

MULTI-SENSORIAL PERCEPTION AND DESIGN

DESIGN RESEARCH SEMINAR

PDSPL - 146

BY

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**INDUSTRIAL DESIGN CENTRE
INDIAN INSTITUTE OF TECHNOLOGY, BOMBAY
2016**

“Touch has a memory”

-John keats

Design Research Seminar

“Multi-sensorial perception & **Design**”

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Guide : Prof. **Ravi Hazra**

Industrial Design Center. Indian Institute of Technology, Bombay, 2016

Approval

Design Research seminar

“Multi-sensorial perception & Design”

By: Patric john

M. Des Industrial Design 2014-2016

Is approved as a partial fulfillment of requirements of a post graduate Degree in Industrial Design at IDC, IIT-Bombay.

Project Guide

(signature)

Declaration

I declare that this written submission represents my idea in my own words and where other ideas or words have been included, I have adequately selected and referred the original source.

I also declare that I have adhered to all principles of academic honesty and integrity and have not misinterpreted or fabricated or falsified any ideas / data / facts / sources in my submission.

I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources that have not been properly cited, or from whom proper permission has not been sought.

Signature:

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Acknowledgment

I Thank my guide prof.Ravi Hazra, for allowing me to work with this DRS topic under him, his friendly attitude and support and guidance.

I Thank all my classmates, my batch-mates and all IDC staff and faculty for all the help which they extended towards me during my DRS work and IDC life.

Contents

Approval.....	i
Declaration.....	ii
Acknowledgment.....	iii

Introduction.....	8
Definitions.....	10
Importance of perception.....	14
Factors affecting perception.....	16
How preception changes with number of senses involved.....	33
Multi-sensoril design examples.....	35

References and bibliography

Introduction

An object is never identified as the object at the fraction of the second. It would take, a few milli seconds for the brain to read the signals from eyes, ears or other sensory organs to sense and perceive it as an object. Depending upon the complexity of the object or its features, the time taken by brain can vary to perceive and understand. Design is a domain in which perception is much considerable and influential.

In this Design Research Seminar i am curious to know about, how senses works & how perception matters in design. What are the elements or factors among senses and sensation which affects the perception.?

The focus area of the project is to know about multi-sensorial perception in the framework of design. How a design with multi-sensorial (catering to more than one sense) perception, is different from a design which is single-sensorial (catering to only one sense). Can multi-sensorial design bring more value to a product? What are the possibilities and limitations of multi-sensorial perception in Design.

“Without our senses the world would simply not exist for us”



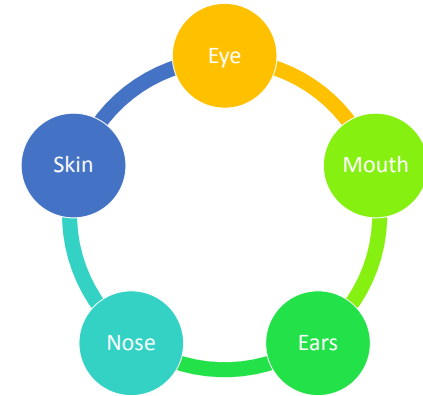
Sense

"A sense is a physiological capacity of organisms that provides data for perception"



Sensation

"A physical feeling or perception resulting from something that happens to or comes into contact with the body."



Sensory Organ

"An organ of the body which responds to external stimuli by conveying impulses to the sensory nervous system."

Sensation

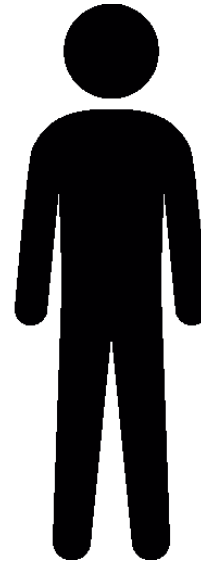
Lets have a look at various definitions of sensation.

"The activation of receptors in the various sense organs"

"The process of detecting physical energy from the environment and encoding it into neural signals."

"The process of detecting a stimulus (light wave, sound wave, molecules smell and taste, temperature, pressure etc.)"

"Sensation is gathering information from the environment via our senses."

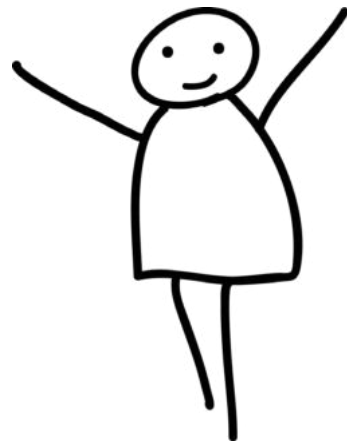


Perception

“Perception is what we understand from what we sense”

“What we interpret with what we sense”

“What we make meaning out of what we experience”



Can see lines, different colors, shape of the object, shadow of the object, distance between me and the object. The object looks similar to what I have seen earlier at my home. It looks like.....

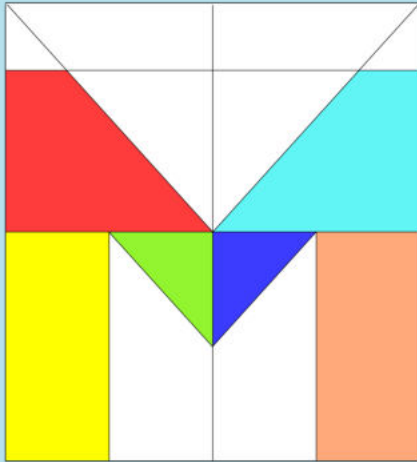
(the sensation, all of these happen inside the brain within the split of a second)

.....a FOOTBALL

(The perception, happens within a second)

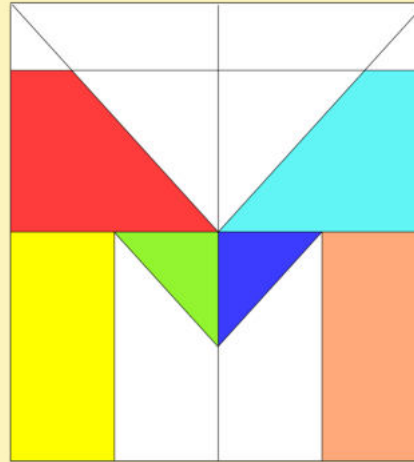
An example

Sensation & perception , An example



Sensation

The person see different colors and lines.



Perception

From the seen/sensed colors and lines, finds the arrangement, order, pattern etc. and arrive at one or multiple conclusions.

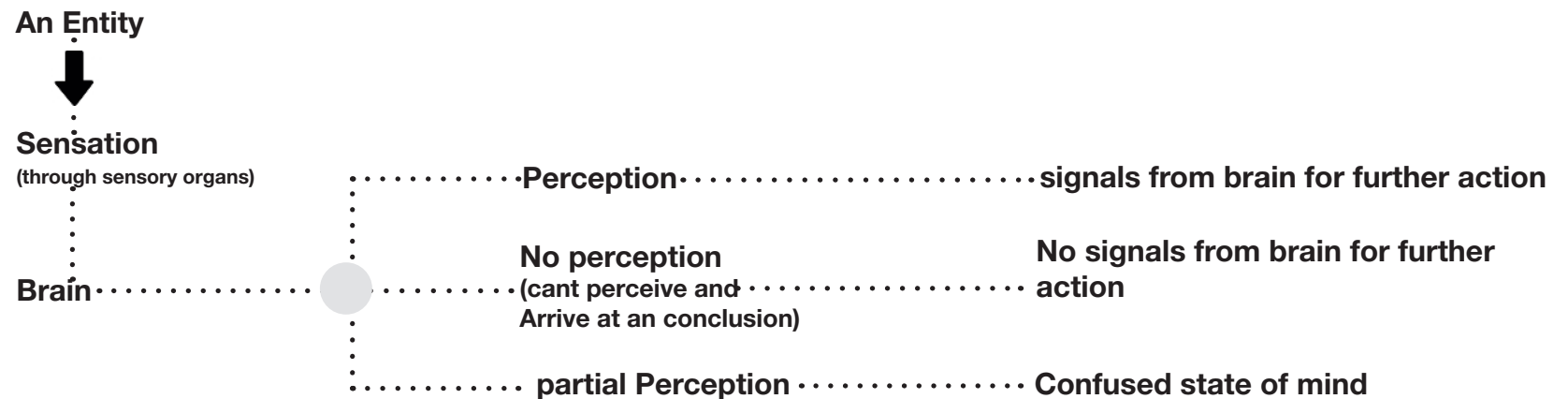
Perceptions of people

1. Letter M
2. A tangram arrangement
3. Two numbers "one" placed together in a mirrored manner
4. An abstract shape with colors and lines
5. A company logo
6. Something else

The example here illustrates how the same image is perceived as different according to different users/people. Even though the visual elements are same the perceived meaning is different. A clear understanding about the scenario is required before proceeding further conclusions.

Importance of perception

What is the importance of the perception? What happens when people perceive? What happens when people can't perceive? To understand that let's take a look at the process of perception.



flow chart showing process of perception

From the above process we can see that

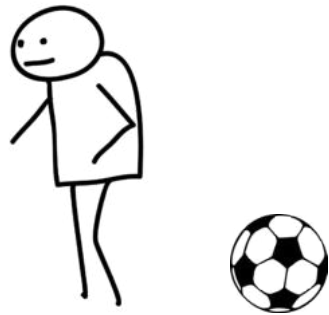
1. A person is clear about what to do when he/she is able to perceive an entity
2. The person doesn't know what to do, when there is no perception
3. The person is in confused state of mind, when perceived partially.

Importance of perception : A person cannot continue/proceed with any further action/interaction with the entity/system, without having a proper perception about the entity/system.

Importance of perception : An example

Child 1

Sees the object
Not able to perceive ,
Walks away



Child 2

Sees the object
Perceives it as ball,
but doesn't perceive it as a ?
football.
Decides to touch it first
Before further action



Child 3

Sees the object
Perceives it as a football
Decides to play with it,
kicks the ball



Possible reasons behind different perceptions !!!

Child 1

May not have seen or used a
football earlier.
Cant relate it to any sports or play
items, neither interesting.
Low brain capacity to sense and
perceive objects.

Child 2

May have used or played with balls,
but not with footballs.
Confused.

Child 3

May have seen someone playing
with similar football.
Have played with football.

Here the reasons which I gave for different perceptions are assumptions. A more clear look into the process of perception is required to identify the aspects which affects the perception.

Design is a also domain in which the perception matters much to the designer, user, product and other related links. If perception matters much, we need to know what all matters to perception.

Factors affecting perception

A general scenario in which an entity is sensed and perceived

After having a look at various situations and scenarios and analyzing them, I came up to a conclusion that in any scenario, we can find three main factors which influences the perception.



1 Entity

An object, image, product, space, or an entity to be perceived. All the factors which compose to form the entity to be sensed, have the potential to influence the perception of the user.



2 Scene

The events & environment is comprised to form scene. The aspects of each event and elements of environment can influence the perception.



3 Person

The ability of the person to perceive includes, the ability to sense, the intelligence, literacy of senses (sensual vocabulary), experience and memories, complexity of brain etc

1



Entity

Factors affecting perception

An entity,
Whatever the entity might be,
it should definitely have some features or elements which can be sensed by at least one sensory organ. Only then an entity will be considered for sensation and perception.

Example 1: A smell can be identified as an entity. In this case the elements of the entity are intensity of smell, concentration, frequency etc.

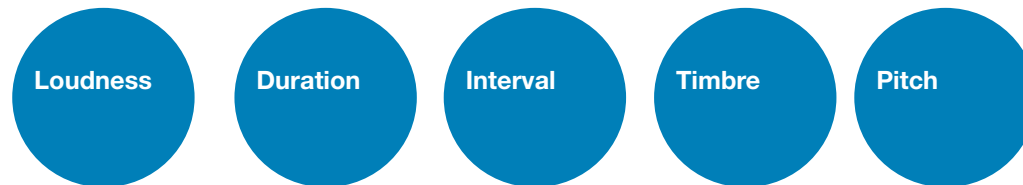
Example 2: A pencil can be an entity. In this case the elements are visual and tactile. The color, shape, texture, hardness etc all play an important role in perception.

Understanding about the elements or features of any object/entity which can be sensed is important, because they are significant to the senses & sensory organs for sensation and thus affect the perception.

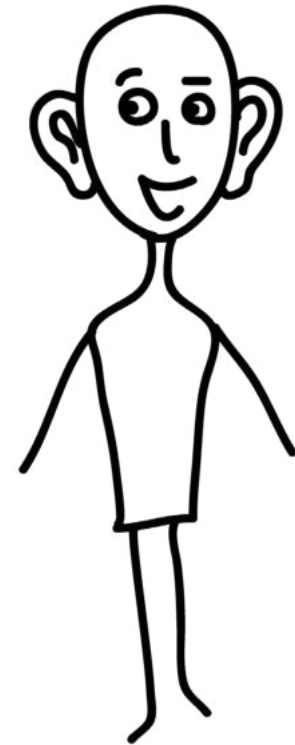
Aural : relating to the ear or the sense of hearing.

Sensory organ : Ear (located at the sides of human face)

Process : The outer ear channels incoming sound waves and directs to ear canal. From the ear canal sound reaches eardrum and causes it to move. Sound vibrations thus created , then move through the ossicles and reaches cochlea. Sound vibrations cause the fluid in the cochlea to move. Fluid movement causes the tiny hair cells in cochlea to bend. These Hair cells create neural signals which are picked up by the auditory nerve. The auditory nerve sends with electrical signals to the brain where they are interpreted as sounds. The Sounds thus sensed are then analyzed and perceived by the brain.



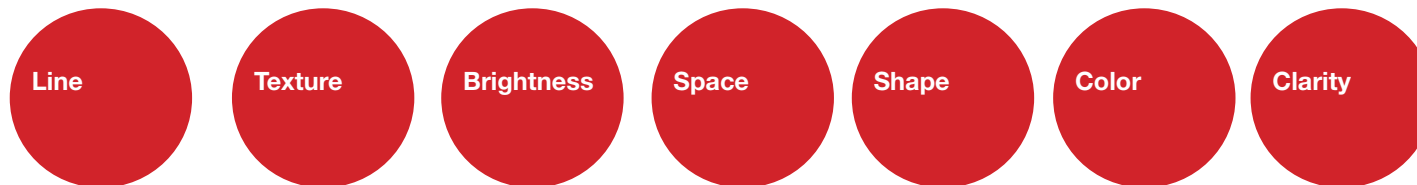
Elements of aural (sound) entity which can influence the perception



Visual : relating to seeing or sight.

Sensory organ : Eye (located on the human face, below the forehead)

Process : The light rays reflect off an object and enter the eyes through the cornea (the transparent outer covering of the eye), .The cornea bends, or refracts, the rays that pass through the round hole of the pupil. The light rays then pass through the lens, the lens changes shape so it can further bend the rays and focus them on retina. The retina, which sits at the back of the eye, is a thin layer of tissue that contains millions of tiny light-sensing nerve cells. These cells in the retina does the job of converting the light into electrical impulses. The optic nerve then sends these impulses to the brain, which produces an image. The Image is then perceived.



Elements of Visual entity which can influence the perception

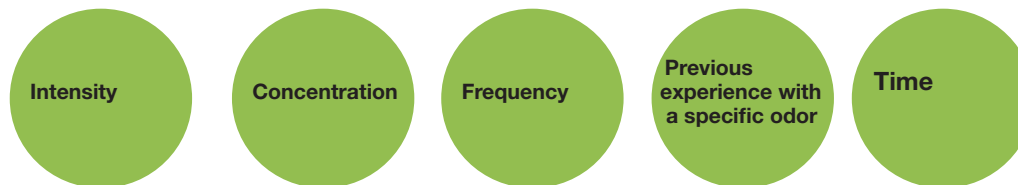


Olfactorial : relating to the smell or the sense of smelling.

Sensory organ : Nose (located above mouth ,below the eyes)

Process : At the top of the nasal passages behind nose, there is a patch of special neurons about the size of a postage stamp. These neurons are unique in that they are out in the open where they can come into contact with the air. They have hair-like projections called cilia that increase their surface area. An odor molecule binds to these cilia to trigger the neuron and cause us to perceive a smell.

Smell is a very direct sense. In order for one to smell something, molecules from that thing have to make it to our nose. Those molecules which are generally light, volatile (easy to evaporate) chemicals that float through the air are only able to enter the nose and able to smell.



Elements of olfactorial (smell) entity which can influence the perception



Gustatorial : gustatory : of or relating to taste or tasting.

Sensory organ : Mouth (located below the Nose)

Process : The food is comprised of different chemicals. The chemical substance responsible for the taste is freed in the mouth and comes into contact with a nerve cell. These activates the nerve cell by changing specific proteins in the wall of the sensory cell. This change causes the sensory cell to transmit messenger substances, which in turn activate further nerve cells. These nerve cells then pass information to the brain for a particular perception of flavor.

Astringency

Numbness

Temperature

Pungency

Elements of gustatorial (taste) entity which can influence the perception

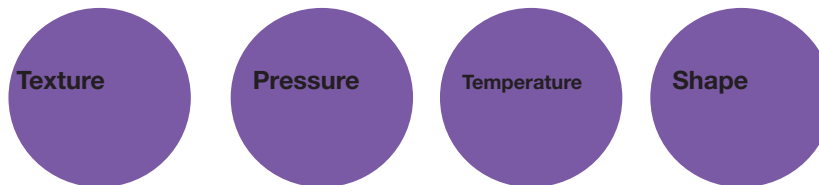


Tactile : of, pertaining to, endowed with, or affecting the sense of touch.

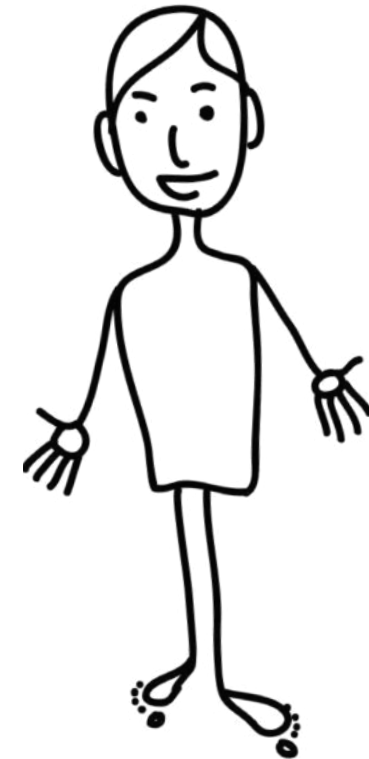
Sensory organ : Skin (located all over the body)

Process : Our skin contains lots of tiny nerve endings that create the sense of touch. When we experience sensations such as pain or heat or cold, or any other feeling, the bottom layer of your skin, the dermis, sends a message to the brain about the sensation. These Sensations are then analyzed and perceived by the brain.

Our sense of touch is controlled by a huge network of nerve endings and touch receptors in the skin known as the somatosensory system. This system is responsible for all the sensations we feel - cold, hot, smooth, rough, pressure, tickle, itch, pain, vibrations, and more.



Elements of tactile (touch) entity which can influence the perception



The conditions of scene & environment is another factor which can influence the perception. Wind, rain, dust, lighting conditions, distance between source and target etc can vary/influence the sensation and thus influences the perception. Let Us see in detail what aspects in the environment affects different sensations.

2 Scene

Factors affecting perception



environment



All the factors or entities in a scene which can be sensed.

Examples : tree, mountain, people,
air flow, rain, snow, dog barking etc.

events



All the factors or entities which cannot be sensed, but perceived.

Examples : the act/event of people running, the act of dog barking, the situation of flood, train going etc.

Environment

Factors affecting perception

.....



Anything which obstructs/interferes the light path between the object and eye effects the sensation and thus perception.



Anything which obstructs/interferes the sound path between the object and ears effects the sensation and thus perception.



Anything which influence the movement of air, surrounding the object and person.



Since taste is something which involves the sensation of tongue and other senses, the factors in environment which effects other senses too affect the perception of taste.



Atmospheric temperature and any other aspects which affects the surface quality of object, influences the perception.

Environment

Factors affecting perception

.....



Related to Visual

Anything which obstructs/interferes the light path between the object and eye affects the sensation and thus perception.



Ambient Light



Presence of any physical entity/
object between the eye and object,
which can refract/reflect/absorb/
obstruct the light rays.



The medium
(in which the light travels)



Distance
(between eye and object)



Related to Aural

Anything which obstructs/interferes the sound path between the object and ears effects the sensation and thus perception.



The medium
(in which the sound travels)



Noise



Sonic texture



Spatial location

Environment Factors affecting perception



Related to Olfactorial

Anything which influence the movement of air, surrounding the object and person.



Presence of other smells



Distance



Any factors which can alter the diffusion of molecules into air,
rate of diffusion & speed of travel of molecules

Environment

Factors affecting perception

.....



Even though taste buds are responsible for the sensation of taste, the perception of taste is not just only linked to tastebuds or tongue. Visual, aural, olfactorial & tactile elements of the food are too responsible and influence the perception. Hence the environmental factors which affects them, affects the taste (perception) too.

Environment

Factors affecting perception

.....



Atmospheric temperature and any other aspects which affects the surface quality of object, influences the perception.

events

• • • • • • • •

All the factors or entities which
cannot be sensed, but perceived.



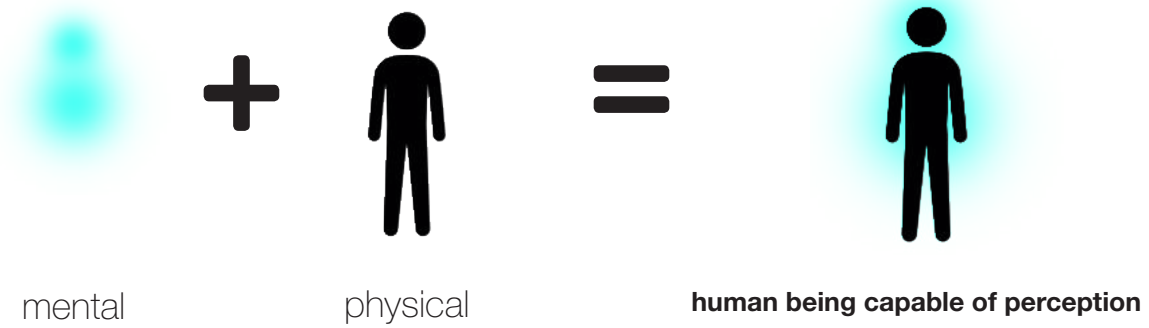
Time



Situation



Geographical location



human

Factors affecting perception

Both the mental and physical aspects of a human being affects the sensation and perception.



Factors affecting perception physical



Eyes



Ears



Nose



Mouth



Skin



Brain

The physical attributes of sensory organs also plays a role in perception. If a sensory organ is not well developed or damaged physically, will effect the sensation thus perception.



Factors affecting perception mental



speed



attention



memory



flexibility



Problem solving

Speed at which the data is processed, attention to a particular sensation, the amount of memory, flexibility in decision making, problem solving skills etc. Are the mental aspects which affects the perception.



Factors affecting perception

human



personality



experience

Personality and experience are the main two factors which affect the perception.

Till now we have covered about sensation, perception and factors affecting and influencing them. Now let us see how perception changes with number of senses involved.

What happens to perception when we rely on only one sense?

What happens when many senses are involved ?

What is the importance of multi-sensorial perception? Does it have any?

How perception changes with number of senses involved ?

An example



find this image : <http://www.dcresource.com/reviews/canon/a40-re-view/veggies.jpg>

Single sense

Scenario 1(only using eyes):
(Perception)A basket of fruits and vegetables.

Scenario 2(only using touch):
can feel the shape of fruits and vegetables, but can't arrive at a conclusion.

Multiple senses

By using multiple senses one can know that these are replica of fruits and vegetables kept in the basket. only from reading the sensations from 4 senses(visual, olfactory, gustatory, tactile) the brain arrives at this conclusion. Without using all senses we won't be able to completely understand the scene or the object here.

The order of sensing (different scenario), here illustrated is just for example. What matters is how much senses are involved.

Lets us look different examples, of products/objects which are multisensorial in nature and its values.

Multi- sensorial design

Example 02

Cookie cup - as a glass to drink hot tea/coffee

Product description

This is a cup for brewing tea/coffee, the cup is made up of same material as cookie and can be eaten after or during drinking tea/coffee.

What all sense involved and how it is affected?

Visual (the shape of the cup, texture of the cup, color etc),

Tactile (texture of the cup, shape of the handle),

Olfactorial (smell of the drink, smell of the cup) and

Gustatorial (taste of the drink, taste of the cup).



<http://www.yankodesign.com/2013/01/02/drinking-my-coffee-and-eating-it-too/>

The value

The product has both emotional and physical (price) value. People buy it for the special experience they get while having the drink and tea.



Multi- sensorial design Example 03

Earthen pot - cooking vessel

Product description

This is a picture of fish curry in earthen pot. Many places in India use such earthen pots for cooking sabjis and curry. From my memory, at my home we all prefer having fish curry in the earthen pot, since it imparts a particular taste to the curry. Many people in kerala still prefer making fish curry in this kind of vessels. Such vessels are carefully handled since the vessel becomes more “appropriate” by time. The smell and texture changes better by time. So more the old & used the pot is, more emotional value it has.



<http://myexperimentswithfood.blogspot.in/2011/01/kerala-style-fish-curry-naadan-meen.html>

What all sense involved?

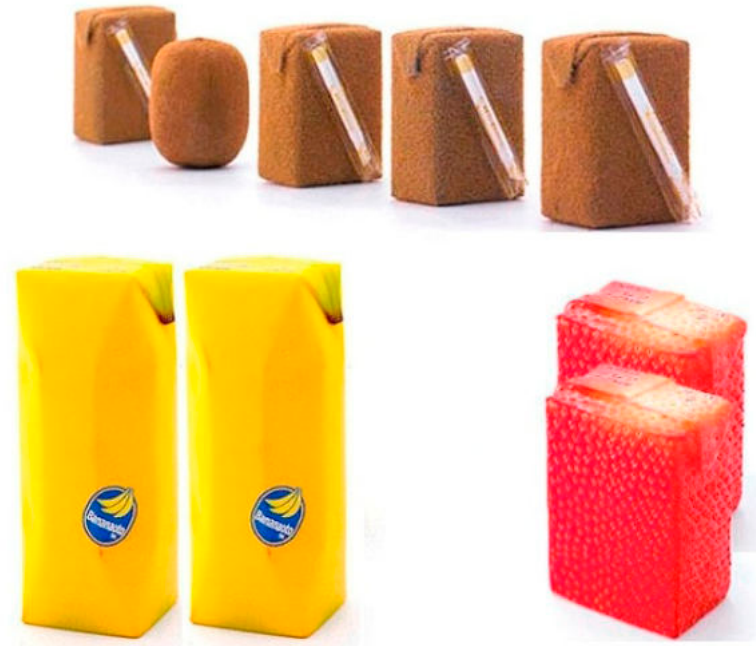
Visual, tactile, olfactorial and gustatorial.

Multi- sensorial design

Example 04

Packaging designs

This is packaging for fruit drinks, and the packaging represents the fruit. The texture of the fruit help in perceiving it as a more natural and like a fruit. Then senses involved are visual, tactile and while drinking, olfactorial and gustatorial. Such designs which are multi-sensorial, gives a better experience to the people



Naoto Fukasawa is a Japanese industrial designer that created these amazing and iconic juice packaging designs.

Know more : <http://inspiration-of-the-nation.com/2012/08/japanese-packaging-design-by-naoto-fukasawa.html>

Multi- sensorial design

Example 05

Umbrella made using coconut leaves.

This is not an umbrella designed to be multi-sensorial. These are the kinds of umbrellas which are used in olden times. Mostly it is made up of coconut flower wrap, and cane. The leaves are woven and fixed in a special manner. These umbrella gives a particular kind of smell.





Multi- sensorial design

Example 06

Scented invitation cards

Scented invitation cards are being gifted to dear and loved ones since ancient times. The greeting cards, wedding cards etc are given in such manner. The smell denotes the goodness of the news which come along with the letter or card. Such cards are remembered better because it involves one more sense and its memories in the brain. These have both cultural and product value.



<http://new-weddingdesign.net/scroll-wedding-invitations-card-design/scroll-wedding-invitations-card-ideas/>

What all sense involved and how it is affected?

The different types of texture(of the paper) : Tactile

Smell of the paper : Olfactorial

Visual elements(lines, shapes, patterns) : Visual

Multi- sensorial design

Example 07

Leather accessories - real leather

Leather products and accessories are usually considered as personal objects. According to the usage the leather will leave a particular texture and smell. For that reason people prefer personalized products to be made up of leather. People can smell it. The usage of a leather bag is more memorable than just any ordinary bag.

Leather bags are valued for its material value, and loved by people around the world.



<http://highonleather.com/blogs/all-about-leather-bags/35394821-average-cost-of-a-genuine-leather-bag>

What all sense involved and how it is affected
Visual, tactile and olfactorial elements are prominent here.

Multi- sensorial design

Example 08

Gaming

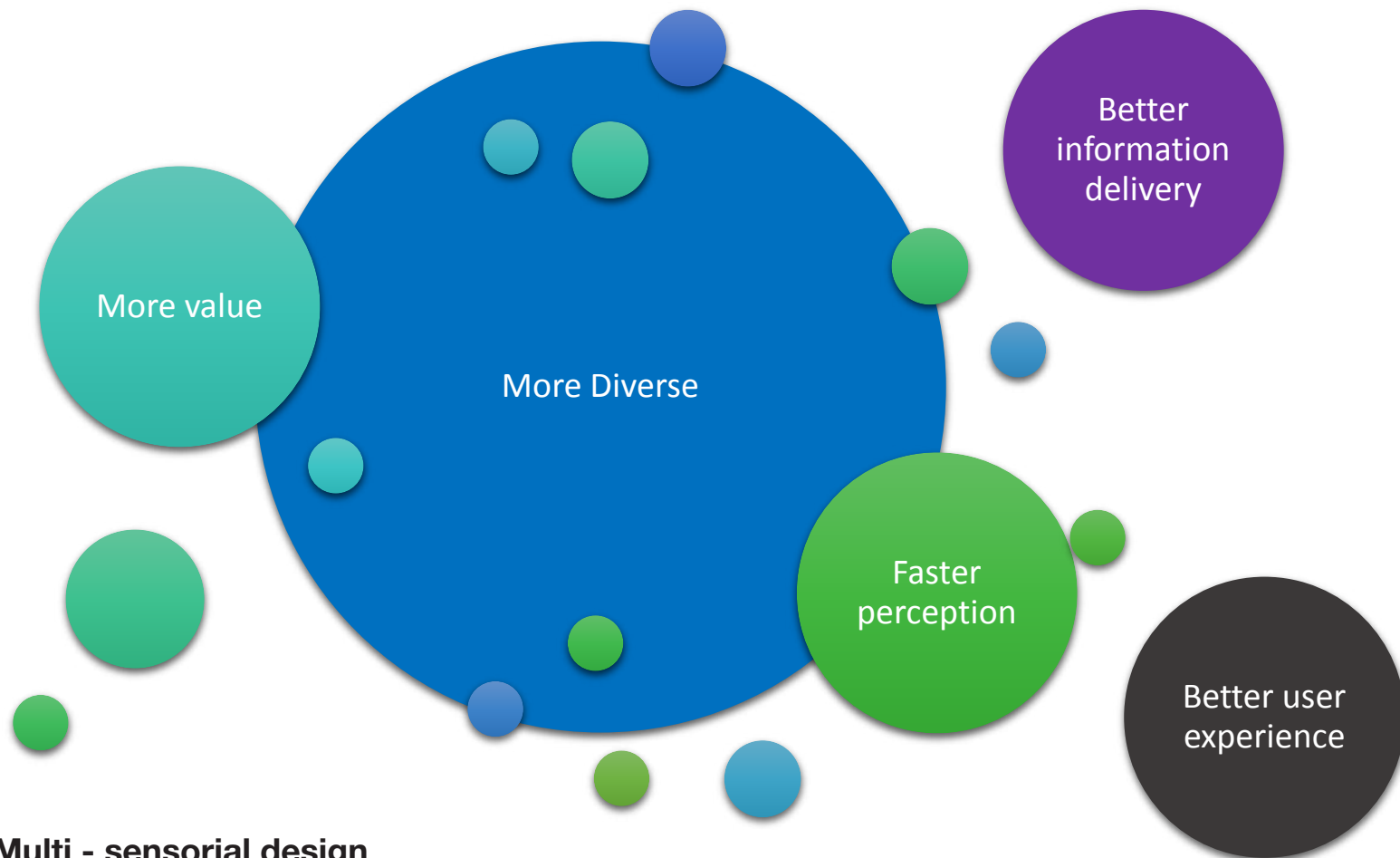
Gaming is a new domain which is popular among all the new generation kids. Games are addictive and enjoyable. A console is used to play the game, it might be a mobile or personal computer or laptop or a play-station etc. All of these includes three senses. Visual, aural and tactile. The display, the sound and the touch input to the game. Gaming is much more involving than a movie because it involves one more sense than movies and involves the user for the further progress of the game.



<http://digitalspyuk.cdnds.net/16/10/980x490/landscape-1457799119-oculus-rift.jpg>

The value is both emotional and (physical)material.

A game can almost give an real like experience to the user once played depending on the structure of the game.



Multi - sensorial design

We have seen the value of multi sensorial percpetion and its relevance in design.
It is time to change our current design process and
follow a Multi-sensorial design process which cater to all our senses.

“Design means being good, not just looking good”

What I have learned

In this DRS

I have learned about senses, sensory organs, sensation, how it works and how sensation affects the perception. Importance of perception. How perception influences in the design area.

I have understood about multi-sensorial perception, and its value addition to the design domain.

What I did

After understanding about sense, sensation and perception, I discovered various aspects which affect the perception. The knowledge about the factors which affects the perception, will help designers while designing to see & analyze what all elements they used will be effective or ineffective. I have also tried to come up with a process which can be used while designing, to make it experiential.

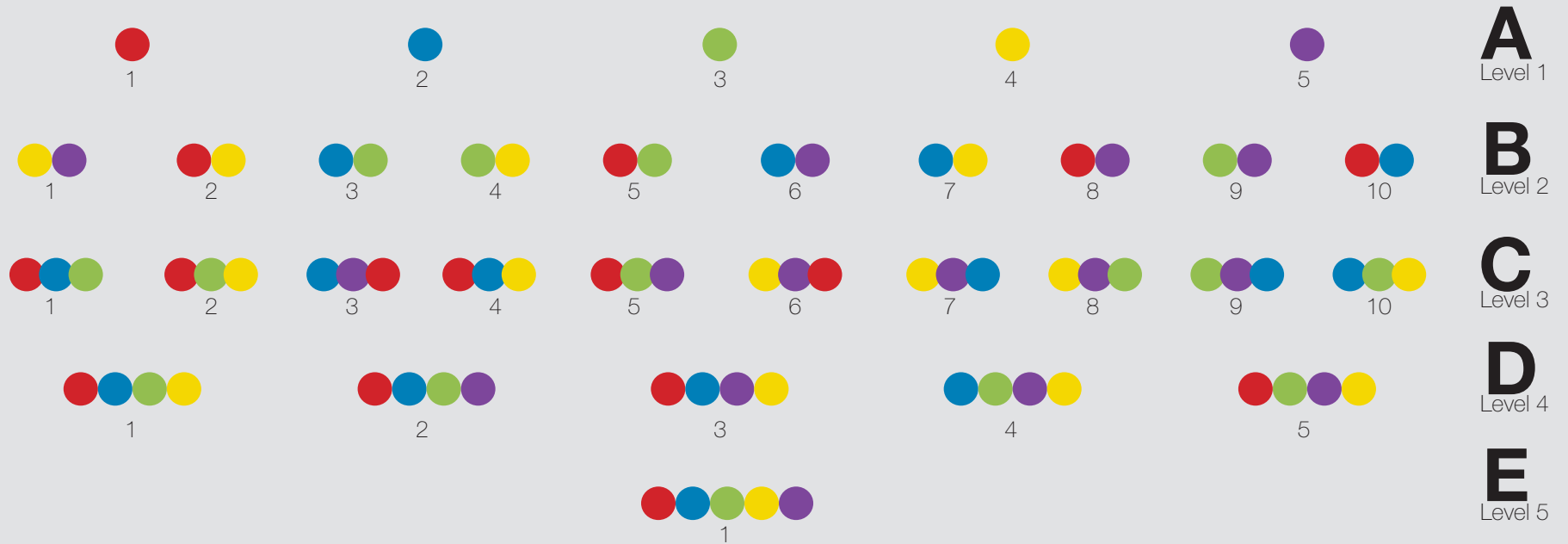
Within the time frame of this DRS I was not able to establish and validate the findings. A further in-depth study and research about the same is required to establish a new path or direction in the design.

The multi-sensorial perception & Design.

possible configuration of senses

below shown are the possible configurations of 5 senses

A - involves one sense. B - combination of two senses. C - combination of three senses.
D - combinations with 4 sense. E - all senses involved



A3 Sheet

Selected configuration :





	Visual	Aural	Olfactorial	Gustatorial	Tactile
Product configuration 1					
Product configuration 2					
Product configuration 3					
Product configuration 4					
Product configuration "n"					

An example of a table to mark and analyse the product configuraions

References

Human icon in page sensation : <div>Icons made by OCHA from www.flaticon.com is licensed by CC 3.0 BY</div>

Tall human silhouette free icon OCHAby OCHA in peoplePack: Humanitarian Icons 2

<http://health.howstuffworks.com/mental-health/human-nature/perception/human-senses-pictures.htm>

Bibliography

<https://en.wikipedia.org/wiki/Acoustics>

<http://plato.stanford.edu/entries/perception-auditory/#Conclusion>

<https://en.wikipedia.org/wiki/Odor>

https://en.wikipedia.org/wiki/Visual_perception

<https://en.wikipedia.org/wiki/Sound>

<https://en.wikipedia.org/wiki/Taste>

https://en.wikipedia.org/wiki/Somatosensory_system

Suggested books to read

Coren, Stanley Ward, Lawrence M. Enns, James T. 201190 **Sensation and perception** , 6th ed

Author : Pallasmaa, Juhani . **"Eyes of the skin : architecture and the senses"**, Chichester : John Wiley, 2005.

Soft mapping- by sugueev hara

(Smell this paper, my "thanks" is in the smell)

