Interdisciplinary Design

In-Class Exercise

You are a software developer working on a new software project. List all other disciplines/professions/stakeholders that you think you will need to involve as part of your team.

Problem: Interdisciplinary Design

User  MAOCE  Developer

interdisciplinary methods

Communication

values

respect
What’s a Design Pattern?

- A design pattern describes a **successful solution** to a **recurring contextualized design problem** in a **consistent format** that is **readable by non-experts** and networked into a language.

A New Literary Form

- Poem
- Encyclopedia
- Pattern
- Novel
- Newspaper
- Letter

**Trattato I**

Francesco di Giorgio

Renaissance Master Builder

1480

**A Pattern Language**

Towns · Buildings · Construction

Christopher Alexander
Sara Ishikawa · Murray Silverstein
with Max Jacobson · Ingrid Fiksdahl-King
Shlomo Angel

Urban architecture

253 patterns

1977
Patterns of Events and Space

“A building or town is given its character, essentially, by those events that keep on happening there most often.”

• QWAN
• Inhabitants create better environments
• Participatory design!
Patterns Balance Forces

• Patterns solve a problem of conflicting forces

Example: WINDOW PLACE (psychological)

• People naturally drawn towards light
• But like to sit

• Forces can be social, economic, natural, or physical

In many places walls and fences between outdoor spaces are too high; but no boundary at all does injustice to the subdividing of the divisions between the spaces.

Consider, for example, a garden on a hillside. If there were a wall somewhere along the edge between the two, it would cut off a sense of a sense of spaciousness, a plane which unites the two, but does not without breaking down the fact that they are separate spaces. If there is a high hedge along the edge, then the people in the garden have no way of being connected to the street; the people in the street have no way of being connected to the garden. But if there is no barrier at all—then the division between the two is hard to maintain. Furry dogs can wander in and out at will; it is even uncomfortable to sit in the garden, because it is essentially like sitting in the street.

• If all is well, the outdoor areas are largely made up of positive spaces—positive outdoor spaces (106); in some fashion they have linked boundaries between garden and streets, between open and paved areas, between indoor and outdoor spaces, between formal and informal areas, between use and use areas, between use and garden, between outdoor rooms and terraces, between open and paved areas, and to the use areas and gardens—green streets (47), pedestrian walk (106), half-hidden garden (111), hierarchy of open space (144), path shape (253), activity pockets (144), private terrace on the street (144), outdoor room (154), opening off the street (146), gallery surrounding (156), garden containing wall (74). With this pattern, you can help shape natural boundaries take on their proper character, by building walls, low enough to sit upon, and high enough to mark the boundaries.

If you have also marked the places where it makes sense to build some—say steps (49), from door [49]—you can kill two birds with one stone by using the wall as seats which help enclose the outdoor space whenever its positive character is weakest.

CONSTRUCTION

The problem can only be solved by a kind of barrier which functions as a barrier which separates, and as a screen which joins, at the same time.

A low wall or hedge, just at the right height for sitting, is perfect. It creates a barrier which separates. But because it invites people to sit on it—invites them to sit with their legs on one side, then with their legs on top, then to swing round and sit further to the other side, or to sit sidewise—it takes functions as a screen, which makes a positive connection between the two places.

Example: A low wall with the children's sandbox on one side, circulation path on the other; low wall at the front of the garden, connecting the house to the public path; a sitting wall that is a relaxing wall, with steps on one side, where people can sit close to flowers and shrubs (146). Buxton describes a sitting wall he experienced:

Last summer I was lodging for a little while in a cottage in the country, and in front of my low window there was, just, some beds of flowers, then a row of groundnut and cabbage beds, and then a low wall about three feet above the ground, covered with sweet peas. Outside, a cornfield, with its green corn glowing in the sun, and a field path through it, just past the garden gate. From my window I could see every pestle of the village passed that way with basket in one hand (for market), or with shovels and spades in the other. When I was inclined for society, I could lean over my window, and call the neighbours when I was invited for dinner, I could humbly press my face against the window pane and watch them. When I was inclined for solitude, I could turn my wall, backwash and forward. The next is less to have to live in a Christian country, and a thing which you can't well live in without embarking yourself like a wild bear, and look out of your window in the morning without expecting to see somebody impartial upon it in the street. (John Ruskin, The Two Paths, New York: E. G. & F. R. Ed., 1873, p. 104.)

The problem may be stated as:

Surround any natural outdoor area, and make minor boundaries between outdoor areas with low walls, about 16 inches high, and wide enough to sit on, at least 24 inches wide.
Designing with Patterns

Design is unfolding
Piecemeal Growth

OOPSLA ’87:
The Smalltalk Experiment

- Kent Beck (Apple), Ward Cunningham (Tektronix)
- Problem: E-R does not work for OOP
- End-user programming: Alexander
- Guiding designer
- 5 Smalltalk window design patterns (GUI!)
  - Example: COLLECT LOW-LEVEL PROTOCOL
- Successful experiment with non-Smalltalk-programmers
- Started software design patterns

The Gang Of Four Book

- Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides: Design Patterns (1995)
- 23 patterns for software engineering
  - Creational, structural, behavioral
- Famous: Singleton, AbstractFactory, Adapter, Façade
- Each pattern ~10 book pages of text

(Notation Cheat Sheet: See Gamma book, back cover)
AbstractFactory Pattern:
WidgetFactory Example

```
CreateScrollBar()
CreateWindow()
```

```
MotifWidgetFactory
CreateScrollBar()
CreateWindow()
```
```
PMWidgetFactory
CreateScrollBar()
CreateWindow()
```
```
PMWindow
MotifWindow
```
```
PMScrollBar
MotifScrollBar
```

AbstractFactory Pattern:
The General Solution

```
CreateProductA()
CreateProductB()
```

```
AbstractFactory
CreateProductA()
CreateProductB()
```
```
ConcreteFactory1
CreateProductA()
CreateProductB()
```
```
ConcreteFactory2
CreateProductA()
CreateProductB()
```
```
AbstractProductA
ProductA2
ProductA1
```
```
AbstractProductB
ProductB2
ProductB1
```

GoF Book: Evaluation

- Highly successful among developers
  - Great for expert communication
  - Instead of reading code
- Not complete language
  - Workarounds instead of good design!
- Not readable by non-developers
  - 50% implementation details
  - Not empowering users
  - Language, intent, audience, values?
- The “Trial”
  - OOPSLA 1999

PLoP Conferences

- PLoP Conference Series
  - Special format: non-academic, shepherding, proceedings
  - Strangely omits HCI area for a long time
  - PLoP 1998: “Have we exhausted this [HCI] field?”
- The OOPSLA’96 keynote by Alexander
The OOPSLA’96 keynote by Alexander

- Annual ACM Conference on Object-Oriented Programming, Systems, Languages, and Applications
- Had been the location of patterns “birth” 9 years before
- Alexander was invited to comment on the efforts of the SW community in creating patterns, such as the GoF book and others
- His remarks were quite devastating, but also very helpful to understand his ideas…

The Origins of Pattern Theory
the Future of the Theory,
and The Generation of a Living World

Transcript available at
http://www.patternlanguage.com/archive/ieee/ieeeetext.htm