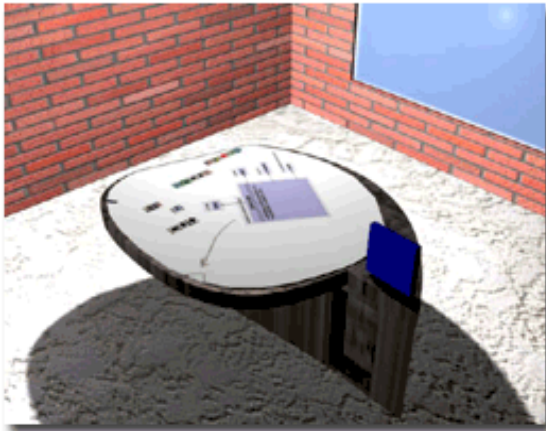# P-Tab
## A Multidisciplinary Participatory Design Environment

Jonathan Benn

B.Eng. Software Engineering

M.Sc. Computer Science (in progress)

benn@cs.concordia.ca

Human-Centered Software Engineering Group

Concordia University

http://hci.cs.concordia.ca/www/hcse/

# Outline

- Introduction to Design
- Introduction to HCD
- Introduction to P-Tab
- P-Tab and the Design Process
  - Brainstorming
  - Design Patterns
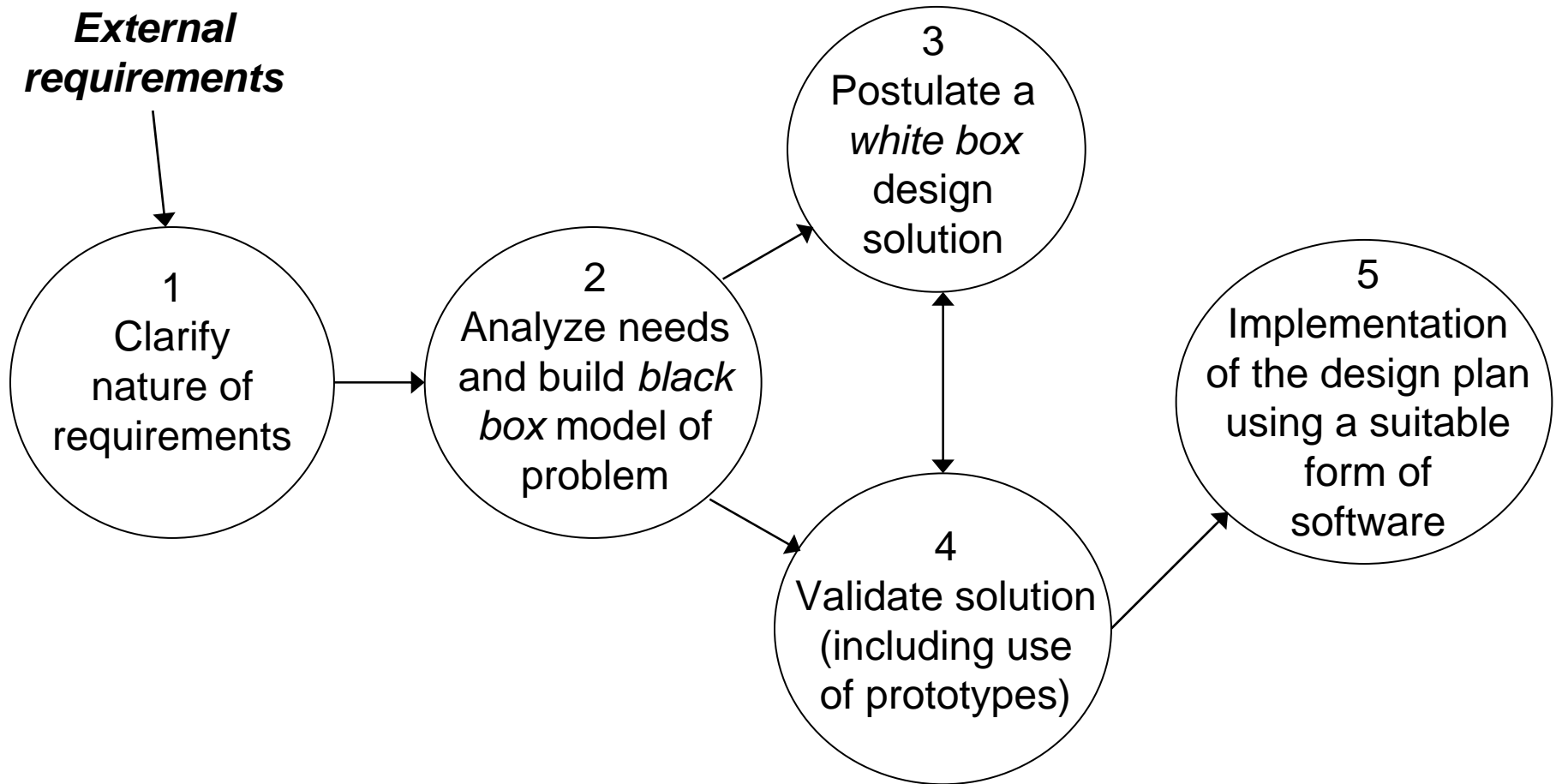  - Interactivity
  - Metaphors
- Conclusion

# Introduction to Design

- What is software design?
  - Tradeoffs, constraints and stakeholders
  - Describes how "software is decomposed and organized into components."
  - Describes the "interfaces between those components… at a level of detail that [enables] their construction."

Source: Software Engineering Body of Knowledge (SWEBOK). http://www.swebok.org/

3

# Importance of S/W Design

- Work distribution
- Maintenance
- All domains and disciplines

# The Design Process



*External requirements*

**1** Clarify nature of requirements

**2** Analyze needs and build *black box* model of problem

**3** Postulate a *white box* design solution

**4** Validate solution (including use of prototypes)

**5** Implementation of the design plan using a suitable form of software

Source: D. Budgen. *Software Design*. 2nd Ed. Addison-Wesley, 2003.

# Why is Design Difficult?

*"The fundamental problem is that designers are obliged to use current information to predict a future state that will not come about unless their predictions are correct."*

--J. Christopher Jones

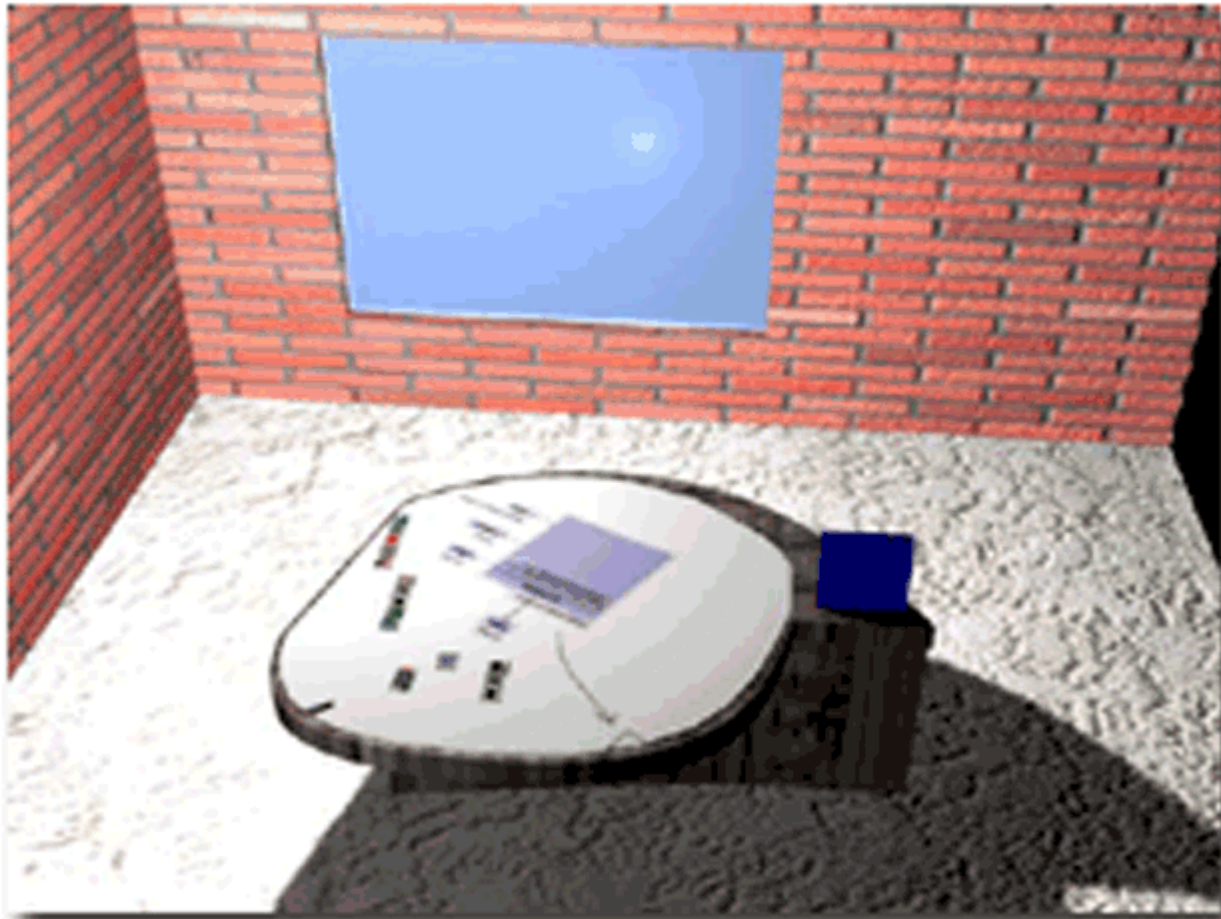Source: J.C. Jones. *Design Methods: Seeds of Human Futures*. 1970.

# Outline

- Introduction to Design
- Introduction to HCD
- Introduction to P-Tab
- P-Tab and the Design Process
  - Brainstorming
  - Design Patterns
  - Interactivity
  - Metaphors
- Conclusion

# Introduction to HCD

- Human Centered Design
    - User focus
    - Multi-disciplinary
    - Iterative development

# Peanut Butter Theory

- Peanut Butter Theory Approach
  - UI is a thin spread
  - User is an afterthought

  - Focus is on system functionalities

- Human-Centered Approach
  - UI has a major focus
  - User is a primary stakeholder
  - Focus is on user tasks

# The Problem

- HCD is a *good thing*, but…
- Challenges
  - User communication
  - Team communication
  - Supportive environment
- A solution

# Outline

- Introduction to Design
- Introduction to HCD
- <span style="color:red">Introduction to P-Tab</span>
- P-Tab and the Design Process
  - Brainstorming
  - Design Patterns
  - Interactivity
  - Metaphors
- Conclusion

# Introduction to P-Tab

- Participatory Tangible Board
  - Concordia University
  - HCSE group & OBX lab

- What is it?

- The P-Tab Group
  - Dr. Ahmed Seffah
  - Antoine Morris
  - James Maciukenas
  - Prof. Jason Lewis
  - Jonathan Benn
  - Rozita Naghshin

# Artist's Conception

# P-Tab Characteristics

- Two distinct user groups
  - Software engineers
  - Digital media artists and designers
- Additional features/constraints
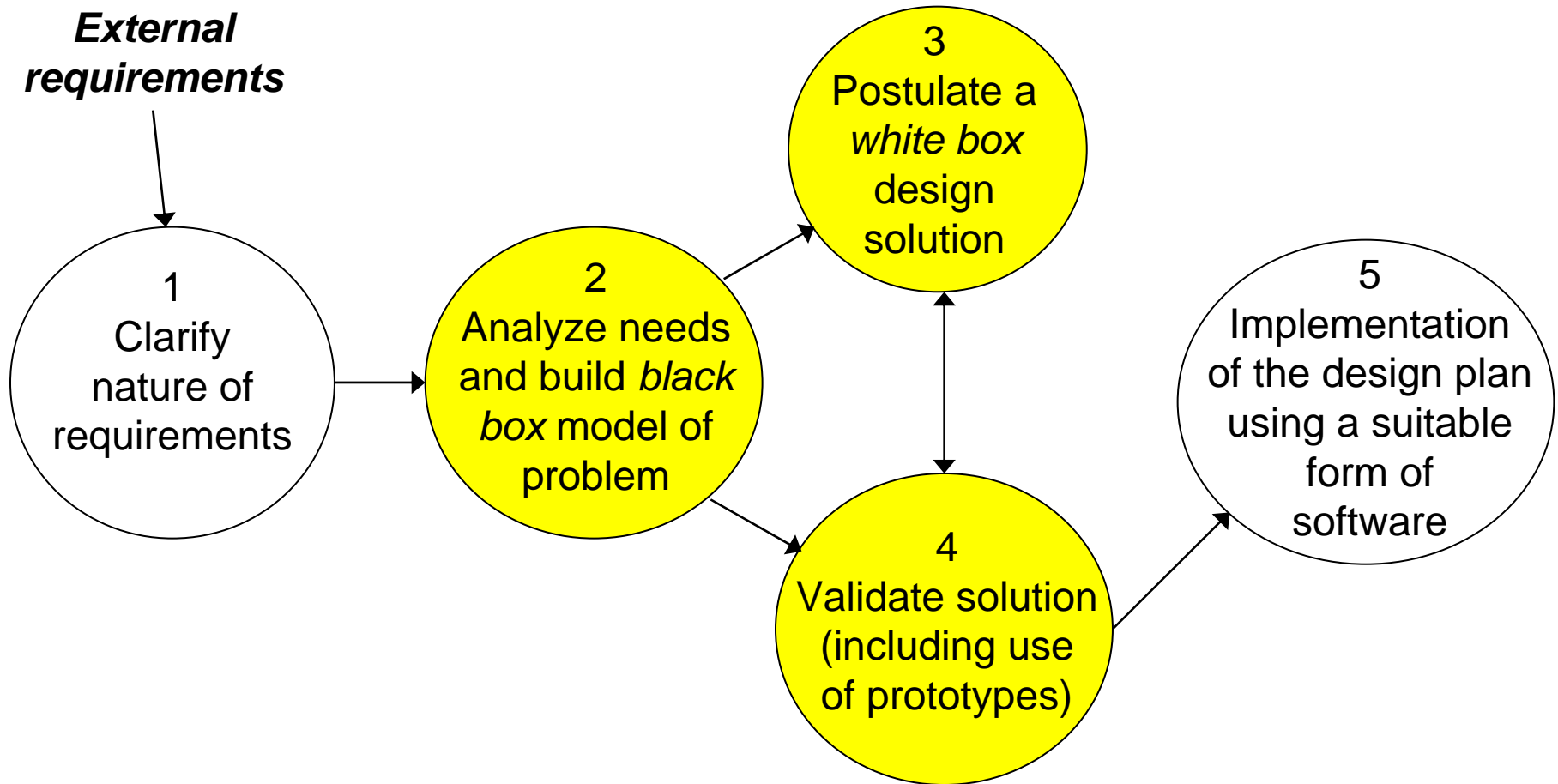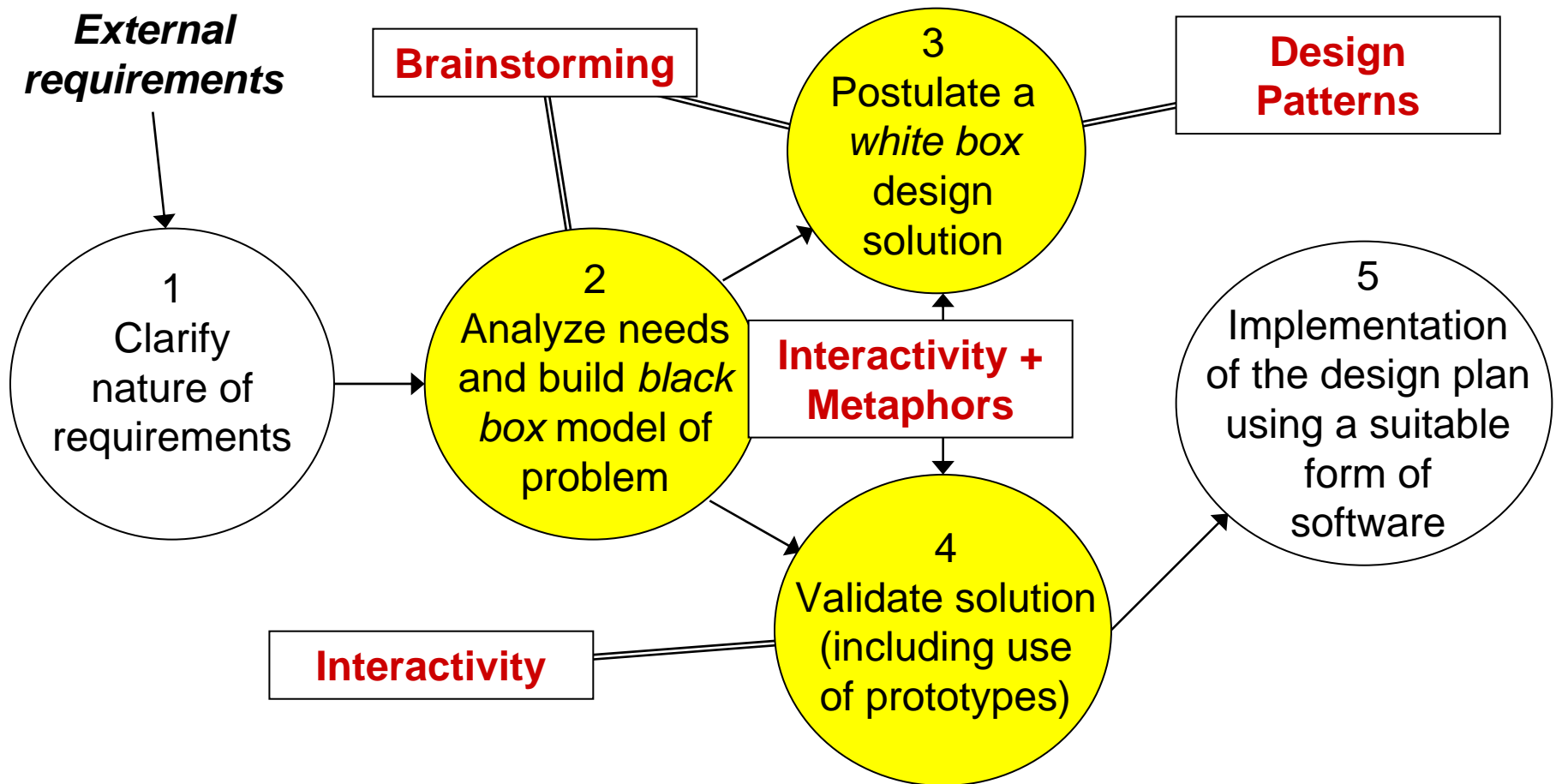  - Network access
  - Interoperability

# Challenges

- P-Tab
  - Research, not engineering
- How to enable participatory design
  - Brainstorming
  - Design Patterns
  - Interactivity
  - Metaphors
- Studies

# Outline

- Introduction to Design
- Introduction to HCD
- Introduction to P-Tab
- P-Tab and the Design Process
  - Brainstorming
  - Design Patterns
  - Interactivity
  - Metaphors
- Conclusion

# Back to the Design Process

*External requirements*

1
Clarify nature of requirements

2
Analyze needs and build *black box* model of problem

3
Postulate a *white box* design solution

4
Validate solution (including use of prototypes)

5
Implementation of the design plan using a suitable form of software

# Back to the Design Process



*External requirements*

**Brainstorming**

3
Postulate a *white box* design solution

**Design Patterns**

1
Clarify nature of requirements

2
Analyze needs and build *black box* model of problem

**Interactivity + Metaphors**

5
Implementation of the design plan using a suitable form of software

4
Validate solution (including use of prototypes)

**Interactivity**

# Brainstorming

- Supporting brainstorming
  - Freeform tools
  - Flexible visualization tools
- Annotation
  - Audio/visual

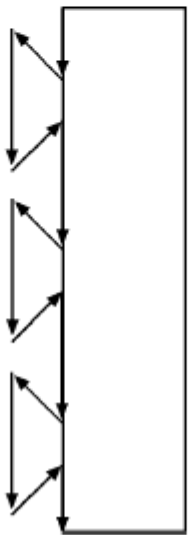# Freeform Tools
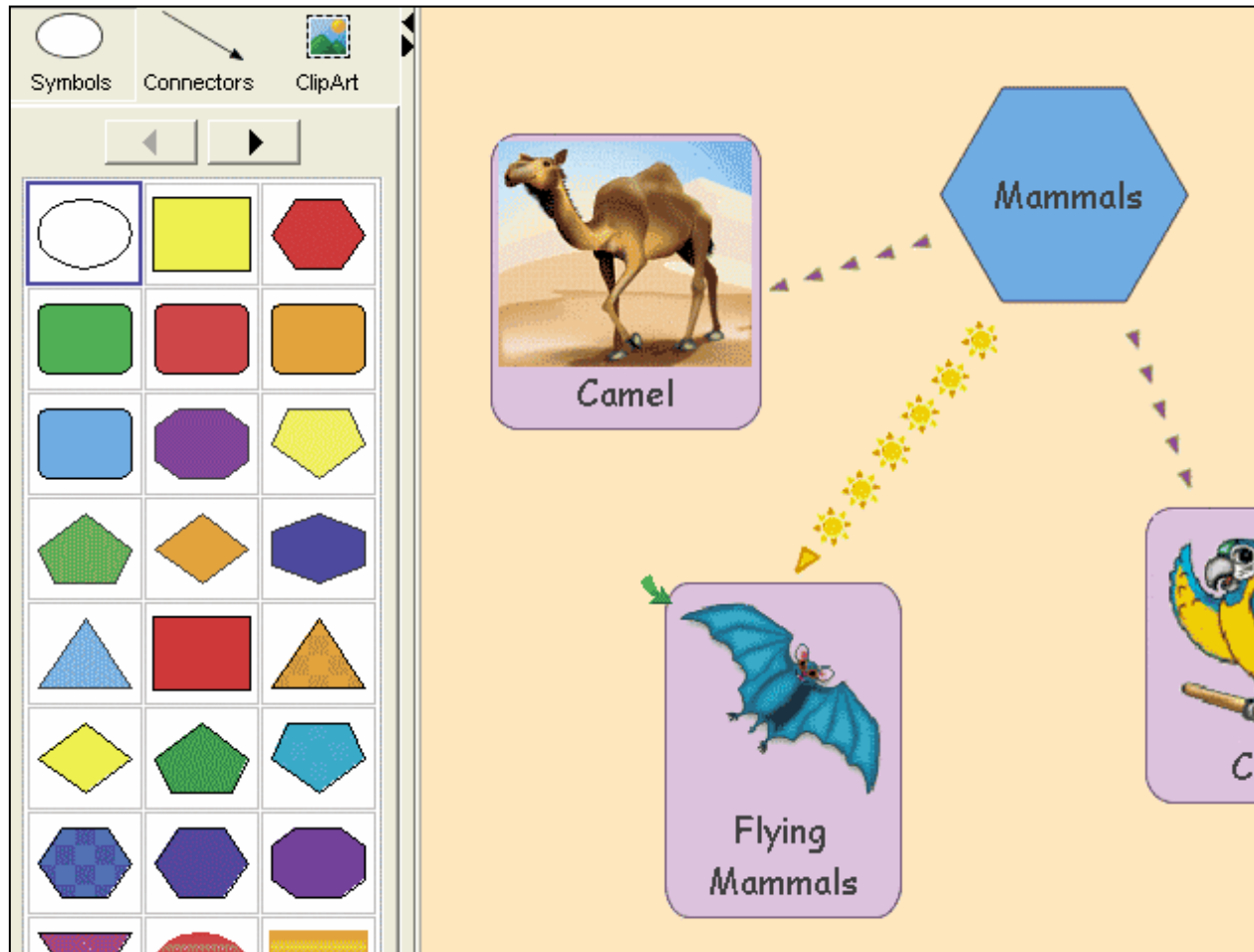
# Design Patterns

- Reuse solutions
- Common terminology
- High-level perspective

Source: A. Shalloway and J. R. Trott. *Design Patterns Explained: A New Perspective on Object-Oriented Design.* Addison-Wesley, 2001.

# Carpentry Example

- **Carpenter 1: "**How do you think we should build these drawers?"

- **Carpenter 2: "**Well, I think we should make the joint by cutting straight down into the wood, and then cut back up 45 degrees, and then going straight back down, and then back up the other way 45 degrees, and then going straight back down, and then…"
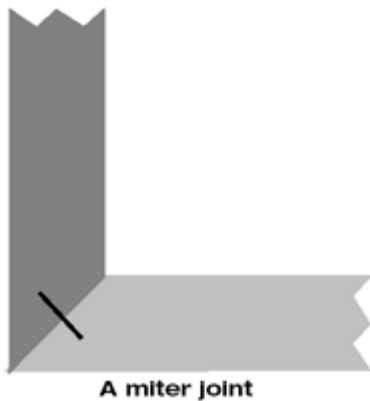
Source: A. Shalloway and J. R. Trott. *Design Patterns Explained: A New Perspective on Object-Oriented Design*. Addison-Wesley, 2001.

| Carpenter 2 Says . . . | Which Looks Like . . . |
|---|---|
| "Well, I think we should make the joint by cutting straight down into the wood, and then cut back up 45 degrees . . ." | |
| ". . . then going straight back down, and then back up the other way 45 degrees, and then going straight back down, and then . . ." | |
| ". . . until you end up with a *dovetail joint*. That is what I was describing!" | |

Source: A. Shalloway and J. R. Trott. *Design Patterns Explained: A New Perspective on Object-Oriented Design.* Addison-Wesley, 2001.

23

# Patterns Are High-Level

- **Question:** Should we use a dovetail joint or a miter joint?

- **Translation:** Should we use an expensive and durable joint, or should we make a cheaper but less durable joint?
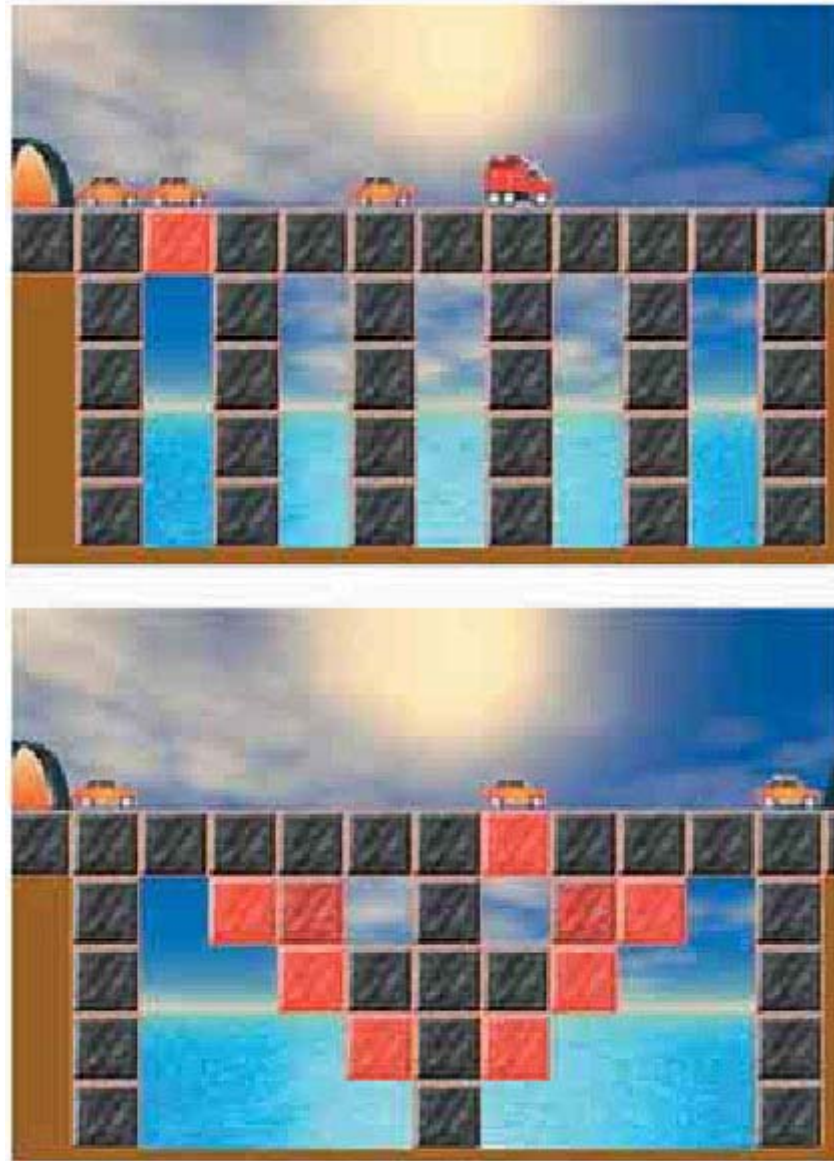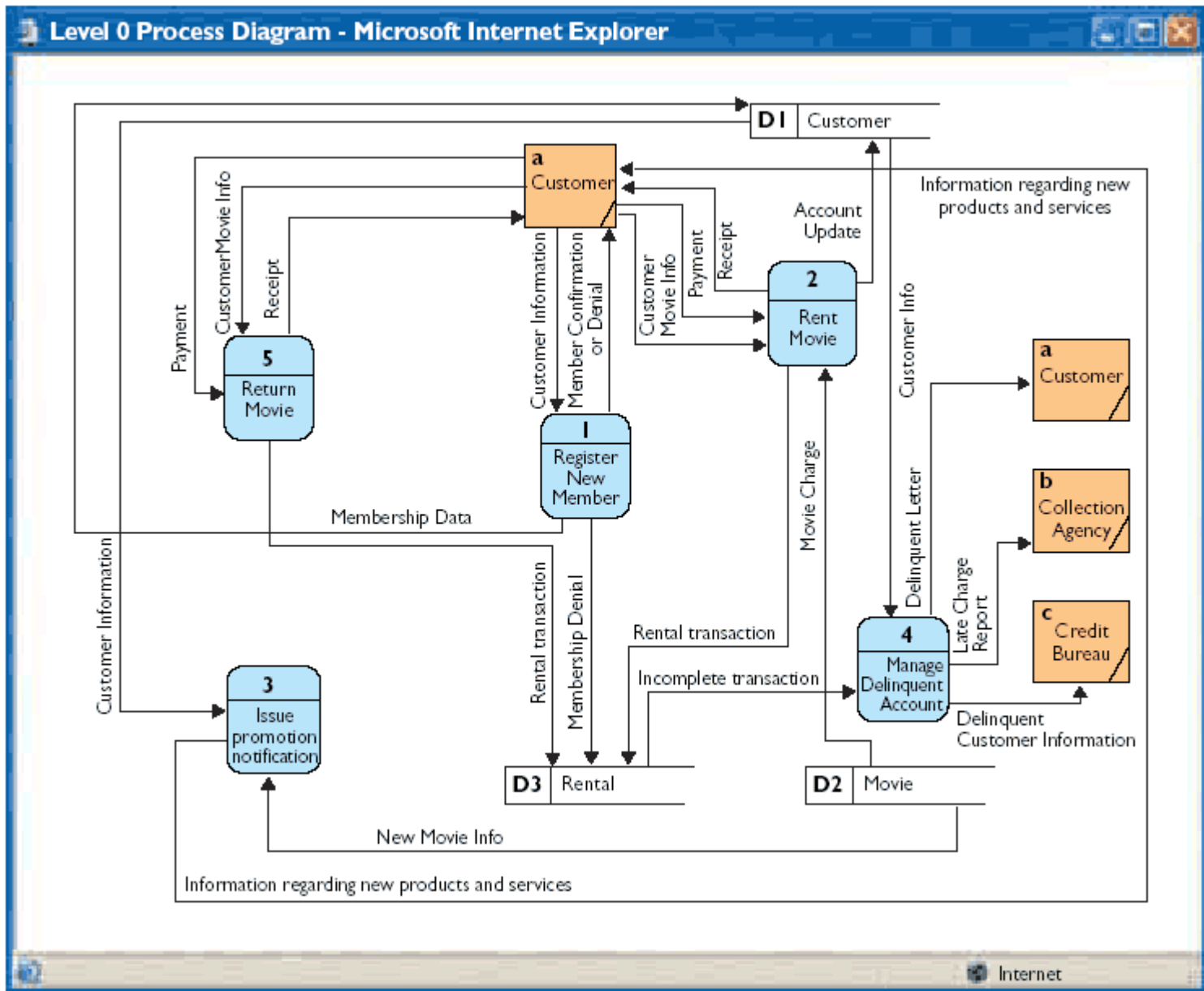


**A miter joint**

Source: A. Shalloway and J. R. Trott. *Design Patterns Explained: A New Perspective on Object-Oriented Design.* Addison-Wesley, 2001.

# Interactivity

- Audio/visual annotation
- Software agents
- Digital libraries
- Prototypes
- Design Visualization
  - Zoom levels
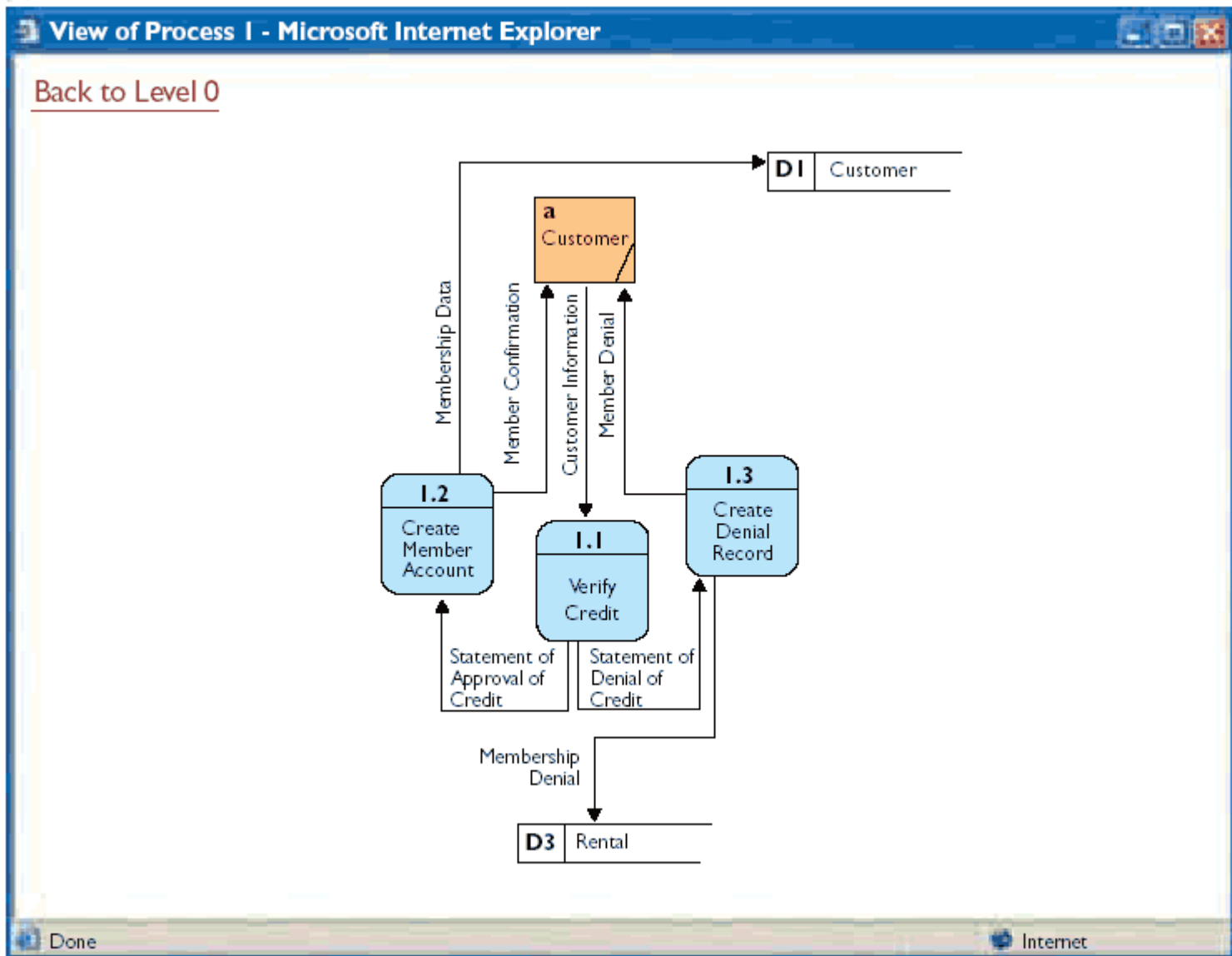  - Fisheye views
  - Customizable views
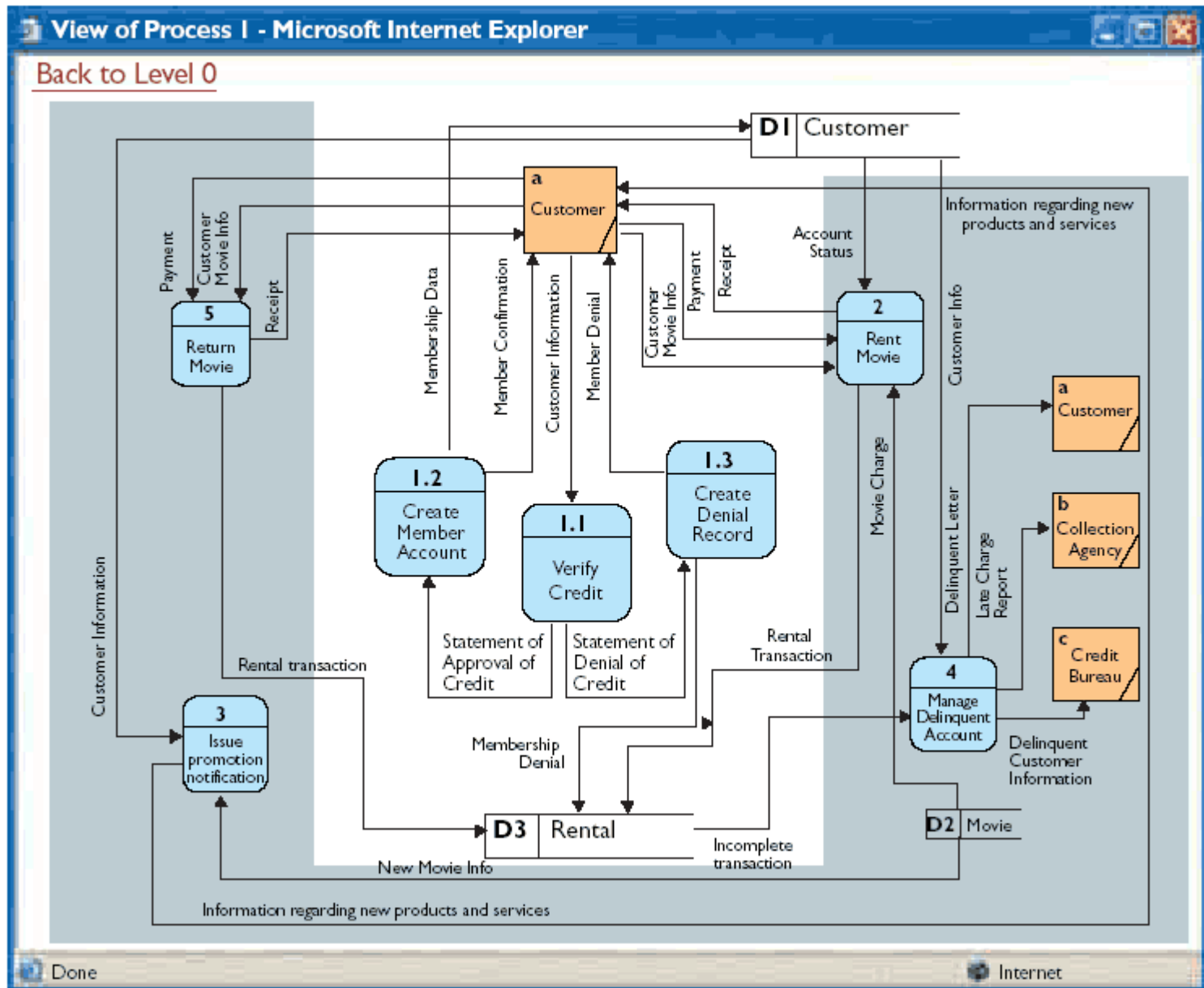
# The Bridge Builder

26

Source: O. Turetken, D. Schuff, R. Sharda, and T. T. Ow. *Supporting systems analysis and design through fisheye views*. Com. of the ACM, September 2004.

Source: O. Turetken, D. Schuff, R. Sharda, and T. T. Ow. *Supporting systems analysis and design through fisheye views*. Com. of the ACM, September 2004.

Source: O. Turetken, D. Schuff, R. Sharda, and T. T. Ow. *Supporting systems analysis and design through fisheye views*. Com. of the ACM, September 2004.
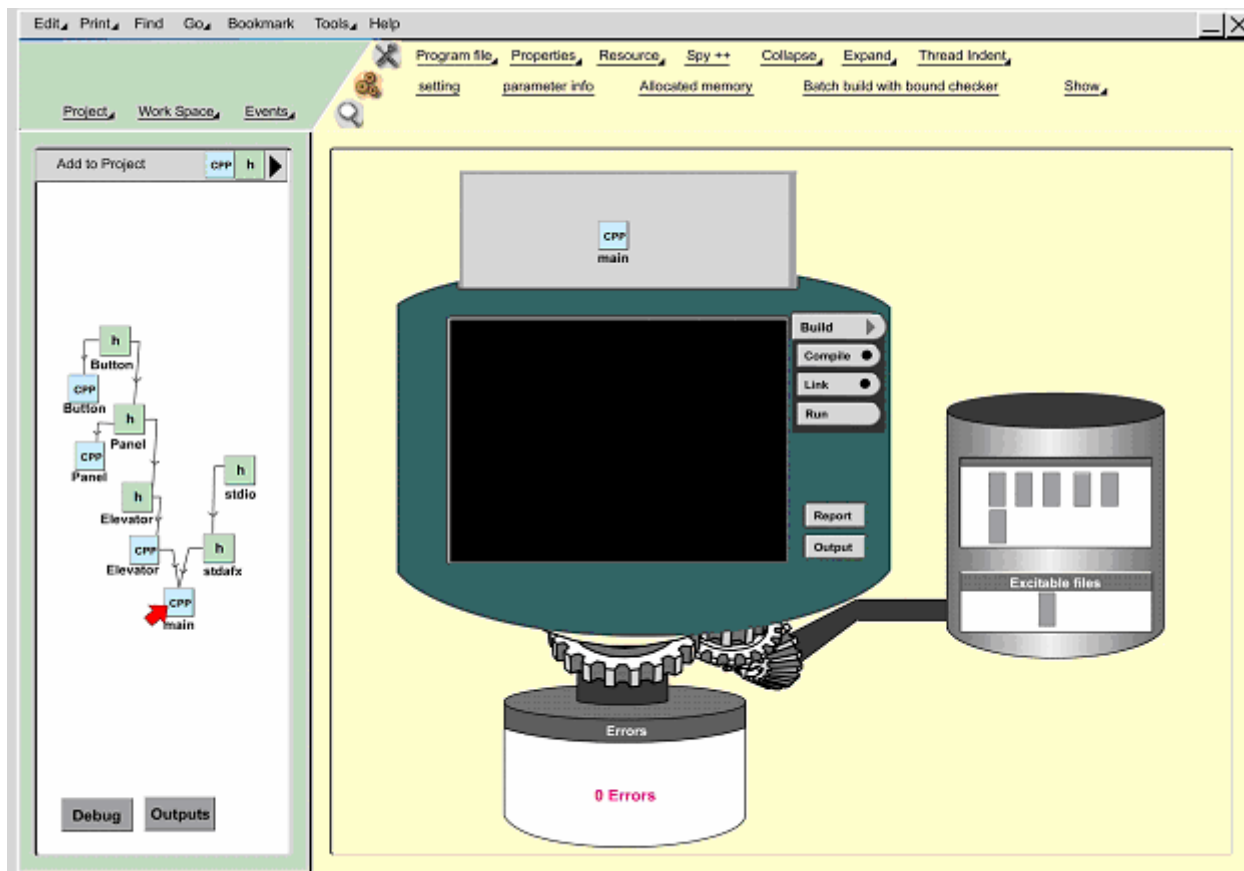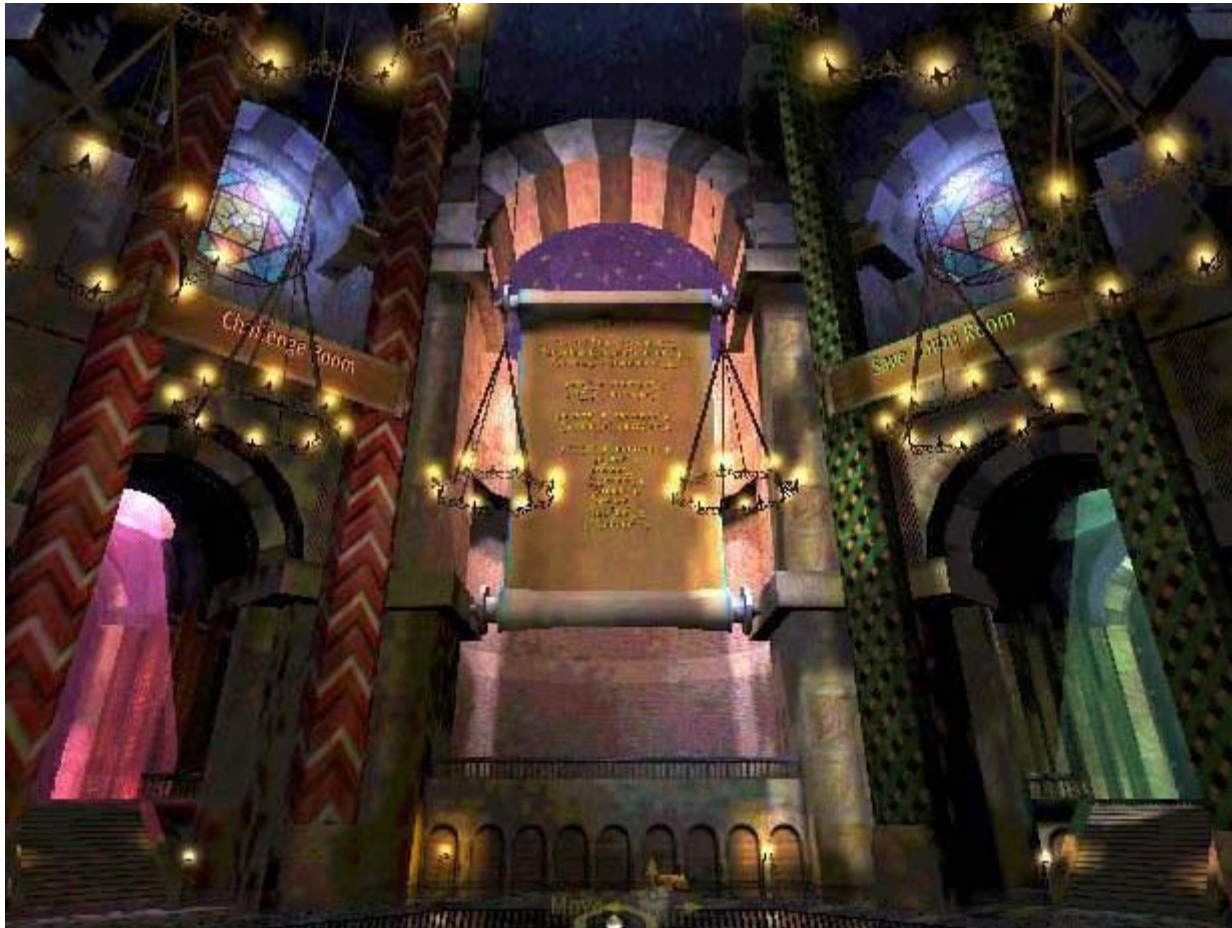
# UI Design Metaphor

- Design metaphor
- Tangible objects
- Impacts
  - Learnability
  - Comprehension
  - Satisfaction
- Metaphors and P-Tab

Source: Black & White game. Courtesy of Strategy Informer.
http://www.strategyinformer.com/screenshots/blackwhite.shtml

Source: Black & White game. Courtesy of Strategy Informer.
http://www.strategyinformer.com/screenshots/blackwhite.shtml

# Outline

- Introduction to Design
- Introduction to HCD
- Introduction to P-Tab
- P-Tab and the Design Process
  - Brainstorming
  - Design Patterns
  - Interactivity
  - Metaphors
- Conclusion

# P-Tab Applications

- Software design
- User-interface design
- User-interface testing
- PMix

# Some Existing Research

- P-Tab vs. other research
- IBM's Rational Rose
- AIRE group and DRG at MIT
  - http://www.ai.mit.edu/projects/aire/projects.shtml
  - http://www.rationale.csail.mit.edu/projects.shtml
- HCII at Carnegie Mellon
  - http://www-2.cs.cmu.edu/~NatProg/
- GUIR at Berkeley
  - http://guir.berkeley.edu/projects/denim/

# floating.numbers

Source: Jewish Museum, Berlin, Germany. http://www.artcom.de/

# Dialog Table

Source: Walker Art Center, Minneapolis, USA. http://dialogtable.com/

# Hmm... Looks Like Fun



Source: Walker Art Center, Minneapolis, USA. http://dialogtable.com/

# How It Works

Source: Walker Art Center, Minneapolis, USA. http://dialogtable.com/

# **Acknowledgements**

- Many images:
  - Rozita Naghshin

- Constructive criticism and ideas:
  - Dr. Ahmed Seffah
  - James Maciukenas
  - Prof. Jason Lewis
  - Rozita Naghshin

# Any Questions?

Jonathan Benn

B.Eng. Software Engineering

M.Sc. Computer Science (in progress)

benn@cs.concordia.ca

Human-Centered Software Engineering Group

Concordia University

http://hci.cs.concordia.ca/www/hcse/

http://www.cs.concordia.ca/~benn/publications/