User Centered Design Process
Chunlun Lee, Illinois Institute of Technology
December 2005
Design Process

Abstract

Observation Analysis
Insight Matrix
Activity Diagram

Brainstorm
Concept Sketch
Concept Matrix
Decision Map

Know

2 Analysis
outcome: Insight

Observation
outcome: Observation Point

Observing Users
Trend Study
Archetype Study

Make

3 Synthesis
outcome: Concept

Prototype
outcome: Design Solution

Configuration Prototype
Behavioral Prototype
Human Factors
Modeling

Real

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“Well, this is certainly a memorable year; 2005 is important because it is the year that the business world stopped dissing design.”

-Bruce Nussbaum, Business Week
Observation

Market Study (Top Down)
- Archetype Study
  - Culture, Society, Trend
  - Material, Color, Form, Tech
  - Precursor

User Observation (Bottom Up)
- Focused Group, Environment
  - Competitive Analysis
  - Brand, Performance, Price
  - Product Attributes Matrix
  - Interview
  - Survey
  - Photo Analysis
  - Video Analysis
### Attributes Matrix

**Element > Attributes > Pattern**

**Example: Electronic Toys**

<table>
<thead>
<tr>
<th>Product</th>
<th>Attributes</th>
<th>Pattern</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fishnet</td>
<td>Brand, Performance, Price</td>
<td>Attributes</td>
<td>Electronic Toys</td>
</tr>
</tbody>
</table>

**Market Trend Study (Top Down)**

- **Archetype Study**
- **Observation**

**Participants**

1. Market Trend Study (Top Down)
2. Archetype Study
3. Observation

**Observation**

- **Design Methods**
- **Chunlun Lee**
- **Dec. 2005 Institute of Design, IIT. Chicago**
Observation

Market Trend Study (Top Down)

Competition Analysis

Observation

Competitive Landscape

Form > Category > Generic > Budget
Competitive relationship on different levels.
Example: TiVo Competitive Landscape

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Observation

User Interview

Open-ended Questions > Focused Interviewee > User sorting > Focused Group
Photo Analysis

Study the interaction between user and product or environment.
Example: kids observation

Focused group, environment

User observation (Bottom Up)

Observation

Photo analysis

Study the interaction between user and product or environment. Example: kids observation

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Observation

User Observation (Bottom Up)

Focused Group, Environment

Video Analysis

Example: shop along for consumer behavior study.
Activity Diagram

Activity > Diagram > Analysis
The diagram presents the interaction process between people and product. It is usually a loop format. Example, shower media player.
Design Analysis

Example, crime prevention process analysis
Activity Diagram

Example, shopping process

**Anticipation**  Depending on types of customers, they might have different desire to buy consumer electronics by ad., friends and their own findings.

**Entry**  If you make a decision to go the store, you would pass a retailer exterior design, outside sinage and holistic atmosphere before heading to products.

**Experience**  Manily customers engage this to find the product they are interested in and try it through sinage, staff’s help and some deivce or service.

**Exit**  Once customers finish the shopping, they will either purchase the products or leave the store. This stage can convey customers last impression to generate next visiting.

**Extension**  After buying the product, customers need help for educating how to use and fixing some problems. Thses can make them re-visit the store and convey intimacy and trust concept.
Experience Diagram

Attraction > Engagement > Extension
Different user experience in different phases
## Design Analysis

AEIOU- Activity, Environment, Interaction, Object, User  
POEMS- People, Objects, Environment, Message & Media, Services

Example, urban one passenger vehicle

<table>
<thead>
<tr>
<th>Activity</th>
<th>Environment</th>
<th>Interaction</th>
<th>Object</th>
<th>User</th>
</tr>
</thead>
</table>
| **Delivery** | **Delivery Locations:** Post Of\tice, Book store, Restaurant, home Unfamiliar Geography | Getting to the destination on time, Loading and unloading, securing cargo, Way finding | **Storage:** Basket, Thermal box  
**Fixing:** Tape, Rope, Carton  
**Way finding:** GPS navigator  
**Communication:** Phone | **Delivery Service Providers:** Letter carrier, FedEX guy, Newsboy, Restaurant deliveryman |
| **Sightseeing** | **Traveler's Interests:** Museums, Historical places, Parks Subsidiary environment: Dinner restaurant, Cruise, Parking lot, Hotel, Airport Unfamiliar Geography | Sightseeing, Parking, Buying tickets, Buying souvenir, Way finding, Taking pictures, Translating | **Capturing sight:** Video/Still camera,  
**Entertainment:** Audio system, **Sightseeing:** Windows, Sunroof, **Way Finding:** GPS navigator, **Translating:** Dictionary | **Travelers:** Foreign travelers, Domestic travelers, Weekend travelers |
| **Shopping** | **Access environment:** Speed bump, Lifting gate, Barricade, Elevatory facilities (Elevator, Ramp) Parking environment: Parking meter, Bike rack, Ticketing booth | Ticketing and Parking, Finding vehicle in a parking lot, Loading and Unloading items, Organizing items, Fastening items | **Storage:** Trunk, Shopping bags  
**Carring:** Shopping carts, Plastic baskets | **Frequent Shoppers:** Housewives, Single person, Old people |
| **Commuting** | **Traffic environment:** Regular drive course, Rush hour traffics, Pedestrians Behavioral environment: News kiosk, Coffee bar, | Daily Parking, Short time Parking, Phone calling, Drive thru, | **Drinking Beverage:** Cups, Cupholder, Thermal product  
**Communication:** Phones | **Urban Residents:** Office workers, Students |
| **Sporting** | **Activity environment:** Open space (Playground, Lakeside, Park, Offroad), Locker room Assistant environment: Auto repair, Beverage shop | Short time Parking, Drinking beverage, Wiping perspiration, Quick self repairing | **Sports objects:** Stop watch, Goggle, Audio device, Cap, Sportswear  
**Drinking Beverage:** Bottles, Thermal product  
**Repairing:** Instant repairing tool kit, Manual book | **Urban Residents:** Athletes, Amateur sportsmen, Dieting women, Students in school sports activity. |
Design Analysis

Insight Matrix

Elements > Relationships (Similarity) > Sorting > Clustering
Excel Tool
Find out the relationship of elements
Example, crime prevention

crime mapping
crime alert
posting of police sketches
news dissemination
police/resident communications
community outreach programs
education programs
in house programs
law enforcement
imprisonment
parole requirements
buddy system
self-defense
weapons
racial profiling
vigilantes
politicians
car security systems
hide locks
booby trap
guard dogs
home lighting
home security systems
neighborhood watch
families

Key
0 1 2 3

Crime Publication/Announcement/Awareness
Crime Prevention Education
Penal System
Society System
Self Defense
Violent Crime Prevention
Extremism
Property Protection
Personal Crime Prevention
Home Protection
Community Crime Prevention

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Design Analysis

Insight Matrix

Elements > Relationships (Similarity) > Sorting > Clustering
Hierarchical relationship of elements

Externalized

Punishment
Penal System
- in house programs
- imprisonment
- parole requirements
- law enforcement

Awareness
Crime Publication/Announcements
- crime mapping
- posting of police sketches
- crime alert
- news dissemination

Crime Prevention Education
- police/resident communications
- community outreach programs

Internalized

Extremism
- racial profiling
- vigilantes
- weapons

Self Defense
- buddy system
- self-defense
- bike locks
- car security systems
- families
- neighborhood watch

Home Protection
- guard dogs
- booby trap
- home lighting
- home security systems

Property Protection
- bike locks
- car security systems

Community Crime Prevention
- crime mapping
- posting of police sketches

Voilent Crime Prevention
- in house programs
- imprisonment
- parole requirements
- law enforcement

Property Crime Prevention
- news dissemination
- police/resident communications
- community outreach programs

Design Analysis

Insight Matrix

Elements > Relationships (Similarity) > Sorting > Clustering
Hierarchical relationship of elements
## Concept Matrix

User, Event, Place, Time, Activity ... > Concepts > Organization > Evaluation

Concept matrix is generated by activity diagram, flow chart, elements or attributes of objects. It helps create concept or concept organization.

Example, urban one passenger vehicle

<table>
<thead>
<tr>
<th>parking</th>
<th>storage</th>
<th>narrow alley</th>
<th>looking around</th>
<th>driving through heavy traffic</th>
<th>human power</th>
<th>safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>delivery</td>
<td>bi-directionally rotating wheels, tall body, minimum bottom area</td>
<td>half width truck (Trulf)</td>
<td>bidirectional driving, steering auto lock (bidirectional bike)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>sightseeing</td>
<td>foldability from aside, hammock seat</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>shopping</td>
<td>bicycle changing to a cart</td>
<td>large storage motorized cart, easy dis/assembly (cart rider)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>commuting</td>
<td>vehicle standing for parking, 90degree steering (side crawl)</td>
<td></td>
<td></td>
<td>transformable tyre positions(transformer)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sporting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>arm movement lying prone</td>
<td></td>
</tr>
</tbody>
</table>
Design Synthesis

Concept Matrix

User, Event, Place, Time, Activity ... > Concepts > Organization > Evaluation
Concept matrix is generated by activity diagram, flow chart, elements or attributes of objects. It helps create concept or concept organization.

Example, shopping experiences for different consumers.

The matrix below shows how the concepts in this paper map to shopping modes and the customer journey. Down the left side of the matrix are our four shopping modes, peacocks, ostriches, eagles and parrots. Across the top are the customer journey phases.
Brain Storming

Problem Statement > “Was of”s List > Concept > Visualization > Concept Sorting
Unlimited Relevant Concept
No debate
Variety of Team Members
Concept Visualization
Concept Organization
Client Participation
Design Synthesis

Brain Storm

Concept Generation

Concept Sketch

Design Synthesis

Concept Sketch

DEWBOP - SHOWER MEDIA

BIG MAIN BUTTON

SCREEN

SUCTION LEVER

SIMPPLIFIED INTERFACE

WATERPROOF SPEAKERS

EASILY TO REPLACE & REPOSITION

LOCKING SUCTION CUPS

SIMILAR TO BIG PANE GLASS CARRIERS;

STRONG ENOUGH & EASY TO CUSTOMIZE.

LOCKING LEVER

MULTIMEDIA CARD, MP3, WMA, RADIO

PRODUCT FORM TRIPLET

SEASHELL

BIOLOGY ANALOGY

ERG. FOR BATHROOM WET ENVIRONMENT

POSITION ALTERNATIVELY RETAINS

USE YOUR ELBOW

FOR YOUR SOAPY HAND

BUMPED KNOB FOR VOLUME & MENU CONTROL

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Concept Sketch

Concept sketch not only presents product, but also service, flow chart and experience of use. Example, physicalized CNET.com
## Decision Map

Concepts > Criteria > Weighing > Scoring > Evaluation > Decision

Evaluate according to criteria, feasibility and importance (weighing)

### Design Synthesis

- **Brain Storm**
- **Concept Generation**
- **Concept Sketch**
- **Design Synthesis**

### Table

<table>
<thead>
<tr>
<th>Weight</th>
<th>Superman</th>
<th>Type-Z</th>
<th>Urban Kayak</th>
<th>Scissors Car</th>
<th>Hammock Seat</th>
<th>Cart Rider</th>
<th>Segcart</th>
<th>Tall Guy</th>
<th>Truf</th>
<th>DBike</th>
<th>Side Crawl</th>
<th>Transformer</th>
<th>Alien</th>
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<tbody>
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<td>6</td>
<td>15</td>
<td>9</td>
<td>12</td>
<td>15</td>
</tr>
</tbody>
</table>

| Total value | 119 | 118 | 121 | 117 | 122 | 100 | 126 | 129 | 152 | 140 | 130 | 129 | 125 | 136 |
| doability | 3   | 9   | 12  | 12  | 3   | 3   | 9   | 12  | 12  | 15  | 3   | 6   | 3   | 3   |
| **Total value + doability** | 128 | 130 | 133 | 120 | 125 | 109 | 138 | 141 | 164 | 155 | 133 | 135 | 128 | 139 |

### downtown-midtown

- **Scoring**
- **Evaluation**
- **Decision**

Evaluate according to criteria, feasibility and importance (weighing)

### Performance-utility

| Total value | 117 | 122 | 100 | 126 | 129 | 152 | 140 | 130 | 129 | 125 | 136 |
| doability | 3   | 3   | 9   | 12  | 12  | 15  | 3   | 6   | 3   | 3   | 3   |

### Total value

- **Scoring**
- **Evaluation**
- **Decision**

Evaluate according to criteria, feasibility and importance (weighing)

### Doability

- **Scoring**
- **Evaluation**
- **Decision**

Evaluate according to criteria, feasibility and importance (weighing)
Prototype

Design Solution

Prototype

Appearance Model

Behavioral Prototype

Configuration Prototype

Human Factors

Physical Human Factor (ergonomic)

Cognitive Human Factor

Social Human Factor

Emotional Human Factor

Culture Human Factor

Human Factors

Design Solution
Configuration Prototype

Simulate the final product configuration, discover problems and improve ahead of time to reduce cost.
Prototype

Behavioral Prototype

Simulate the final solution and test it with user, inspire improvement.

Form and material should not affect user at the beginning prototype.