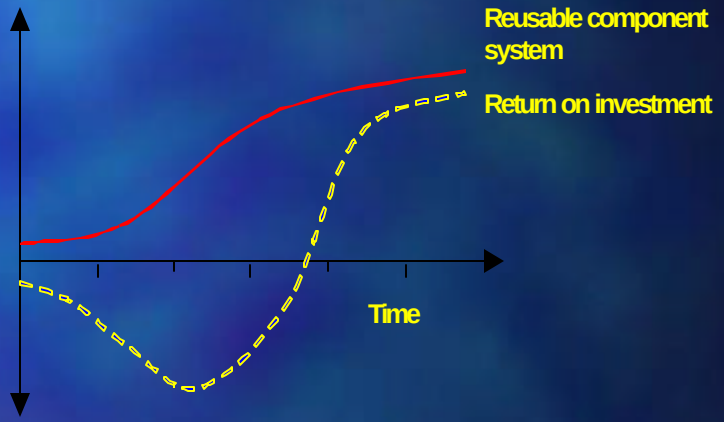


"Cost or effort, time to market, and defect rate all start at a fairly high level. At first, as the reuse effort is in the planning stage, they remain steady. As reuse begins to make a difference, they drop rapidly. Eventually, when reuse reaches 80 or 90 percent, the rate of decline flattens out"

Literature Search

Success Factors

- **Business Related Factors**
  - *Business strategy*
  - *Organization structure and culture*
  - *Investment strategy*
- **Technical Factors**
  - *Standards*
  - *Tools*
  - *Examples*
  - *Not invented here*
  - *Incentives*



Literature Search

- Diffusion Levels
  - Very little in literature
  - Very high levels in software
  - Limited levels in hardware
  - Low levels in business areas

Literature Search

- Diffusion Factors
  - *Management support*
  - *Training*
  - *Personal experience*
  - *Accountability*
  - *Publications*
  - *Standards*
  - *Tools*

Literature Search

- **Case Summaries**
  - Ericsson
  - Hewlett Packard
  - Motorola
  - Synopsys

Field Study

- Case Summaries
- Relevant Issues

Field Study

- **Case summaries**
  - **Small startup companies**
    - *Less likely to pursue*
  - **Non-software companies**
    - *Beginning to pursue ad-hoc*
  - **Large software related consulting companies**
    - *Likely to pursue systematically*

Field Study

- **Relevant Issues**
  - Methods of Implementation
  - Goals/Benefits
  - Success Factors
  - Diffusion Factors
  - Observations of note

Field Study

- **Methods of Implementation**
  - *Mostly software*
    - *Object-oriented*
    - *Libraries*
  - *Modular HW design in circuit boards*
  - *Modular chip design*
  - *Modular business processes*
  - *System architectures*

Field Study

- **Goals / Benefits**
  - *Reduced cycle times*
  - *Lower cost*
  - *Improved quality*
  - *Improved compatibility / interoperability*
  - *Simpler planning*
    - *Improved estimation capability*
    - *Improved schedule stability*
  - *Improved employee morale*

Field Study

Success Factors

- *Management commitment & accountability*
- *Systematic strategy rather than ad-hoc*
- *Short-term cost/Long-term benefit*
- *Training*
- *Existence of successful examples*
- *Availability of appropriate tools*
- *Communication between management & engineering*
- *Communication among and between engineering teams*
- *Selection of appropriate projects*
- *Client involvement*
- *“Not invented here” syndrome*
- *Incentives*

Field Study

- **Diffusion Factors**
  - *Movement of people*
  - *Strategic vs. ad-hoc approach*
  - *Communicating success to others*
  - *Strategic selection of projects*

Field Study

Observations of Note

- *In most cases these efforts are pushed from the bottom-up rather than top-down*
- *Managers from strong technical backgrounds are much more likely to support & advocate reuse*
- *Consulting companies with involvement across the technological landscape are more likely to fully and formally support reuse across the organization*
- *Small companies may not find this technology as appropriate*

Results

Does interview data match literature?

Is this an emerging trend?

Is it successful in achieving its goals?

What factors affect its success?

What factors affect its diffusion?

What are the future prospects?

Results

Does interview data match literature?

Yes, with two exceptions unique to field study

- Small startup companies lack of interest
- Importance of training to success

Is this an emerging trend?

Yes. Has long been common sense but is now becoming strategic.

Moving toward becoming standard in SW

Likely to become much more significant in HW

Is it successful in achieving its goals?

When approached systematically, it is very successful!

When approached ad-hoc, it usually fails to achieve its potential.

Results

What factors affect its success?

- *Management commitment & accountability*
- *Systematic strategy rather than ad-hoc*
- *Understanding Short-term cost/Long-term benefit*
- *Training*
- *Flexible organization structure & culture*
- *Existence of successful examples*
- *Availability of appropriate tools*
- *Existence of standards*
- *Communication between management & engineering*
- *Communication among and between engineering teams*
- *Selection of appropriate projects*
- *Client involvement*
- *“Not invented here” syndrome*
- *Incentives*

Results

What factors affect its diffusion?

- *Movement of people*
- *Management support & accountability*
- *Strategic vs. ad-hoc approach*
- *Communicating success to others*
- *Strategic selection of projects*
- *Training*
- *Publications*
- *Standards*
- *Tools*

Results

What are the future prospects?

- *Will soon become the standard in software*
- *Rapidly changing environment and increasing competition is likely to drive toward wide-scale adoption in hardware*
- *As the full potential of reuse becomes more widely publicized it may also begin to see wide implementation in business practices*

Conclusion

In the market of tomorrow where flexibility determines survival, the practice of strategic reuse will likely become a standard element in *every* technology manager's strategic toolbox.

Suggested Readings:

- I. Jacobson, M. Griss, and P. Jonsson, "Software reuse: architecture, process and organization for business success." *Addison-Wesley.* (1997)
- D. M. Erb, "Technology Roadmap for DOD's Reuse Initiative", http//rbse.jsc.nasa.gov/ricis/review/volume6number2/Erb.html
- W. C. Lim, "Managing Software Reuse : A Comprehensive Guide to Strategically Reengineering the Organization for Reusable Components", Prentice Hall. (July 1998)
- Jacobson I., "Succeeding with objects: Reuse in reality", Object Magazine, July 1996.