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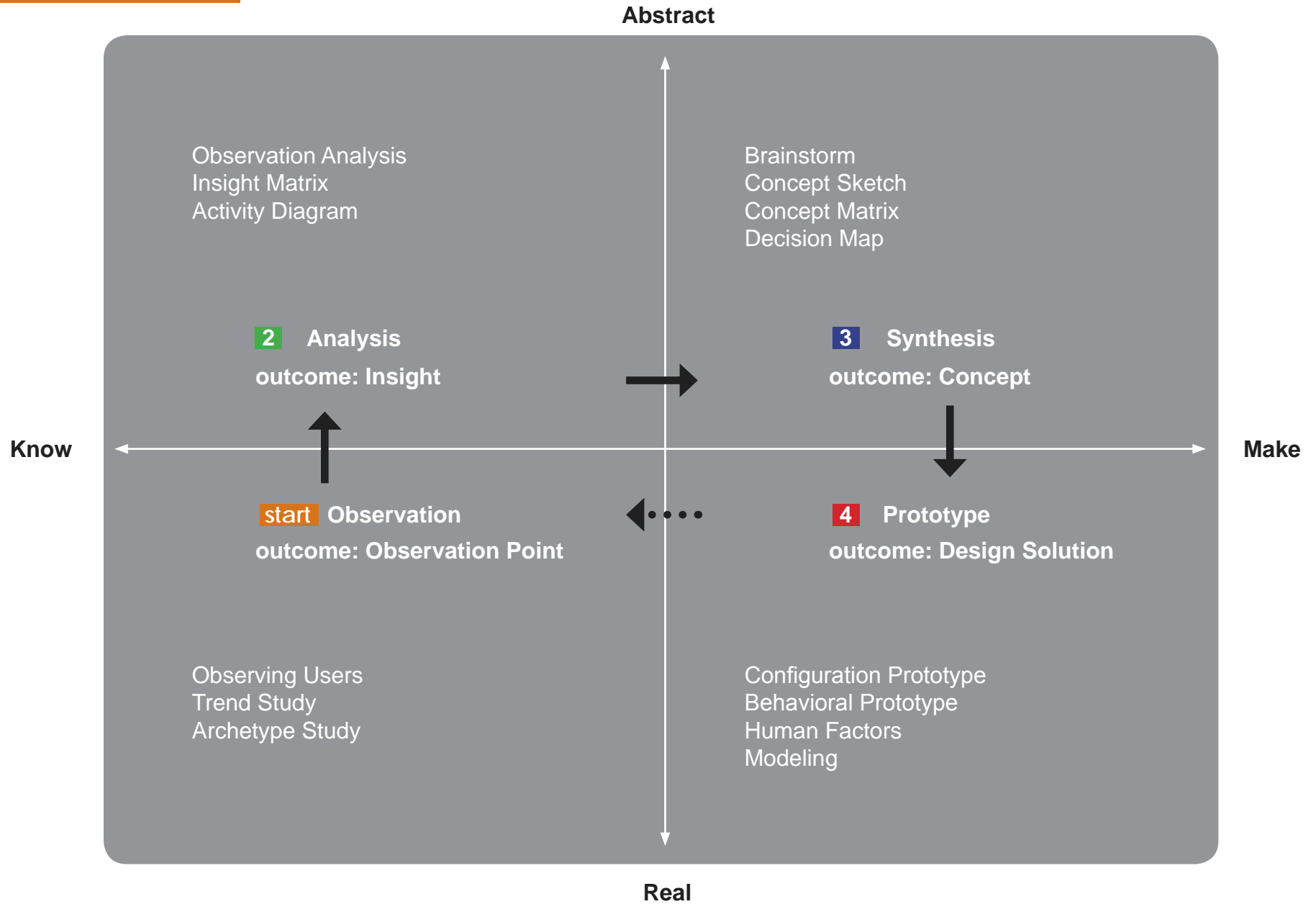
Chunlun Lee, Illinois Institute of Technology
December 2005

Design Process
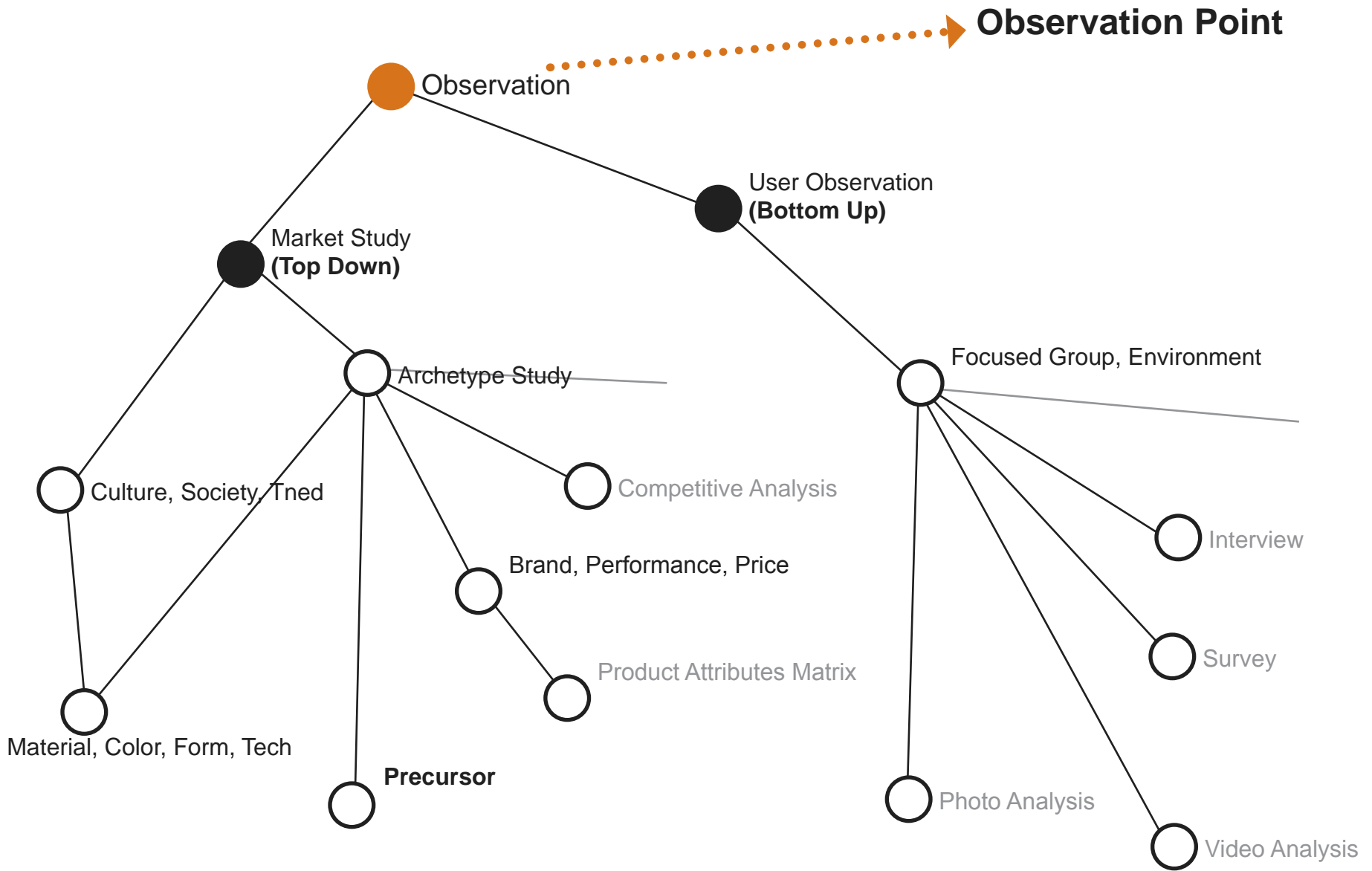
Abstract

Observation Analysis
Insight Matrix
Activity Diagram

Brainstorm
Concept Sketch
Concept Matrix
Decision Map

2   **Analysis**

outcome: Insight

3   **Synthesis**

outcome: Concept

Know

Make

start   **Observation**

outcome: Observation Point

4   **Prototype**

outcome: Design Solution

Observing Users
Trend Study
Archetype Study

Configuration Prototype
Behavioral Prototype
Human Factors
Modeling

Real

Design Process

Abstract

Trend for Design Research

Know　　　　　　　　　　　　　　　　　　　　　　　**Make**

2　Analysis　　　　　　　　　Synthesis　3

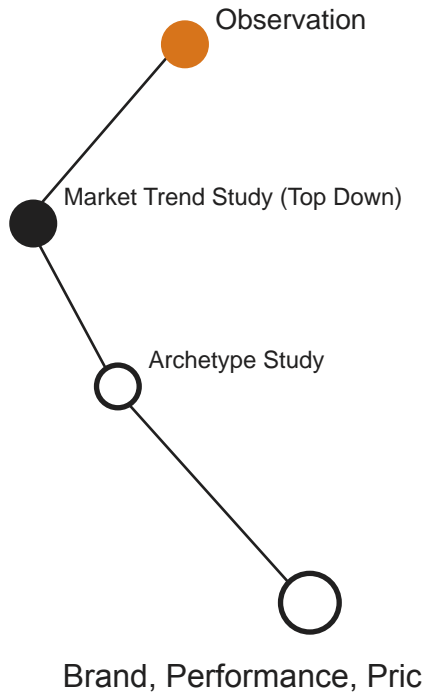start　Observation　　　　　Prototype　4

Traditional Design Firms

"Well, this is certainly a memorable year; 2005 is important because it is the year that the business world stopped dissing design."
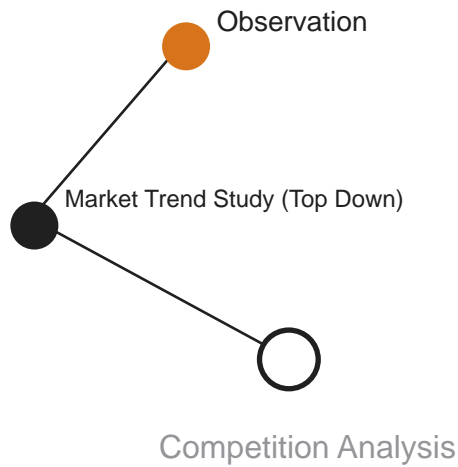
-Bruce Nussbaum, Business Week

Real

Observation Point

Observation

User Observation
(Bottom Up)

Market Study
(Top Down)

Archetype Study

Focused Group, Environment

Culture, Society, Tned

Competitive Analysis

Interview

Brand, Performance, Price

Product Attributes Matrix

Survey

Material, Color, Form, Tech

Precursor

Photo Analysis

Video Analysis

Observation

Market Trend Study (Top Down)

Archetype Study

Brand, Performance, Pric

Attributes Matrix

Element > Attributes > Pattern >
Example: Electronic Toys

	Mattel Brand	product (series)	Picture	Description	price ($)	age		gender	educational	mobile	group play	family play	skill	pretend	collectible	extendable	Unit Price	Digital Media
1																		
2	Fisher-Price	Read With Me		read with the interactive DVD about classical text books for kids	25	3	8	both	[]							[]	10	[]
3		Power Touch		Learn color, vocabulary, music from electronic book	35	3	8		[]									
4		Power Touch Baby		Learn color, vocabulary, music from electronic book	35	0	3		[]									
5		InteracTV		DVD based learning system	40	3	8		[]							[]	15	[]
6		Smart Shopper		Learn number and vocabulary with shopping cart	50	2	4	girl	[]									
7		Star Station		Let kids see themselves on TV screen in real-time	60	3	7								[]		[]	10, 20	[]
8		Shack 'n Go		shake to charge energy for cars, voice report car racing game	60	3	6	boy			[]					[]	9	
9		Pixter		video, picture, interactive games	90	4	8		[]	[]						[]	15-20	[]
10																		
11	Hasbro	Littlest Pet Shop: Get Better Center			20	4+		girl						[]				
12		Star Wars Darth Vader Voice Changer Helmet			30	5	12	boy						[]				
13		Star Wars Build Your Own Lightsaber			35	6	11	boy						[]				
14		VideoNow		PVD player	75	6	11			[]								[]
15		VcamNow		low quality video recorder	85	6	12			[]								[]
16		iDog		speaker		8	15			[]								[]
17																		
18	Vtech	V. Smile Joystick			15	3	7											
19																		
20	Zizzle	IZ Blue			30	5	12											[]
21																		
22	Kids Station	Batman 1.3MPX Digital Camera			60	5	10	boy		[]								[]
23		Batman 35mm Camera			20	6	10	boy		[]								
24		Batman CD player with remote			35	8	12	boy		[]								[]
25		Batman Voice Recognition Security Safe			20	6	10	boy										
26		Sing Along Microphone			11	4	7							[]				
27		Little Tikes Chit Chat Phones		kid's walkie talkie	22	3	6			[]								
28																		
29	Leapfrog	Multimedia Learning System			60	4	8		[]	[]						[]	25	[]
30		Fridge Phonics Magnetic Letter Set			20	0	4		[]									
31		L-Max			100	4	7											
32		FLY pentop computer			100	8	13		[]									

1 Observation

Observation

Market Trend Study (Top Down)

Competition Analysis

Competitive Landscape

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

Form

TiVo DVR

DVR from other brands:

- Sony

- ReplayTV

- Toshiba

- DirecTV

- Pioneer

Category

Mobile DVR
- Archos
Record your TV programs and watch it on the go.

- Sling Box
Sling Box let you turn your home TV signal into digital data and transmit to your high-internet-collected PC
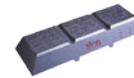
- Orb
A freeware lets your pocket PC receive TV signal and play other media.

TV cell phone
- Moto V710

home wireless TV
- Sony LF-X1

Generic

Personal Media Device
- Apple video iPod
Video podcast let users download video programs and watch on the go.

- Sony PSP
UMD card allow you to watch movie on PSP.

- iRiver U10
Hard drive based high capacity portable media device.

- Panasonic Portable DVD

Budget

Camcorder

Plasma TV

Projector

Video Game

VHS-DVD converter
- LiteOn VHS DVD converter.

User Interview

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

Observation

User observation(Bottom Up)

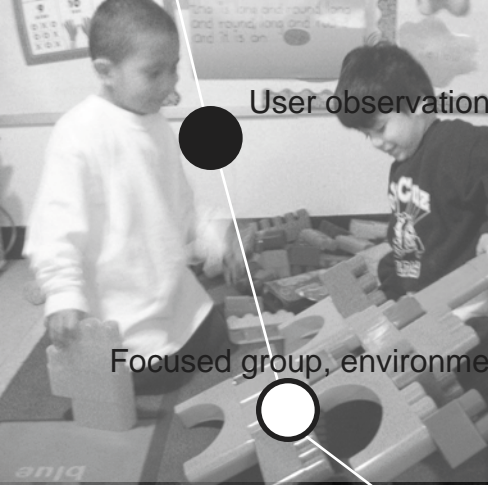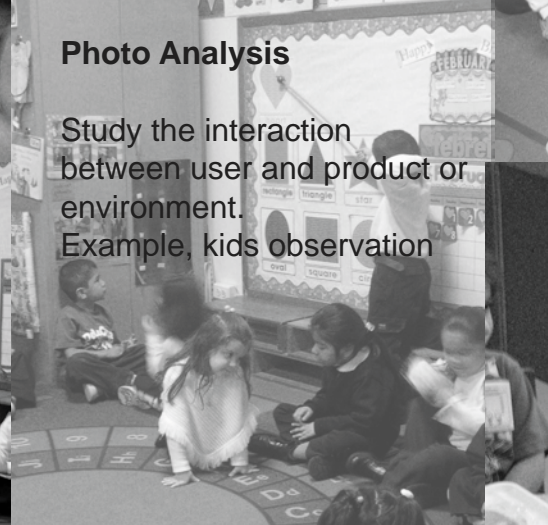Focused Group, Environment

User Interview

Observation

1
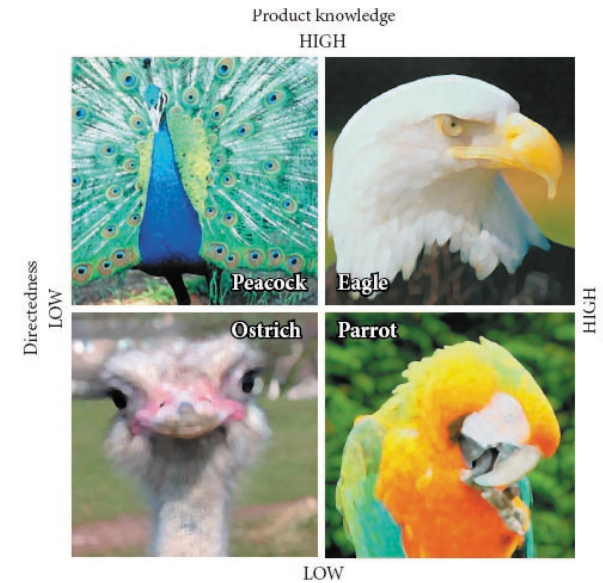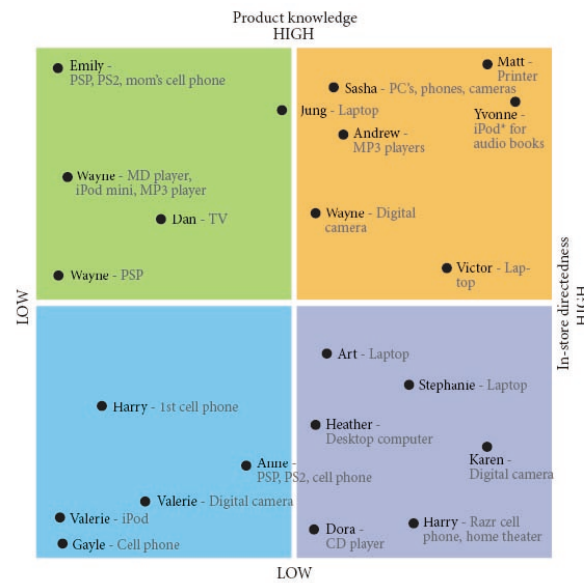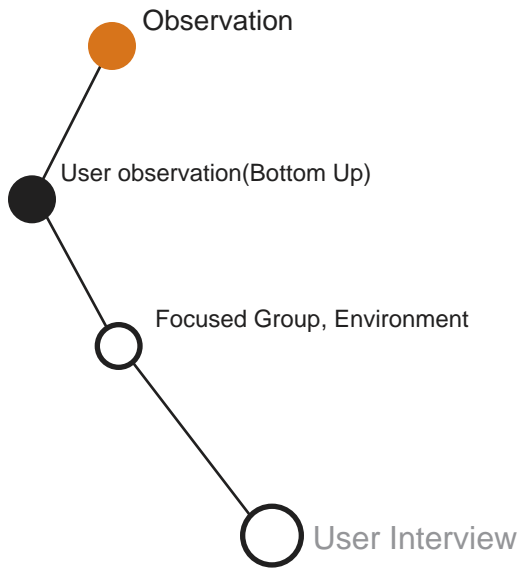
Observation

User observation **(Bottom Up)**

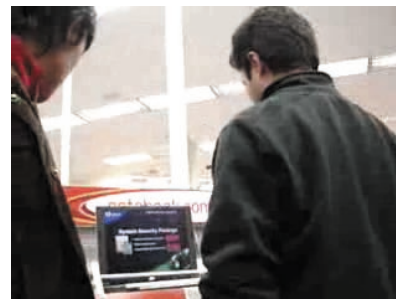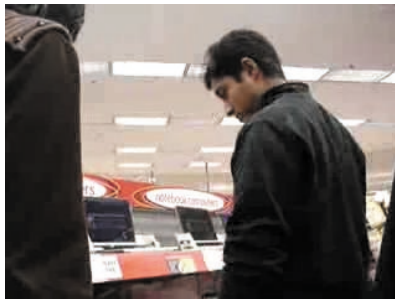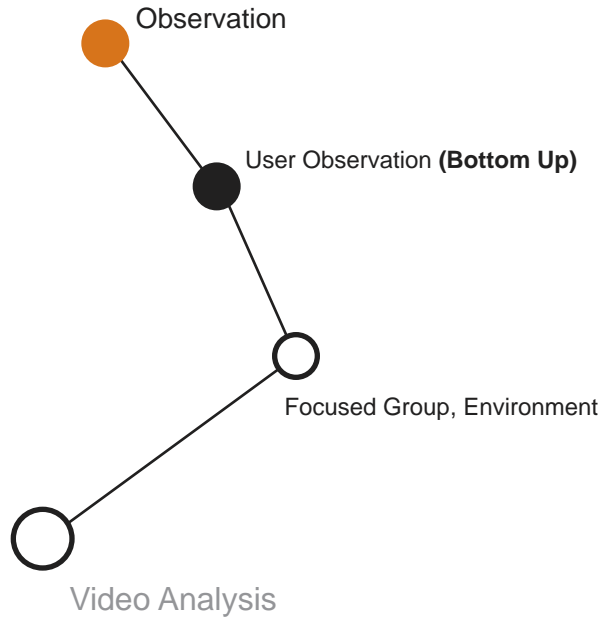Focused group, environment

Photo analysis

Photo Analysis

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

Observation

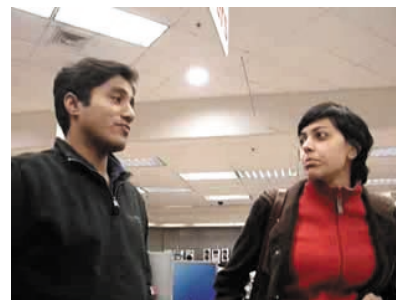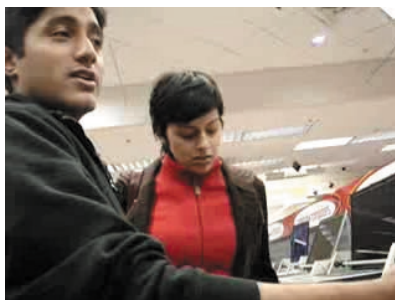User Observation **(Bottom Up)**

Focused Group, Environment

Video Analysis

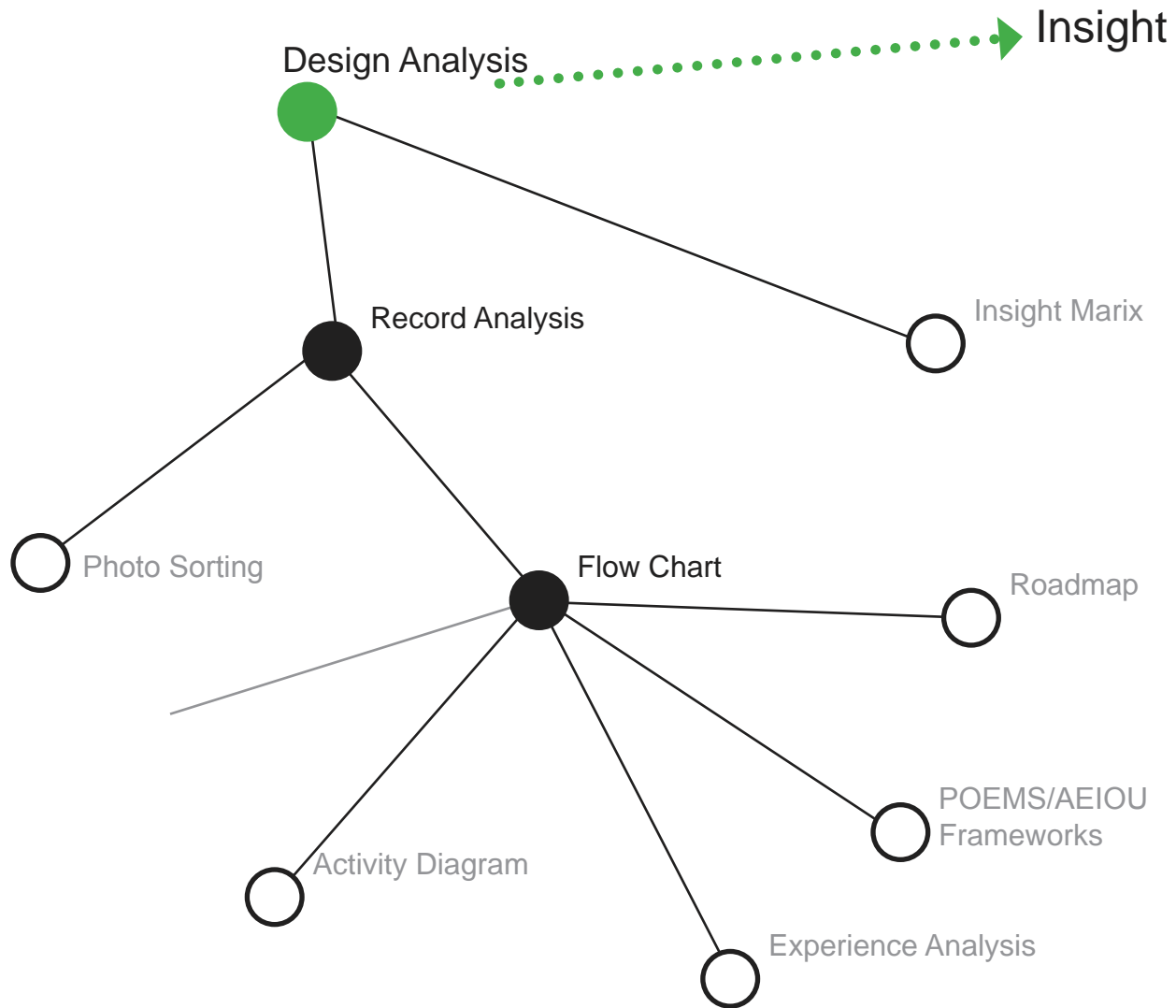**Video Analysis**

Example: shop along for consumer behavior study.

Design Analysis

Design Analysis ·············▶ Insight

Design Analysis

Record Analysis

Insight Marix

Photo Sorting

Flow Chart

Roadmap

POEMS/AEIOU
Frameworks

Activity Diagram

Experience Analysis

Design Analysis

Record Analysis

Photo Sorting

Photo Sorting

Design Analysis

Design Analysis

Record Analysis
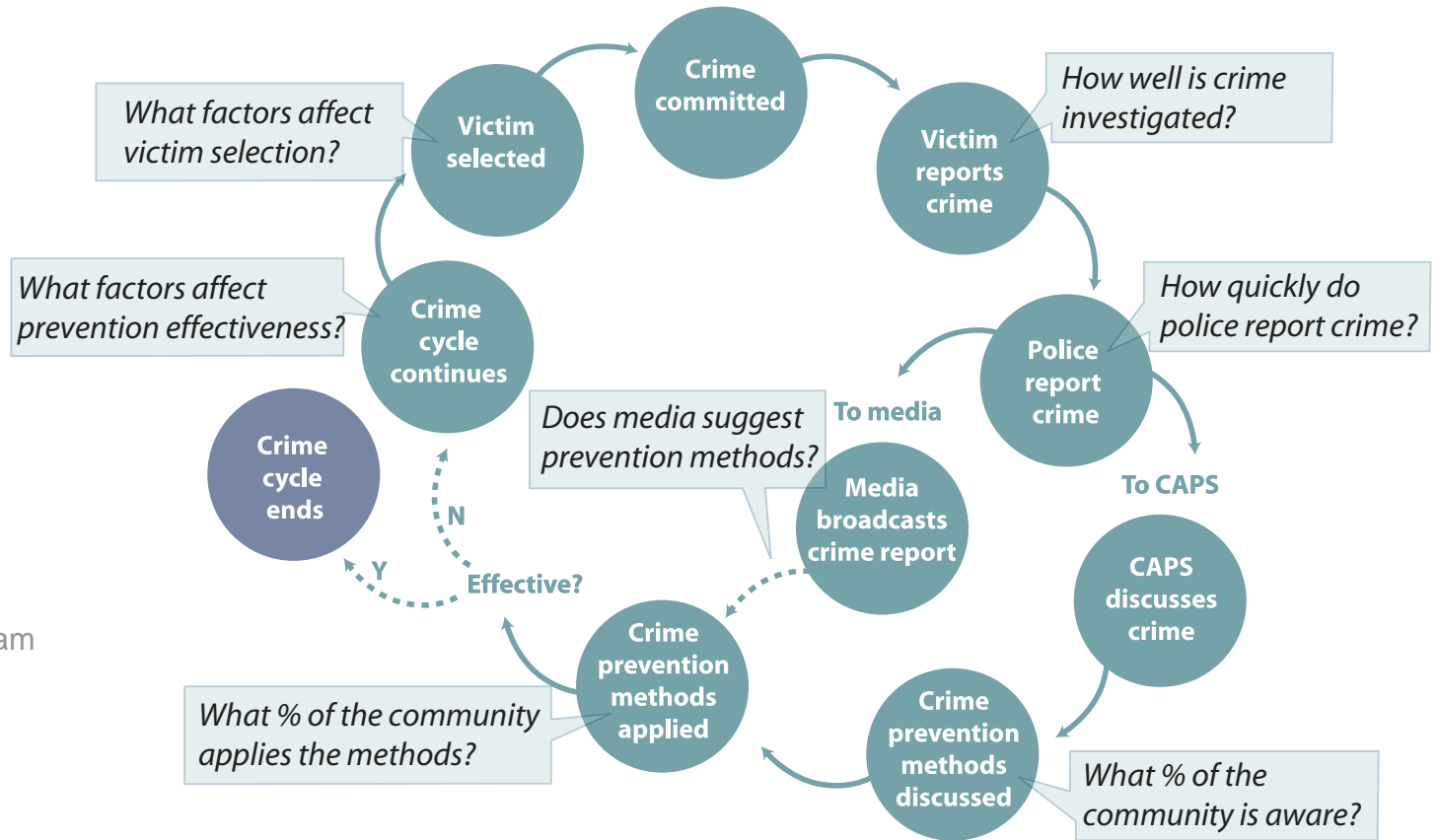
Flow Chart
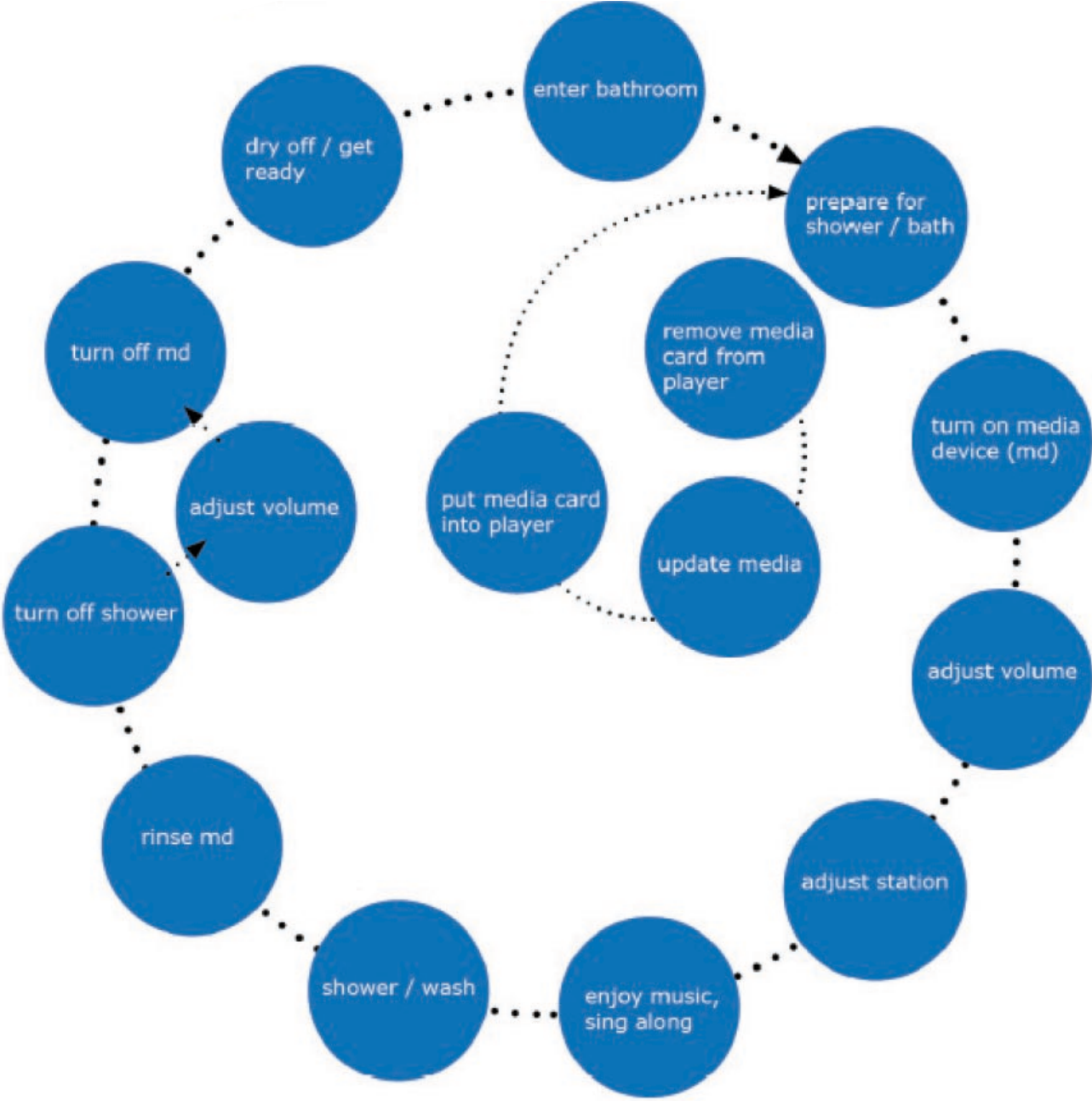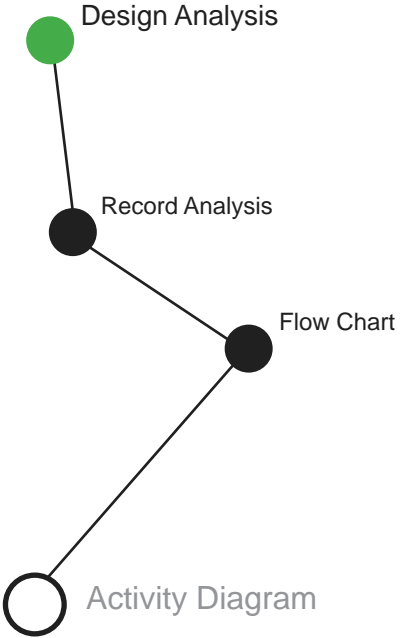
Activity Diagram

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.

enter bathroom

dry off / get ready

prepare for shower / bath

turn off md

remove media card from player

turn on media device (md)

adjust volume

put media card into player

update media

turn off shower

adjust volume

rinse md

adjust station

shower / wash

enjoy music, sing along

Design Analysis

Design Analysis

Record Design

Flow Chart

Activity Diagram

Crime committed

Victim selected

What factors affect victim selection?

How well is crime investigated?

Victim reports crime

How quickly do police report crime?

Police report crime

Crime cycle continues

What factors affect prevention effectiveness?

Crime cycle ends

Does media suggest prevention methods?

To media

To CAPS

Media broadcasts crime report

CAPS discusses crime

N

Y

Effective?

Crime prevention methods applied

Crime prevention methods discussed

What % of the community applies the methods?

What % of the community is aware?

Activity Diagram

Example, crime prevention process analysis

Design Analysis

Design Analysis

Record Design

Flow Chart

Activity Diagram

Activity Diagram

Example, shopping process

Anticipation

Want/Need product purchase

Entry

Go to a store

Experience

Walk through aisles, browse products

See if desired/ needed product is good

Exit

Pay for purchase/ Leave the store

Use customer service/classes

Use the products

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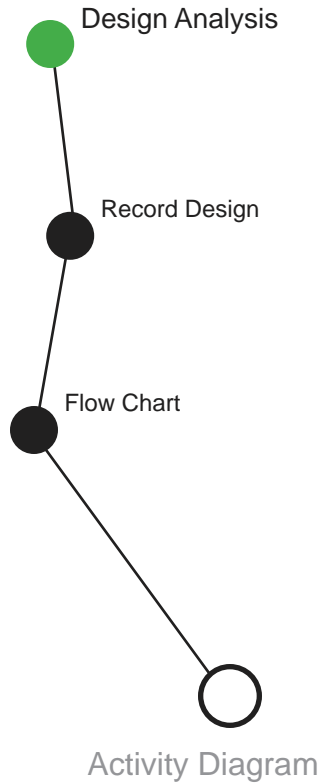
Anticipation *Depending on types of customers, they might have different desire to buy consumer electronics by ad., friends and their own findings.*

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.*
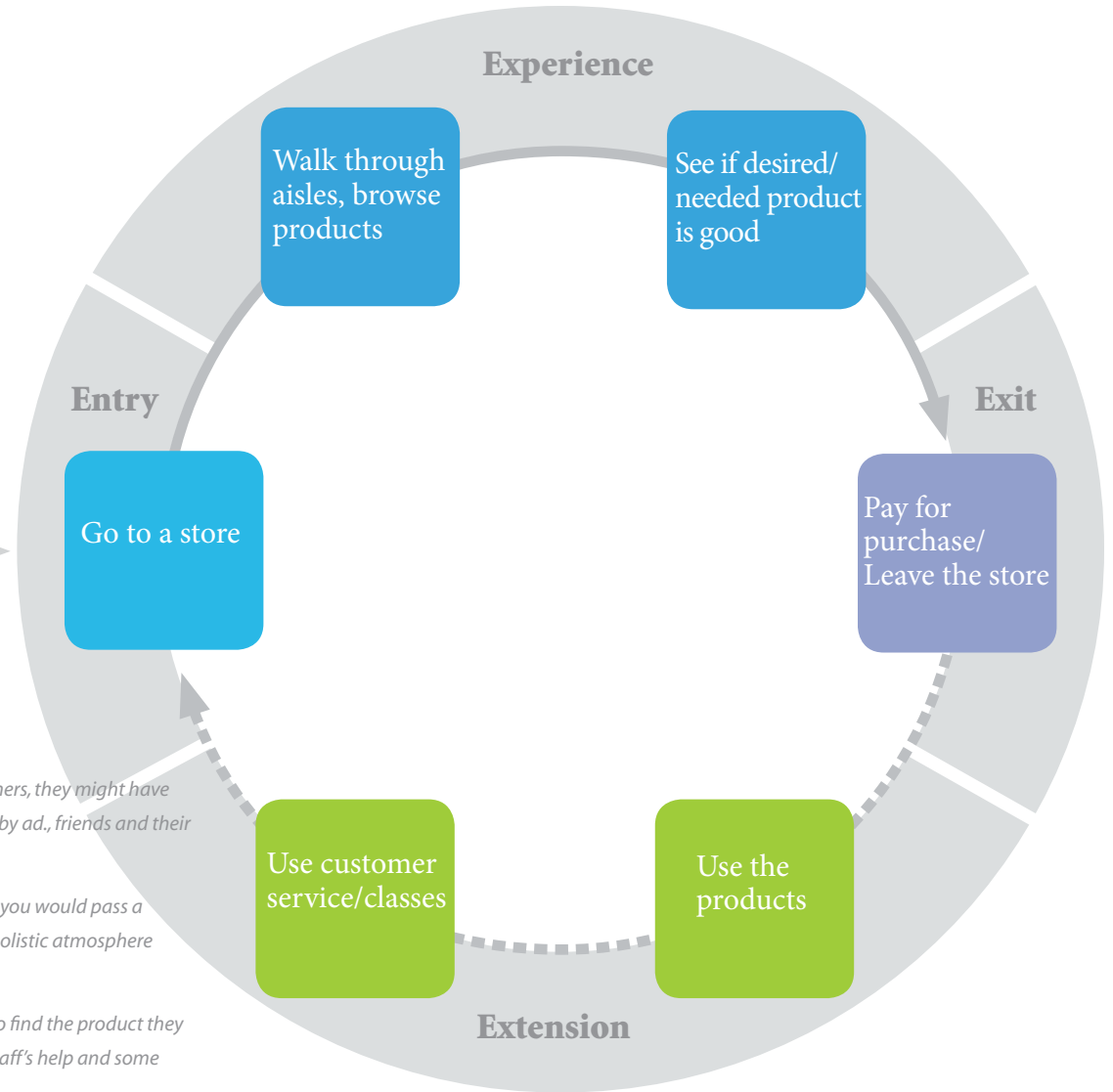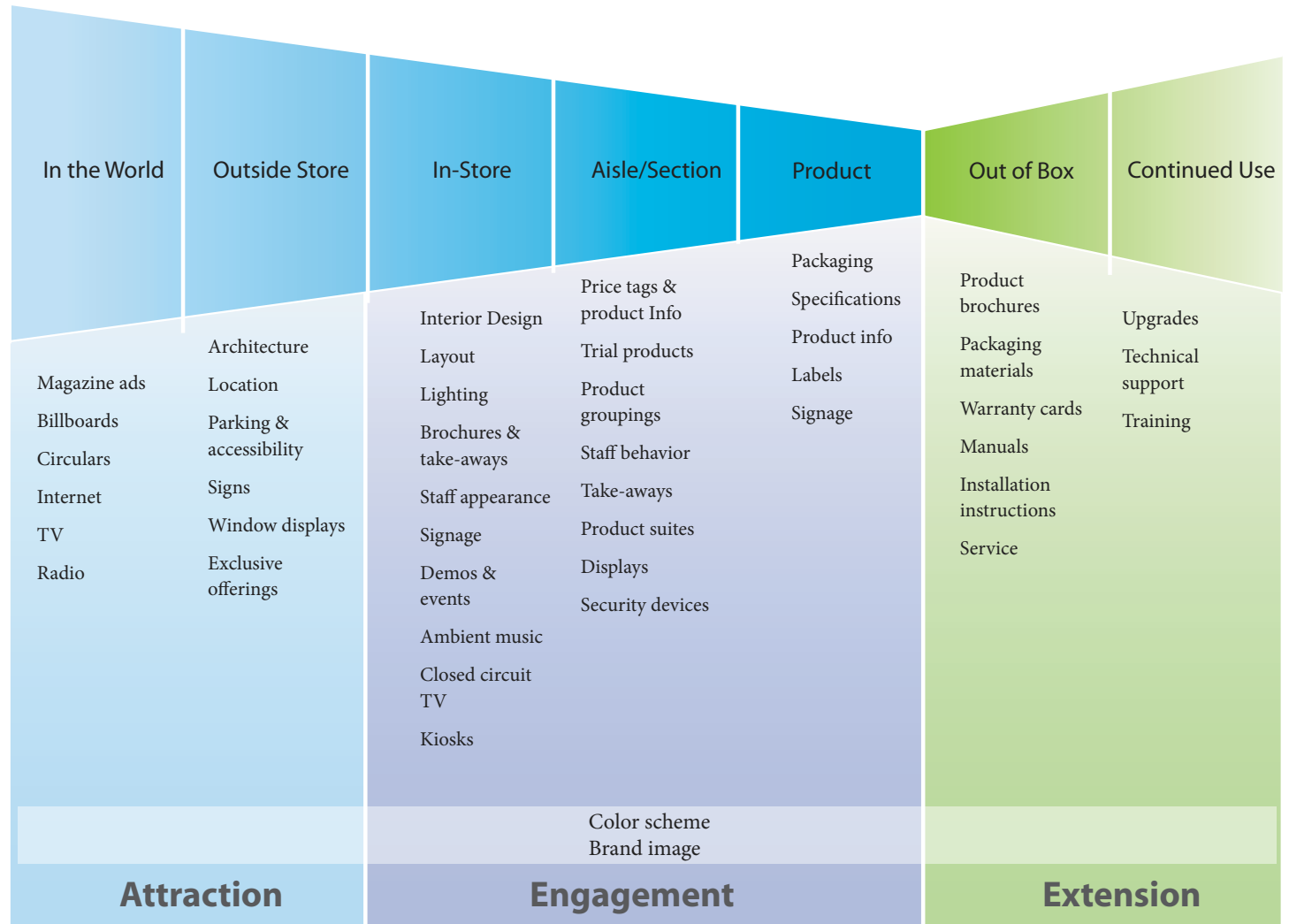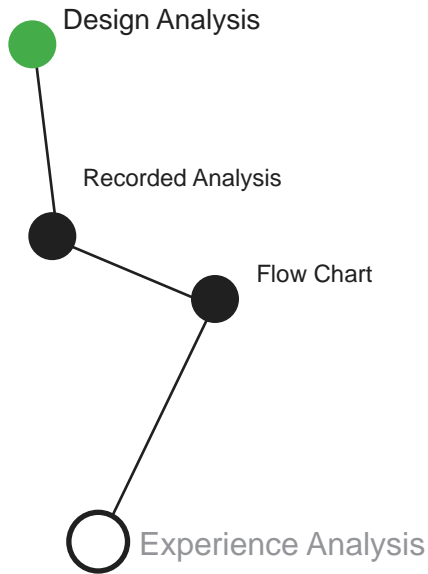
Design Analysis

Experience Diagram

Attraction > Engagement > Extension
Different user experience in different phases

Design Analysis

Recorded Analysis

Flow Chart

Experience Analysis

In the World	Outside Store	In-Store	Aisle/Section	Product	Out of Box	Continued Use
				Packaging	Product brochures	
			Price tags & product Info	Specifications		Upgrades
		Interior Design	Trial products	Product info	Packaging materials	Technical support
	Architecture	Layout	Product groupings	Labels	Warranty cards	Training
Magazine ads	Location	Lighting	Staff behavior	Signage	Manuals	
Billboards	Parking & accessibility	Brochures & take-aways	Take-aways		Installation instructions	
Circulars	Signs	Staff appearance	Product suites		Service	
Internet	Window displays	Signage	Displays			
TV	Exclusive offerings	Demos & events	Security devices			
Radio		Ambient music				
		Closed circuit TV				
		Kiosks				

Color scheme
Brand image

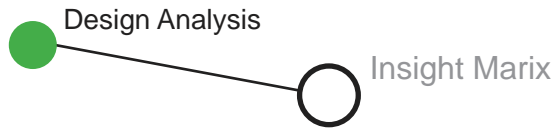| **Attraction**	**Engagement**	**Extension**

Design Analysis

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

Example, urban one passenger vehicle

Design Analysis

Recorded Analysis

Flow Chart

POEMS/AEIOU
Framworks

| Activity	Environment	Interaction	Object	User
Delivery	*Delivery Locations:* Post Office, 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 *Reparing:* Instant reparing tool kit, Manual book	*Urban Residents:* Athletes, Amateur sportsmen, Dieting women, Students in school sports activity.

Design Analysis

Insight Matrix

Design Analysis

Insight Marix

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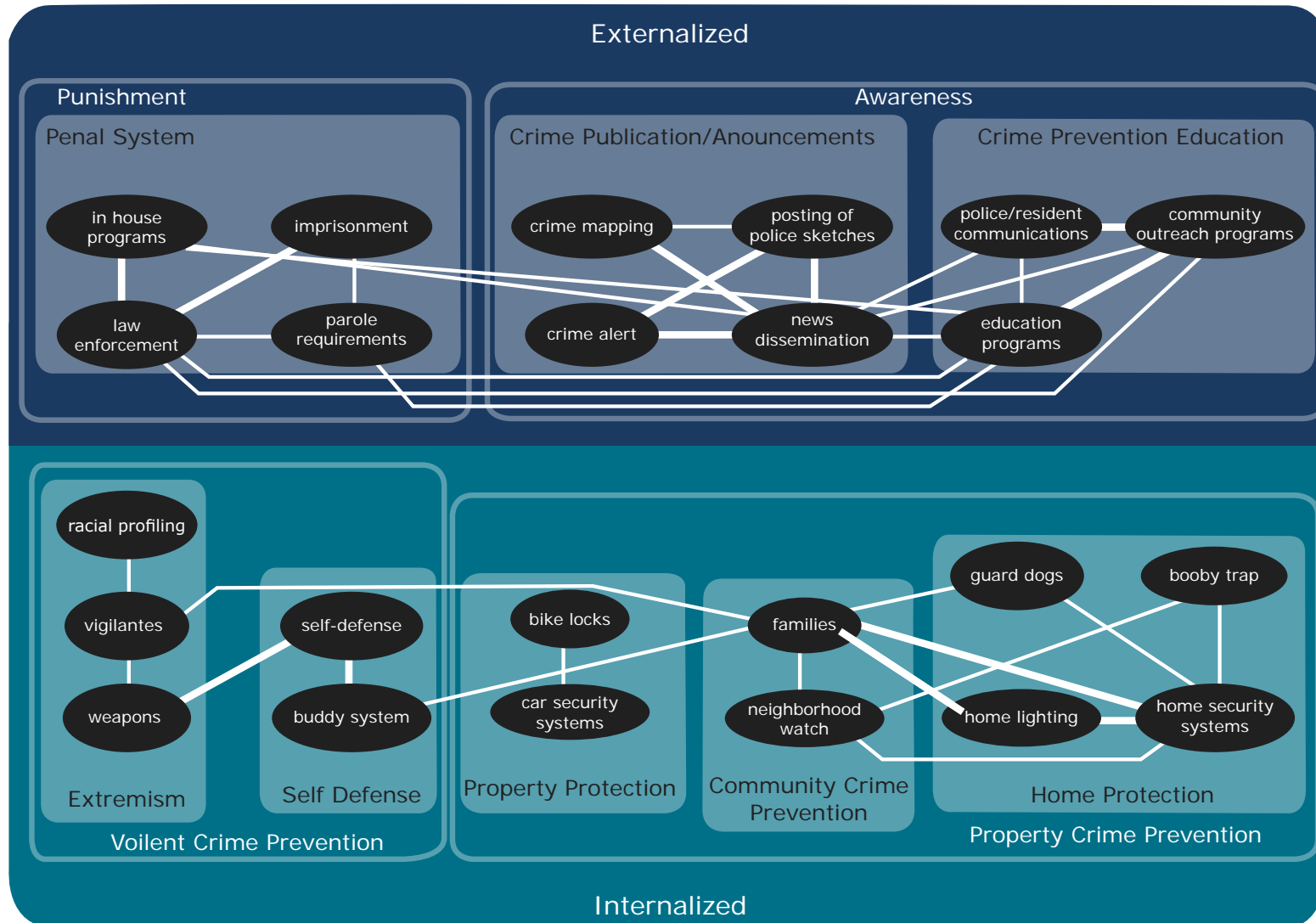Find out the relationship of elements
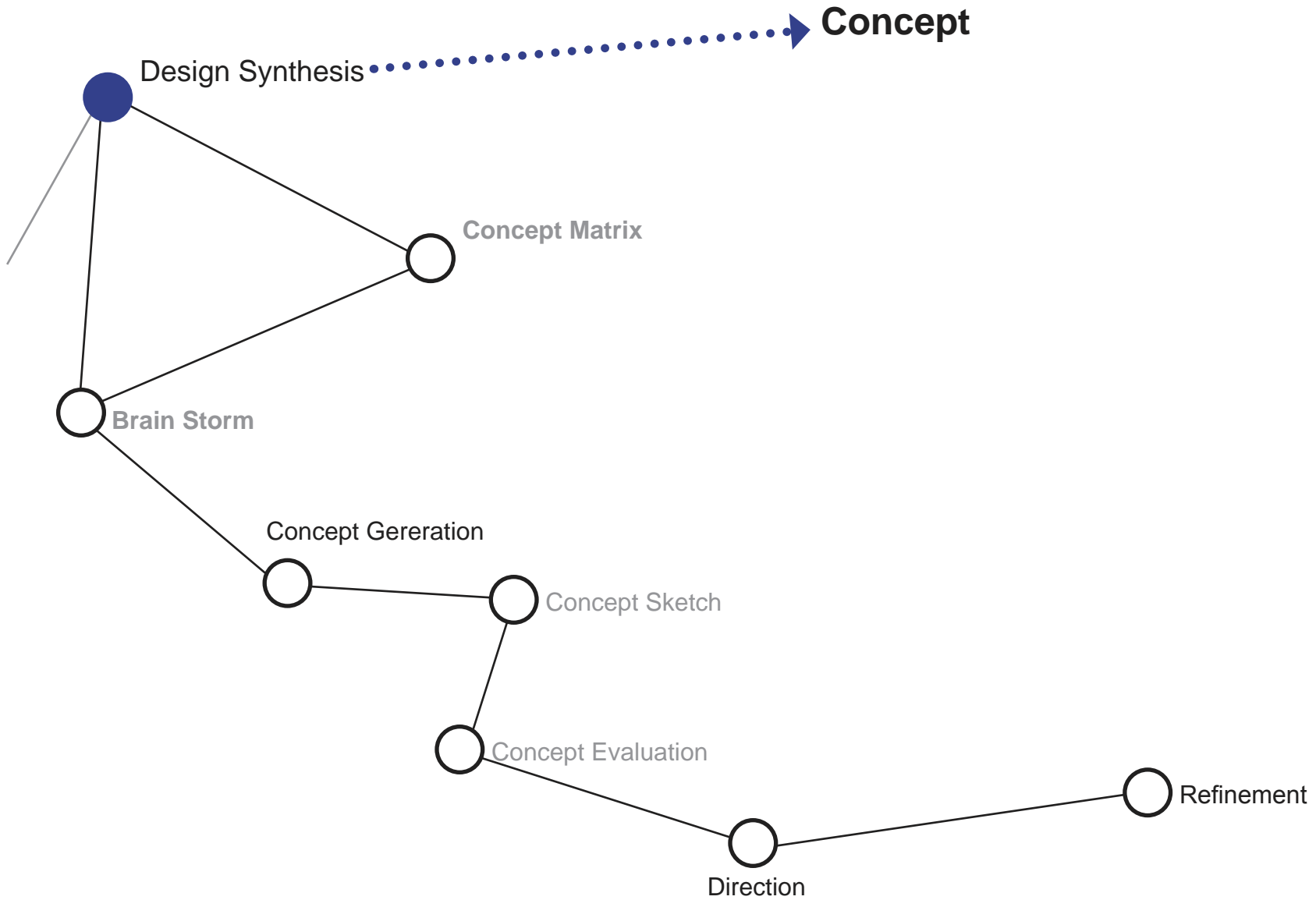Example, crime prevention

Design Analysis
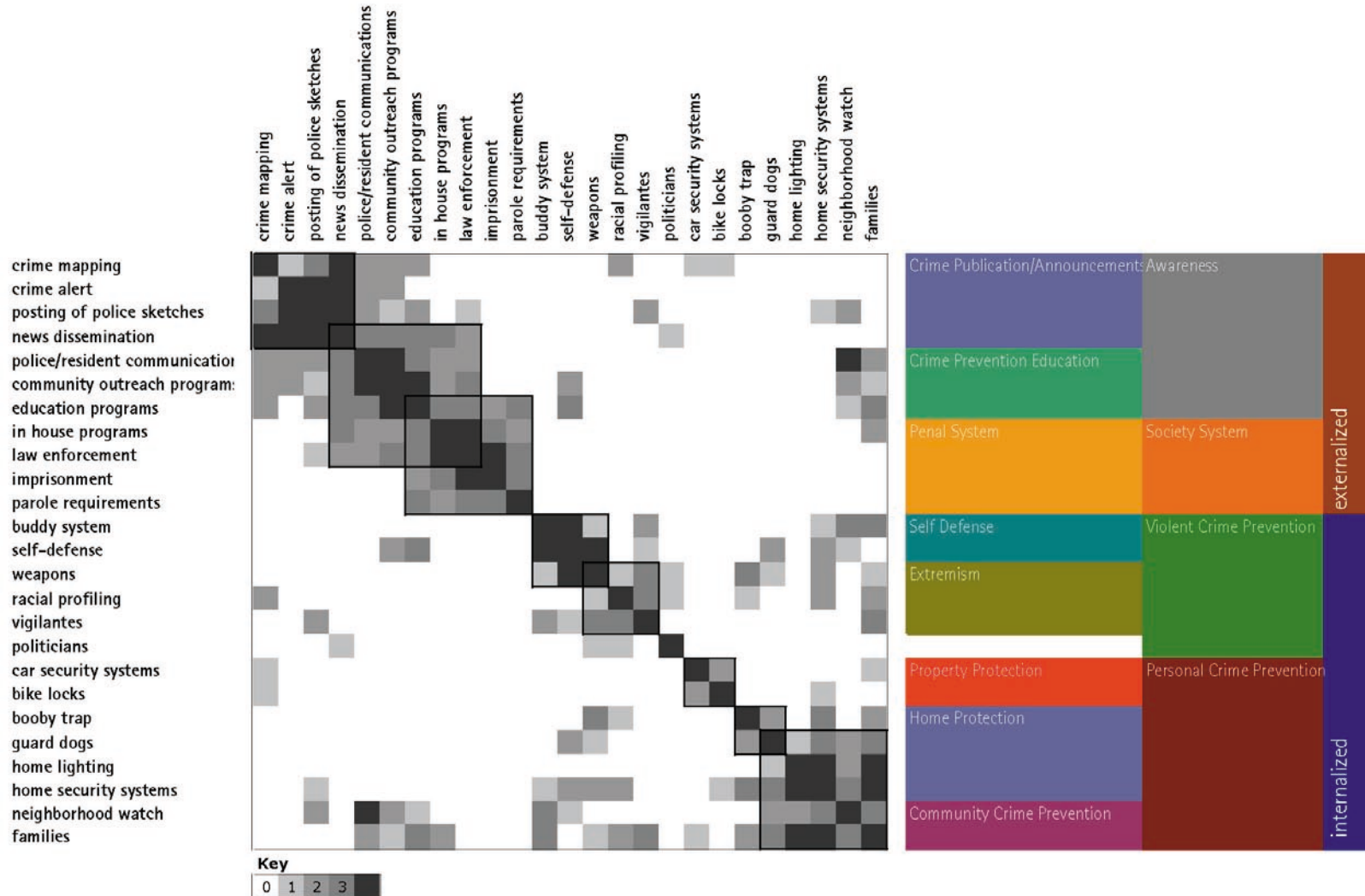
Design Analysis
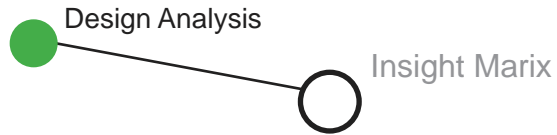
Insight Marix

Insight Matrix

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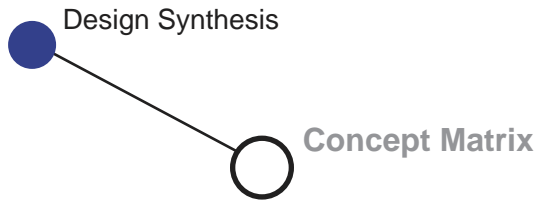Hierarchical relationship of elements

Externalized

Punishment

Penal System

- in house programs
- imprisonment
- law enforcement
- parole requirements

Awareness

Crime Publication/Anouncements

- crime mapping
- posting of police sketches
- crime alert
- news dissemination

Crime Prevention Education

- police/resident communications
- community outreach programs
- education programs

Internalized

Voilent Crime Prevention

Extremism

- racial profiling
- vigilantes
- weapons

Self Defense

- self-defense
- buddy system

Property Protection

- bike locks
- car security systems

Community Crime Prevention

- families
- neighborhood watch
- home lighting

Property Crime Prevention

Home Protection

- guard dogs
- booby trap
- home security systems

Design Synthesis

Concept

Design Synthesis · · · · · · · · · · · · · · · · · ▶

○ **Concept Matrix**

○ **Brain Storm**

Concept Gereration ○

○ Concept Sketch

○ Concept Evaluation

○ Refinement

○ Direction

Design Synthesis

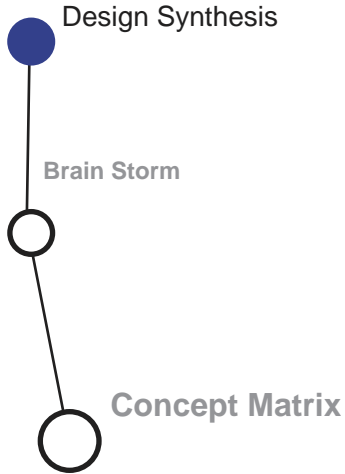Design Synthesis

◯ **Concept Matrix**

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

	parking	storage	narrow alley	looking around	driving through heavy traffic	human power	safety
delivery	bi-directionally rotating wheels, tall body, minimum bottom area	half width truck (Trulf)	bidirectional driving, steering auto lock (bidirectional bike)				
sightseeing	foldability from aside, hammock seat			high seating, seat height adjustable, height adjustment (scissors car)			
shopping	bicycle changing to a cart	large storage motorized cart, easy dis/assembly (cart rider)					
	Integrate the shopping cart with your segway						
commuting	vehicle standing for parking,				transformable tyre positions(transformer)		
	90degree steering (side crawl)						
sporting						arm movement	
						lying prone	

Design Synthesis

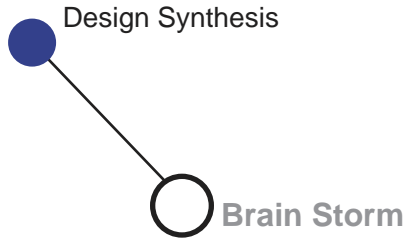Design Synthesis

Brain Storm

Concept Matrix

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 expriences 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.

| Concept	Page
Online Social Communities	8
Friendship Registry	9
Hair Salon Staff Service	10
C.E. TV	11
Info Scanner	12
Product Forecast	13
Product Info Email	14
Neighborhood BestBuy	15
In-store Cafe	16
In-store Events	17
Physicalized Cnet	18
In-Store Internet Portal	19
3-D Virtual Shopping	20
Photo Studio	21
In-Store Nav	22
Finding Yours	23
User-Centered Layouts	24
Position Maps	25
Staff Caller	26
How-to-shop Classes	27
Learning Stations	28
Needs Sleuth	29
Information Book	30
Sticky Tags	31
Setup Center	32
Virtual Online Helper	33
Targeted Manuals	34
Up to Date Service	35

Design Synthesis

Design Synthesis

Brain Storm

Brain Storming

Problem Statement > "Was of"s List > Con-
cept > Visualization > Concept Sorting
Unlimited Relevant Concept
No debate
Variety of Team Members
Concept Visualization
Concept Organization
Client Paticipation

Design Synthesis

Design Synthesis

Brain Storm

Concept Generation

Concept Sketch

Concept Sketch
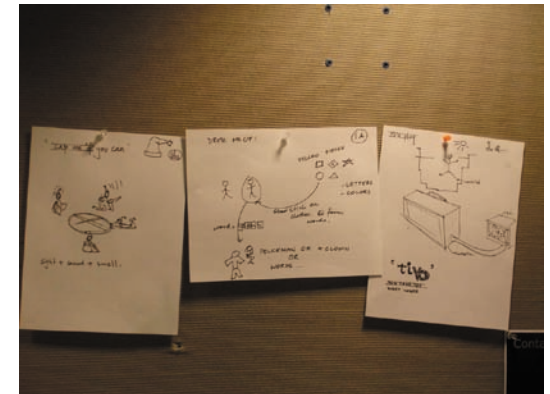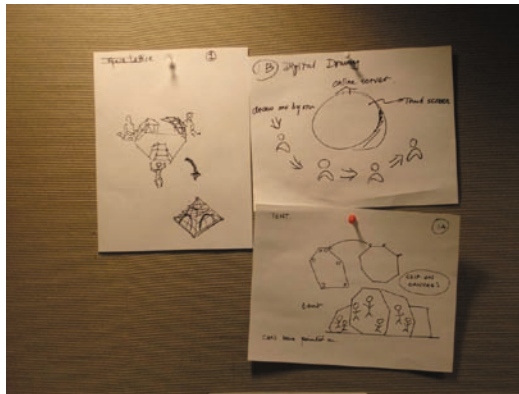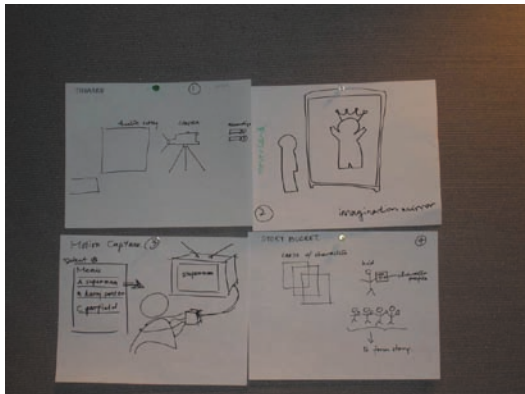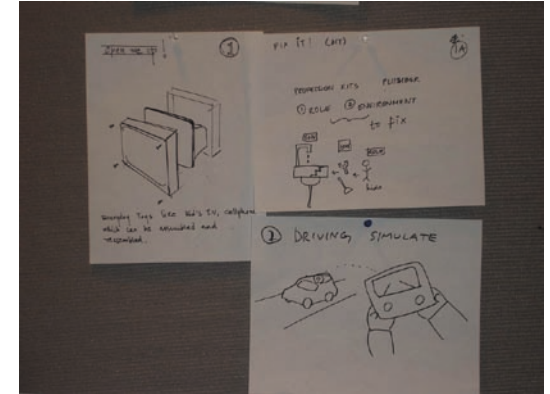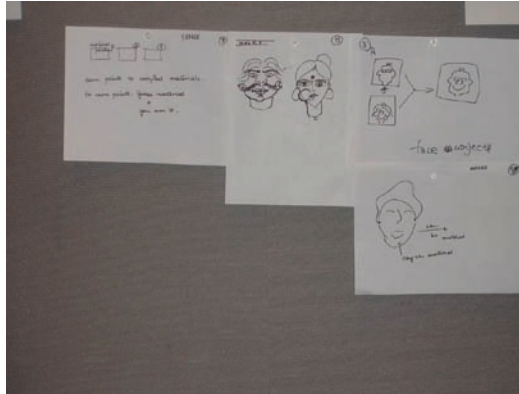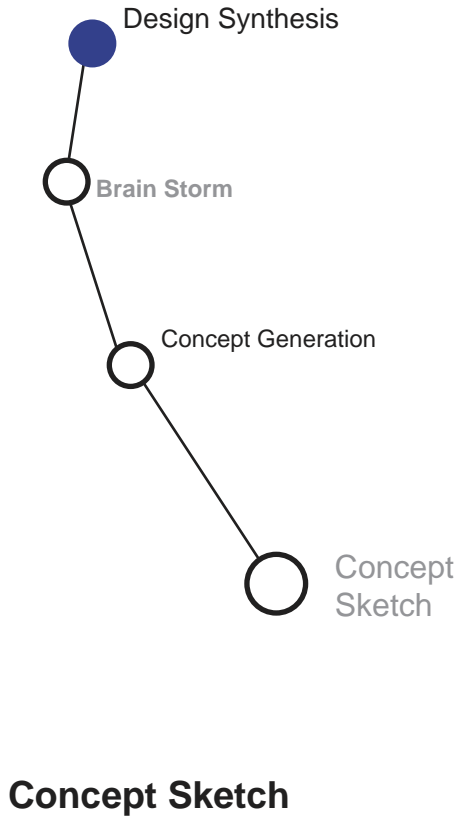
DEWBOP — SHOWER MEDIA

SIMPLIFIED INTERFACE

MENU.
BIG MAIN BUTTON
SCREEN
VERTICAL MENU.
SMALL TIME BUTTON.
SUCTION LEVER
SPEAKER
KNOB
WATERPROOF SPEAKERS

MUSIC FORMAT.
MULTIMEDIA CARD.
MP3. WMA... RADIO.
DEW.
BIOLOGY ANALOGY
SEASHELL
PRODUCT FORM: TRIPLET

WALL
PUSH TO FIX
WALL
PULL TO RELEASE.

LOCKING SUCTION CUP
SIMILAR TO BIG PANE GLASS CARRIER.
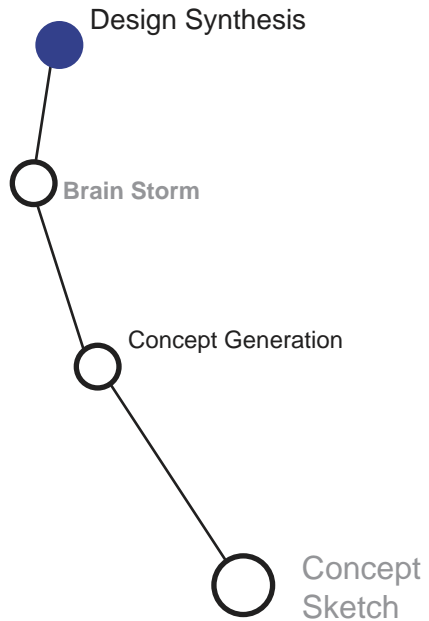STRONG ENOUGH & EASY TO CUSTOMISE.
LOCKING LEVER.

STRONG & LONGER FIXING.
EASY TO RELEASE & REPOSITION

USE YOUR ELBOW.
ERGO FOR BATHROOM ALL-WET ENVIRONMENT.
AUTOMATICALLY RETURNS.
1. ROTATE THE BODY TO GO NEXT/PREV.
FOR YOUR SOAPY HAND.
2. BUMPED KNOB FOR VOLUME & MENU CONTROL.

3 **Design Synthesis**
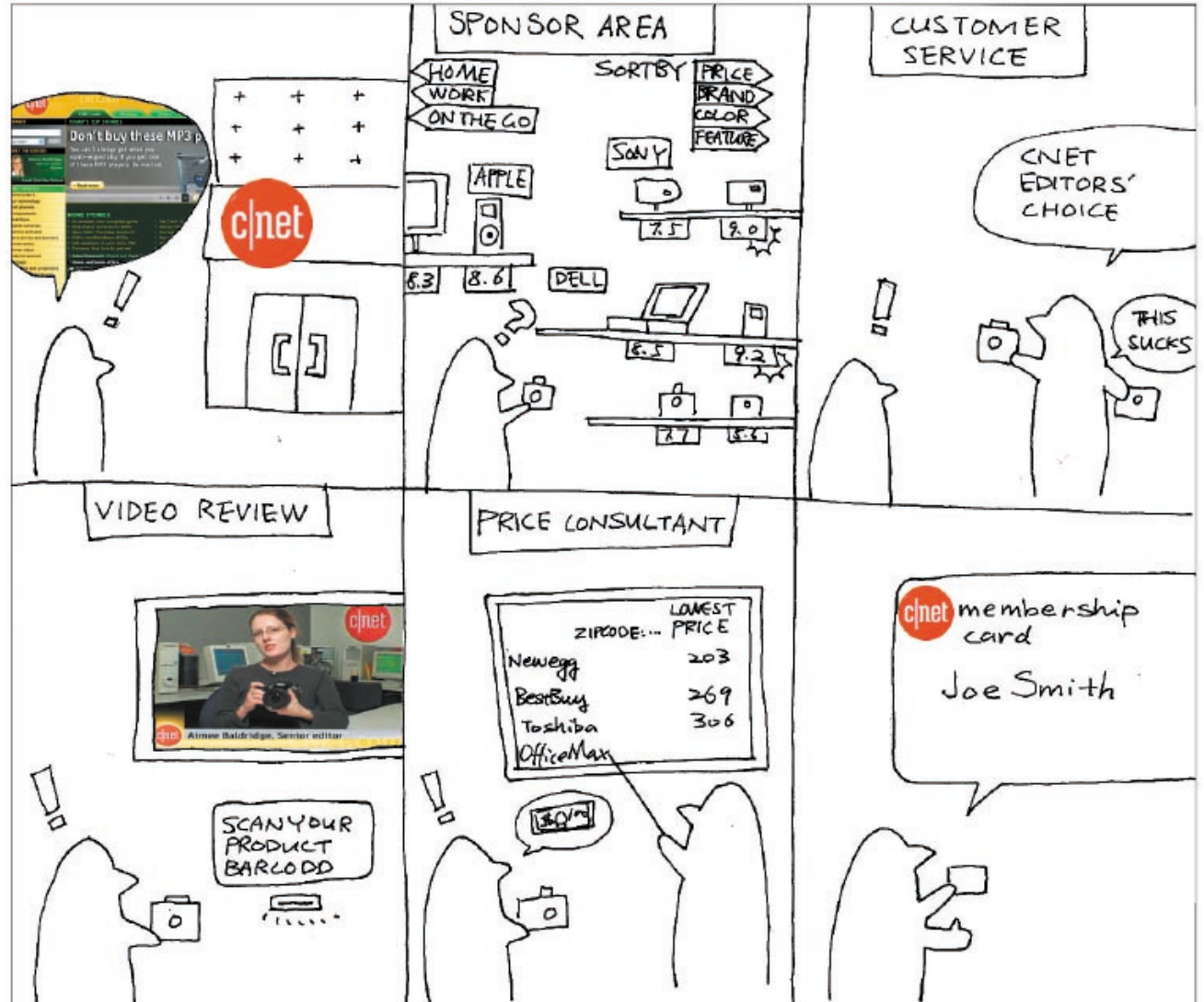
Design Synthesis

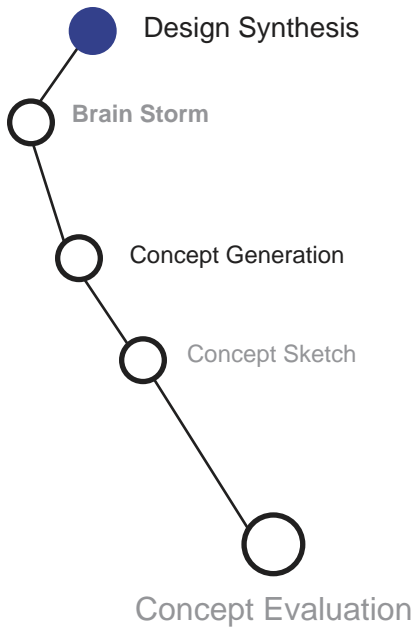**Brain Storm**
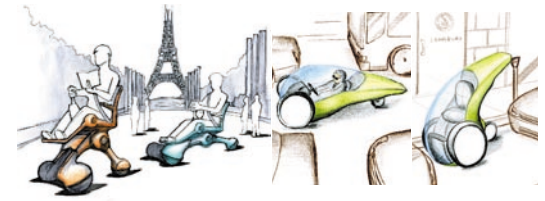
Concept Generation

Concept
Sketch

Concept Sketch

Concept sketch not only presents prod-
uct, but also service, flow chart and
experience of use.
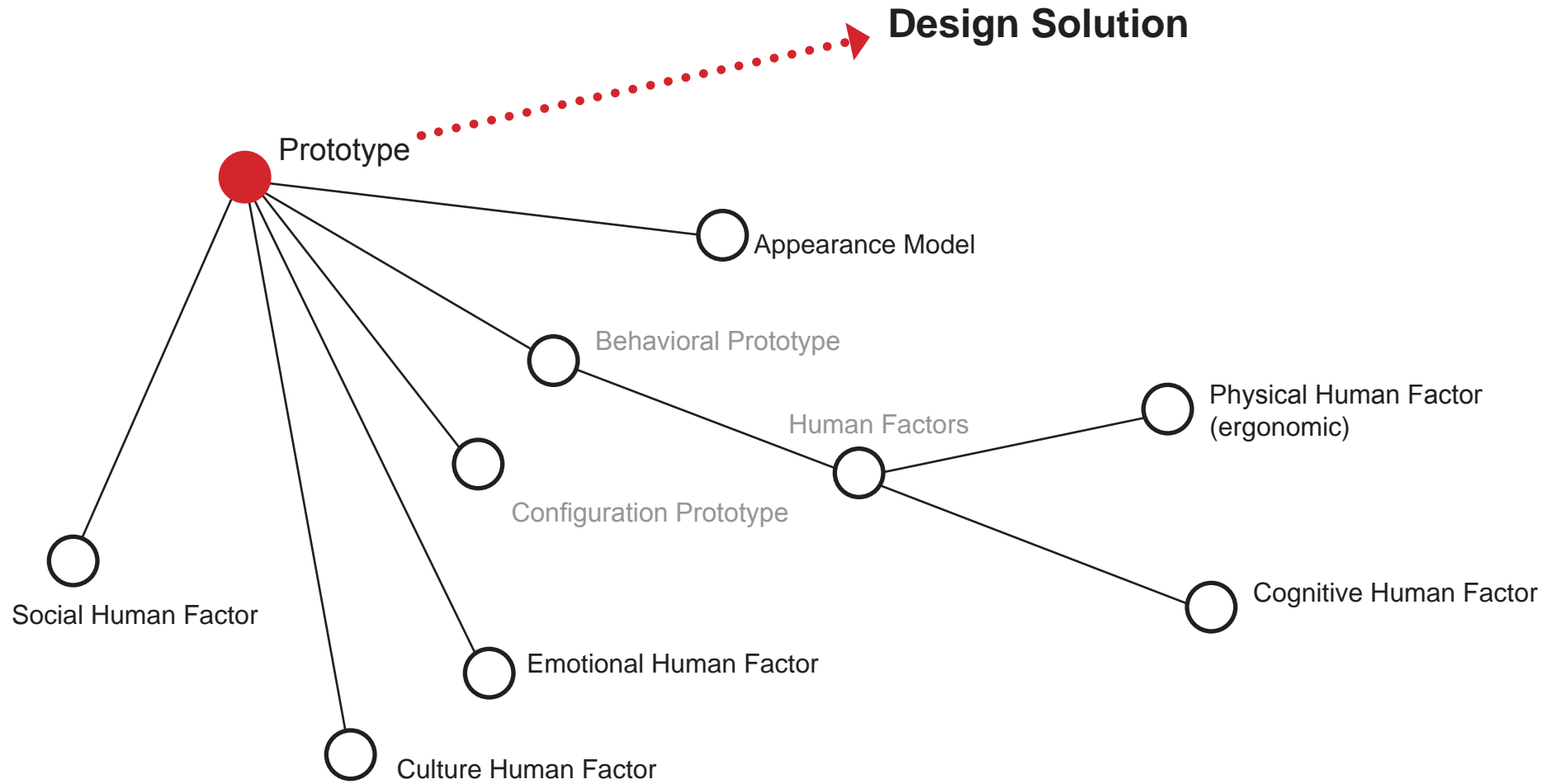Example, physicalized CNET.com

3 Design Synthesis

Design Synthesis

Brain Storm
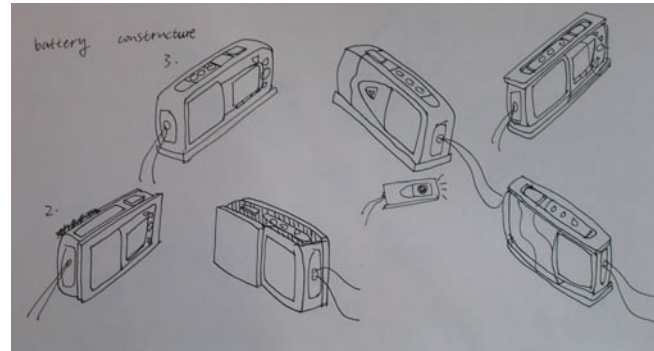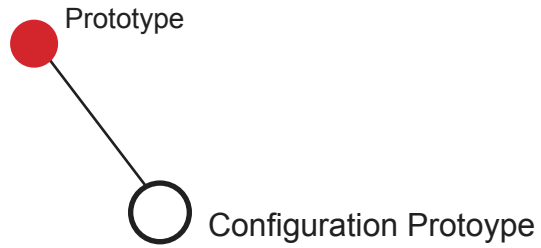
Concept Generation

Concept Sketch

Concept Evaluation

Decision Map

Concepts > Criteria > Weighing>
Scoring > Evaluation > Decision
Evaluate according to criteria,
feasibility and importance(weighing)

Criteria	Weight	Superman	Type-Z	Urban Kayak	Giraffe	Scissors Car	Hammock Seat	Cart Rider	Segcart	Tall Guy	Trulf	BDBike	Side Crawl	Transformer	Alien
economy	5	25	25	25	10	10	25	15	15	20	15	20	15	10	10
driving compactness	4	12	12	12	12	8	4	12	8	20	12	20	12	12	12
parking efficiency	5	25	15	15	15	15	25	20	25	25	15	25	25	20	25
environmental friendliness	3	15	15	15	9	9	15	12	12	6	6	9	6	6	6
utility	5	5	5	5	10	10	5	15	20	20	25	10	10	10	10
style	3	3	3	9	6	12	9	9	6	12	3	12	9	6	15
safety	3	3	6	6	6	9	3	6	6	12	15	6	9	9	12
visibility	3	3	6	6	15	15	3	9	9	6	9	9	6	12	6
comfort	3	3	6	3	9	9	6	3	3	6	15	9	12	15	15
suitability	5	25	25	25	25	25	5	25	25	25	25	10	25	25	25
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	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					-2	-2	-3	-2	-3	3	2	3	3	2	3
performance-utility					3	2	1	-2	-3	-3	-3	-2	3	3	2
total value					117	122	100	126	129	152	140	130	129	125	136
doability					3	3	9	12	12	12	15	3	6	3	3

Design Methods | Chunlun Lee | Dec. 2005 Institute of Design, IIT. Chicago

Design Solution

Prototype

Appearance Model

Behavioral Prototype

Human Factors

Physical Human Factor (ergonomic)

Configuration Prototype

Social Human Factor

Cognitive Human Factor

Emotional Human Factor

Culture Human Factor

Prototype

Configuration Protoype
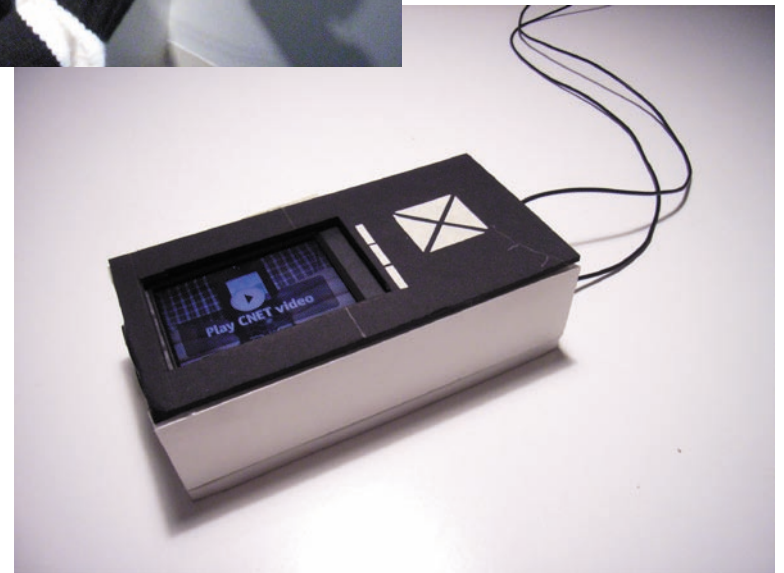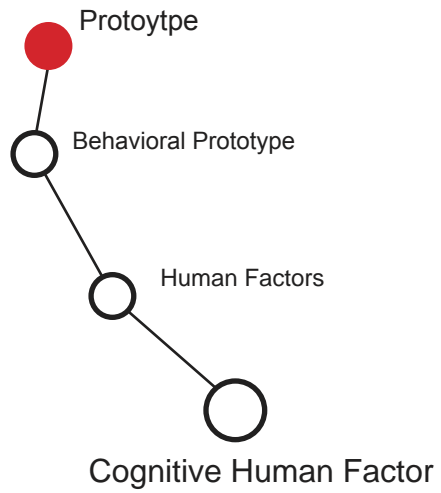

Configuration Prototype

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

Protoytpe

Behavioral Prototype

Human Factors

Cognitive Human Factor

Behavioral Prototype

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

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