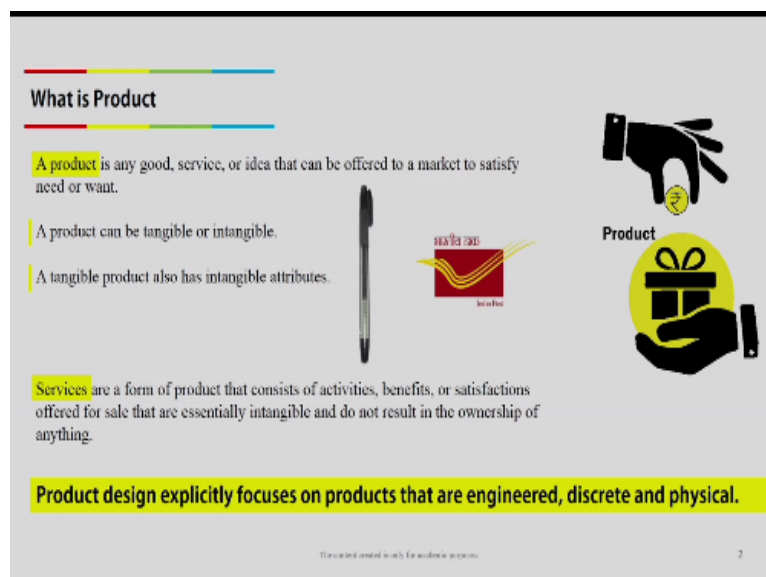


Product Design and Innovation
Mr. Supradip Das
Department of Design
Indian Institute of Technology - Guwahati

Lecture – 03
Product Design – Part I

Hello participants, so today in this module 1, lecture 3, we will be discussing about product design. So, our day starts with products and ends with products only, so in and around us there are many products but we should know what comes under the scope of product design and what is the definition of product, what are the types of products, so here in this lecture we will be discussing about different aspects of product.

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So, what is product? A product is any good, service or idea that can be offered to a market to satisfy need or want, any offering in the market satisfying human need or want is a product, so on that sense LIC policy is also a product but we should know what comes under the scope of product design, so a product can be tangible or intangible also. For example, pen; pen is a tangible product and when you go to Indian Post, you get a service, so that is intangible.

A tangible product also has intangible attribute for example, you have pen, you can write with this pen and you can experience the smoothness, its quality of grip and etc. and etc. So, these are intangible properties, so we also should know what is service; services are a form of product that consist of activities, benefits or satisfactions offered for sale that are essentially intangible and do not result in the ownership of anything.

So, in case of service the ownership is not changing in case of product, when it is satisfying need or want, the need can be favourable and unfavourable also, so provider selling it to the customer and customer is paying for it. In case of intangible products, we have to keep in mind 2 things; one; product is not in isolation, product is under product service and system, so in case of intangible products, we have to keep in mind 2 things; services and experience to satisfy our need or want.

And we also should keep in mind that product design explicitly focuses on products that are engineered, discrete and physical. What is discrete? Discrete means individually separate industrial mass manufacturing produces product which are discrete.

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Types of Product

Products can be classified as either consumer or business (industrial) products, depending on the buyer's intentions. The key distinction between the two types of products is their intended use.

Consumer products are the products purchased to satisfy an individual's personal needs or wants.

The products which are used as inputs to produce consumer products are known as **industrial products**

Sometimes the same item can be classified as either a business or a consumer product, depending on its intended use.

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Now, we will discuss the types of products, products can be classified as either consumer or business products depending on the buyer's intention. The key distinction between the two types of product is their intended use, so consumer products are products purchased to satisfy an individual personal need or wants and the products which are used as input to produce consumer products are known as industrial products.

For example, screws, we can ask the question that whether screws are industrial product or consumer product, if I am buying a screw to put on the wall to hang a photo frame on that case it is a consumer product, when it is used for example, LED machine then same screw will be considered as industrial product. So, sometimes the same item can be classified as either a business or a consumer product depending on its intended use.

Earlier, we used to call it RPT now, it is 3d printer machine, used to be huge and large big size now, it is coming as portable table top product. So, now same 3d printer has become consumer product.

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Types of Consumer Product

Consumer Products can be further classified as convenience product, shopping product, specialty product and unsought product.

A **convenience product** is a relatively inexpensive item that merits little shopping effort— that is, a consumer is unwilling to shop extensively for such an item. Candy, soft drinks, combs, small hardware items, dry cleaning, and car washes fall into the convenience product category.



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So, what are the types of consumer product? Consumer products can be further classified as convenience product, shopping product, specialty product and unsought product. A convenience product is a relatively inexpensive item that merits little shopping effort that is a consumer is unwilling to shop extensively for such an item, candy, soft drinks, comb, small hardware item, dry cleaning and car washes fall into the convenience product category.


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Types of Consumer Product

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A convenience product is a relatively inexpensive item that merits little shopping effort— that is, a consumer is unwilling to shop extensively for such an item. Candy, soft drinks, aspirin, small hardware items, dry cleaning, and car washes fall into the convenience product category.

A **shopping product** is usually more expensive than a convenience product and found in fewer stores. Consumers usually buy a shopping product only after comparing. TV, refrigerator, car, washing machine comes under this category.



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A shopping product is usually more expensive than a convenience product and found in fewer stores because of the price, consumer has to compare with in the same price what are the other brands giving and they come after comparing they go for buying, so consumers usually buy a shopping product only after comparing. So, TV, refrigerator, car, washing machine comes under this category.

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Specialty Products refer to those products which have certain special features due to which the buyers are willing to spend a lot of time and effort on the purchase of such products. These products are very costly, personalised and higher brand loyalty. For example designer clothes, jewellery, personalised car etc.



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Speciality products refer to those products which have certain special features due to which the buyers are willing to spend a lot of time and effort on the purchase of such products. These products are very costly and personalized and also have higher brand loyalty for example, designer clothes, jewellery, personalized car, etc.

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Types of Consumer Product


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An **unsought product** is one that is not actively sought out by a consumer, but is instead purchased due to fear, precaution etc. Mask, safety goggles, offerings for temples, fire extinguishers etc. falls under this category.



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An unsought product is one that is not actively sought out by a consumer but is instead purchased due to fear, precaution etc. mask, safety goggles, offerings, for temples, fire extinguishers, etc. falls under this category.

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Product design explicitly focuses on consumer products, but not limited to it.

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So, we have to keep in mind the product design explicitly focuses on consumer products that are not perishable but not limited to nowadays, the scope of the product design expanded over time and because of that lot many product designers go beyond the boundary of the product design and on design other products also.

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Need Vs Want

Need: a lack of a basic requirement.
Want: a specific requirement of products to satisfy a need.

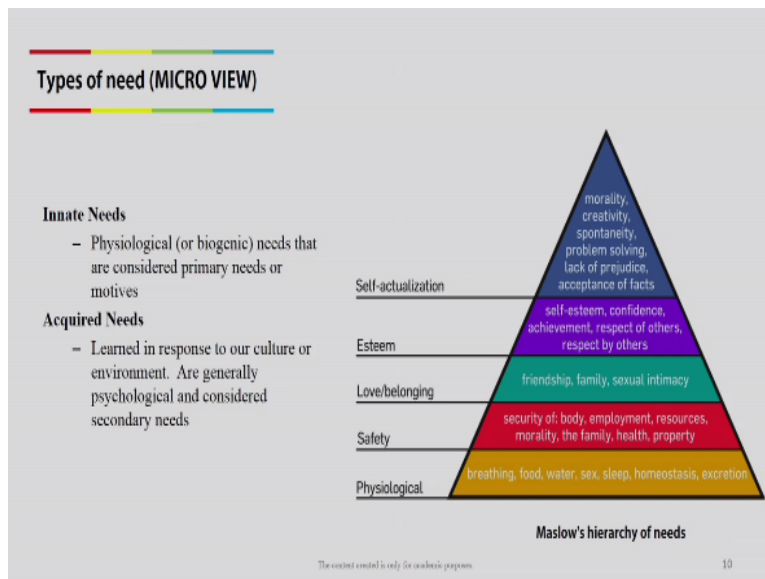
The slide features an illustration of two silhouettes of people's heads facing each other, with two speech bubbles (one orange, one green) between them. To the right is a smartphone with an apple logo on its screen.

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What is need and want? Need is a lack of basic requirement and want is a specific requirement of product to satisfy a need for example, you need a phone to communicate but when you ask, I need an Apple phone to communicate it is what. So, a specific requirement is coming in picture

when you are saying that yes, I need Apple phone. Another thing here we have to keep in mind that when your financial capacity reinforces the want, it becomes demand.

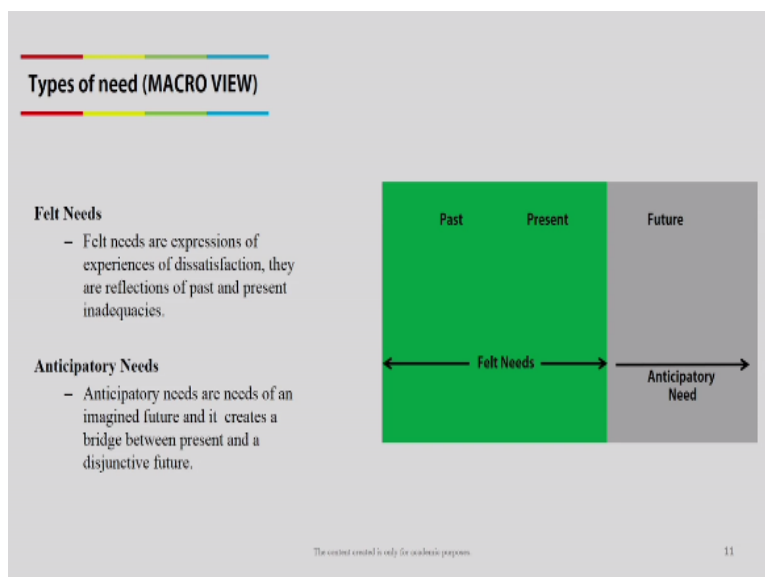
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Now, we should know different types of needs, so there are in micro view, 2 types of needs. One is innate need; another is acquired need. Innate needs are physiological that are also considered primary needs or motives. Breathing, food, water, sex, sleep, etc. comes under physiological needs. Acquired needs are learned in response to our culture or environment and are also generally psychological and considered secondary needs.

Safety needs, belonging needs, esteem needs, self-actualization needs come under acquired needs, so these are well explained by Maslow's hierarchy of needs.

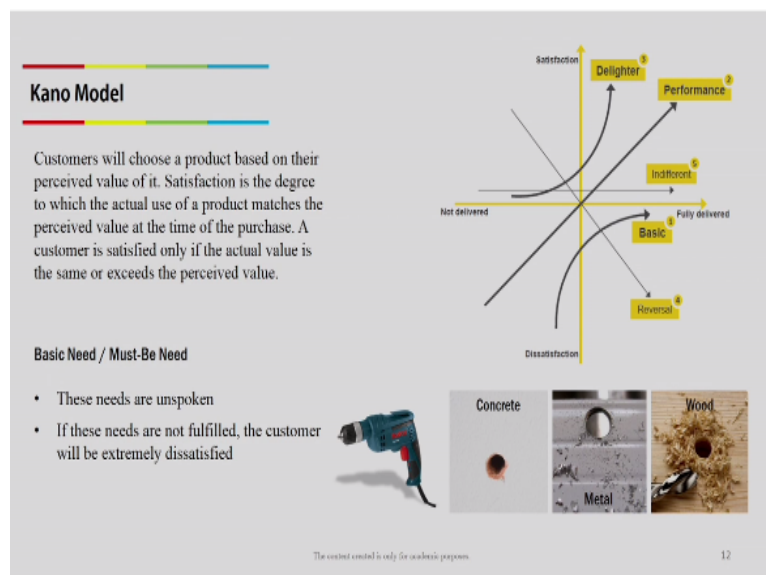
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So, now we will discuss types of need as per the macro view, so there are 2 types of need according to the macro view. One is felt need, another is anticipatory need, felt needs are expressions of experiences of dissatisfaction, they are reflections of past and present inadequacies. So, in case of felt need, if we go to a community and find out user need, they will tell about their past experiences and present experiences.

And based on that designer designs but the designer is going to design for the future and hence felt need is not sufficient enough, what you need; you need anticipatory need but most of the time, designer do not consider this anticipatory need so, anticipatory needs are needs of an imagined future and it creates a bridge between present and a disjunctive future. So, in case of anticipatory need, we are at present and we do not know the future point.

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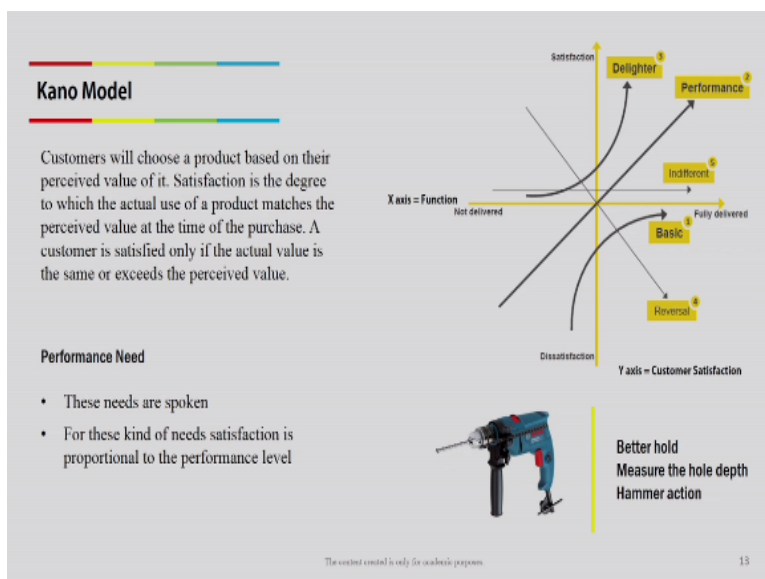
But we are anticipating a need and that is that anticipatory need is creating a bridge now, let us explain Kano model and let us see different kind of need. So, customers will choose a product based on their perceived value of it, satisfaction is the degree to which the actual use of a product matches the perceived value at the time of purchase. A customer is satisfied only if the actual value is the same or exceeds the perceived value.

And that is why Kano explained product function and customer satisfaction through a graph, so in this graph you can see in this x-axis, it is function, fully delivered and function not delivered on the vertical axis, which is y, it is on the top it is satisfaction and in the bottom it is dissatisfaction, so Kano explain that first need is basic need, which is must be need and these needs are unspoken.

Unspoken because customers take it granted, they assume that these facilities should be there in the product and if these needs are not fulfilled, the customer will be extremely dissatisfied for example, in case of drill when we are buying a drill, we are actually buying holes, we expect that the drill will be able to make holes on different kind of material such as concrete, metal, wood etc.

And we take it granted and if this needs are fulfilled, then customer will be satisfied in this case, let me give you another example in the case of service design. For example, you are booking a cab and you called the cab, you expect that the cab will take you from point A to point B but when you call the driver, driver will decline your request because he does not want to go to that point so, you are extremely dissatisfied.

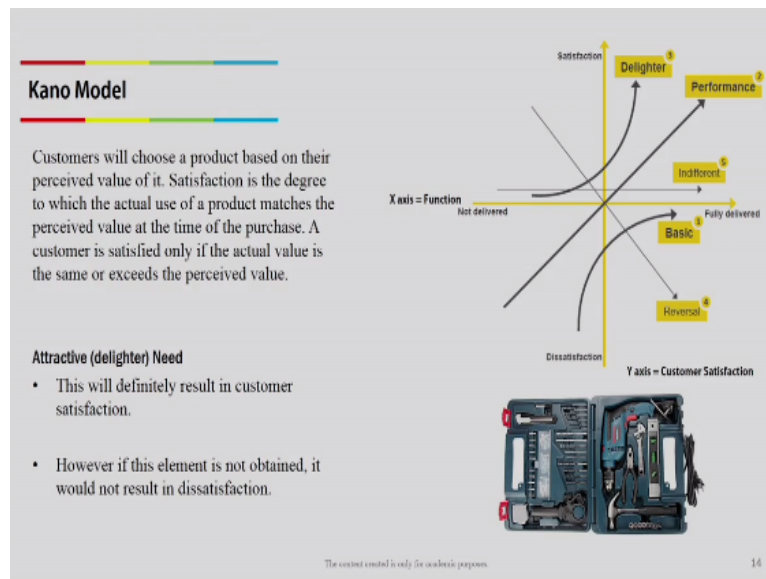
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So that is how Kano explained basic need now, let us explain performance need, so these needs are spoken and for this kind of need, satisfaction is proportional to the performance level. In case of drill, if there is better hold, there is measurement capacity of hole depth and hammering action for example, then the performance of the drill is good and customer will buy this product and their satisfaction will be high.

In case of service design for example, you called a cab and you are in hurry and you request the driver that I want to go fast and he is taking you through a path which is traffic less and he has taken a shortcut route and you are going early and then you are very satisfied, so performance of the driver here is satisfactory.

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Next need is attractive or delightful need, this will definitely result in customer satisfaction however, if this element is not obtained it would not result in this satisfaction for example, in the case of drill you are providing a good box, you are providing different kind of tool bits for example, for concrete, for wood, for metal so, different kind of tool bits and other tools required like plier, spanner etc., etc. so, these are delighting you.

So, for example in service design, you are inside the cab, the driver is offering you a bottle of cold water and also he is asking that sir that is Wi-Fi in the cab, you can use it, so you did not expect this kind of facilities inside the cab but when you got this kind of facilities, you got delighted though if it is not there then also you are satisfied so, here I have to mention that this delightful need overtime period becomes basic need.

Why? Because other competitors over period of time will take this idea and they will also start offering it and that is how it will become a basic need, people will take it granted that this facility should be there, when I am going for this kind of product or service. For example, earlier Wi-Fi in hotel rooms who are not considered as basic need nowadays, it is basic need without Wi-Fi no one will book hotel rooms.

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Kano Model

Customers will choose a product based on their perceived value of it. Satisfaction is the degree to which the actual use of a product matches the perceived value at the time of the purchase. A customer is satisfied only if the actual value is the same or exceeds the perceived value.

Reverse Need

- Too much of anything increases complexity
- Reverse requirements bring more satisfaction if absent than if present

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Next is reverse need, so too much of anything increases complexity so, reverse requirement brings more satisfaction if absent then, if present so, if you are giving more choices then it is always confusing for the customer because they are not expert on that category, so they do not know which one to buy. So, another example is you are going to the restaurant and they are giving you a 50-page menu, you are confused, you do not know which one to select, so to customer you should not give too much options.

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Kano Model

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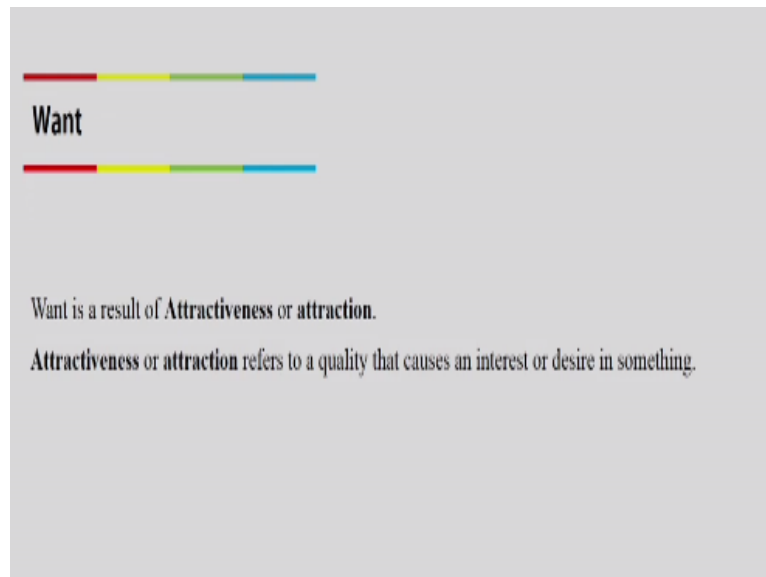
Indifferent Need

- The level of customer satisfaction will not be affected by this factor

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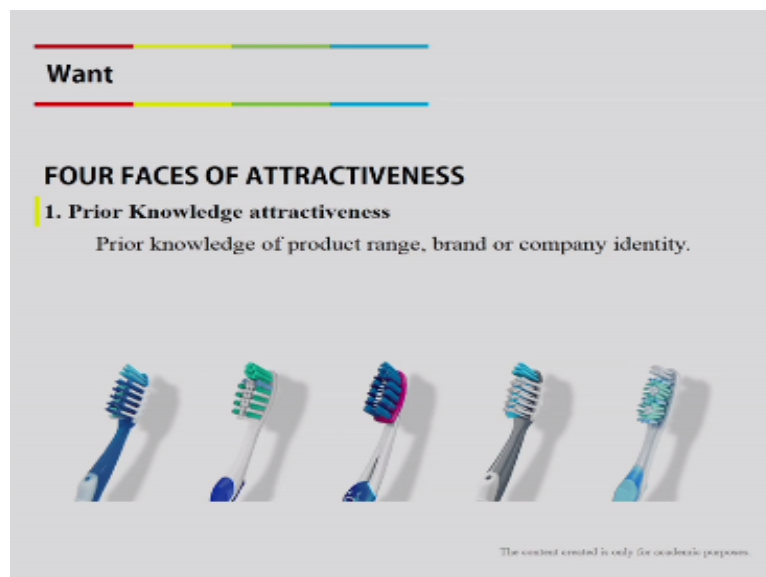
Another need is in different need, so the level of customer satisfaction will not be affected by this factor for example, the logo of the product so, where the logo is used, what is the colour, whether it is orange or on the black background or white on black background, what is this dimension of the logo that is indifferent for the customer.

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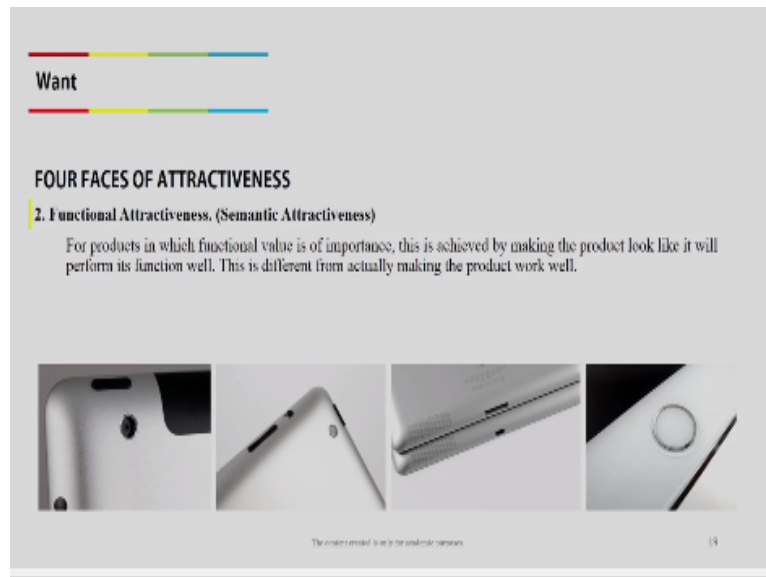
So, now we will discuss about want. Want is a result of attractiveness or attraction; attractiveness or attraction refers to a quality that causes an interest or desire in something. So, want is a product of attractiveness, so we also should know why this attractiveness happens. Basically, the different faces of attractiveness, there are 4 faces of attractiveness.

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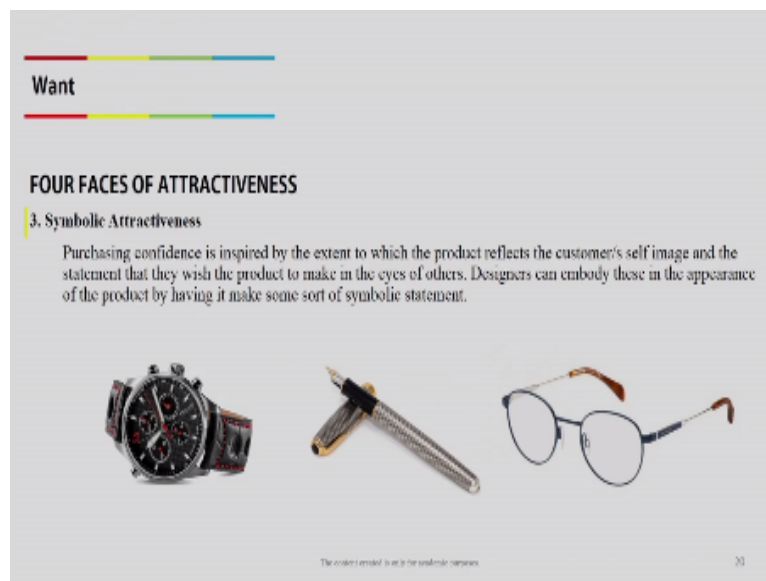
The first is prior knowledge attractiveness, prior knowledge of product range, brand or company identity will help you to buy a product for example, you know that Nike is producing good shoes or oral b is producing good brushes, so you will go for this kind of product because prior information is there and guiding you to buy this kind of product.

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Next is functional attractiveness or also considered a semantic attractiveness, for products in which functional value is of importance, this is achieved by making the product look like it will perform its function well, this is different from actually making it product well. So, you are making the product in such a way that it will look like good functional product.

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Third is symbolic attractiveness, so purchasing confidence is inspired by the extent to which the product reflects the customer's self-image and the statement that they wish the product to make in the eyes of the others, you will go with those products which are symbolically representing your attitude, your personality, so designer can embody these in the appearance of the product by having it make some sort of symbolic statement.

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Want

FOUR FACES OF ATTRACTIVENESS

4. Inherent attractiveness of visual Form

At the root of visual appearance, for a product of any sort, is that most elusive and intangible quality: its elegance, its beauty, its intrinsic aesthetic appeal. It evokes emotion, pleasure, sensuality and sense of ownership.

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Fourth face is inherent attractiveness of visual form, at the root of visual appearance for a product of any sort is that most elusive and intangible quality, its elegance, its beauty, its intrinsic aesthetic appeal. It evokes emotion, pleasure, sensuality and sense of ownership, in this particular case you can see in these products, the transparency, the quality of the; quality and the texture of the product and the form of the product is attracting customers.

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Levels of Product

There are three levels of product and services. Each level adds more customer value to it.

Core customer value

It addresses the question
"What is the buyer really buying?"

When designing products, designer should consider the core, problem-solving benefits or services that consumers seek.

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So, now we will discuss about levels of products, there are 3 level of product and services, each level adds more customer value to it. First level is core customer value, as I already explained in case of drill what we actually buy, we buy holes, so we will see whether the drill is able to make holes on different kind of surfaces or not. In case of utensil, we will see whether it can make good food or not.

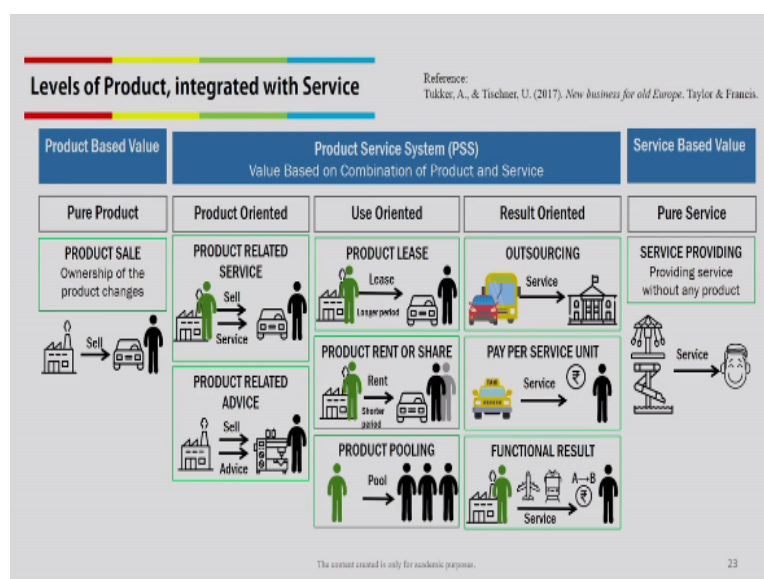
So, for core customer value; I should ask question, what is the buyer really buying? So, when designing products designer should consider the core, problem solving benefits or services that consumer's seeks. The next level is actual product; in this part, the different features of the product for example, whether it has a hammering action or not, whether it has hole depth measuring facility or not, whether it has a good grip or not that we will see.

We will also see the design of it, the form and etc. we will see how it has been packaged, the quality of the material and the manufacturing, we will also see branding. On the third level, we will see after sales service, so we are buying a product and after six months if it gets it; if it has any problem then where should I go, how would I make it repair, so these things will consider under after sales service, whether it has warranty period, if any parts are having problem, then will I get replacement or not.

We will also see in the third level, augmented product level product support; product support is different from after sales service. In the product support for example, you are buying a product the representative of the company will come to your house or any premises and they will help you how to use this product or how you can use this kind of product and if any kind of problem occurs and how to handle all those issues.

So, another thing is delivery and credit, is there any if the price is high, then is there any credit option and how it would be delivered at your house that is also considered in the augmented level.

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Now, we will discuss about the levels of product integrated with services, so there are 3 levels; one is product based value, second is product service and system where products will be involved and also service also will come along with the product and the third level is pure service. In the product based value, it is pure product for example, when you are buying a car, you are going to the dealer and you are buying this car.

So, ownership of the product is changing, second level is product service and system, in this there are 3 levels; one is product oriented. In the product oriented service, there are also 2 parts; one is product related service for example, you are buying a car and for a time period, the manufacturer is giving you service, so you are going with the car and you are getting the service.

Second level is product related advice for example, you are buying a machine tool for example, Festool okay, so that is a brand if you buy products from Festool for your workshop, then company representative will come to your place and they will give demonstration as well as they will give you training, so they will advise you what can be manufactured with this kind of tools, how to use this kind of tools and etc., etc.

Next level is use oriented, in this there are 3 level; one is product lease, so when you are taking a product for longer period on lease, you are getting the product and as well as you are taking the service for example, if you pay 3000 dollars, you can take Rolls-Royce for 1 month, second level is product rent or share. The difference between rent and lease is the time period in case of rent; it is shorter period of time.

For example, you are taking rent a car for one day again, when you are returning the product, the second person will use it. Third example is; third part is product pooling for example, you are going from one point to another point, let us say point A to point B and you would like to share your cab seats, so you will declare that yes I am going alone, there are other 3 seats also in my car, people going from point A to B tomorrow at such and such time can join me.

So, you are giving this service against some money, the third level is a result oriented under the section product service system. In result oriented, there are 3 levels; one is outsourcing, sometimes some organization do not want to buy cars or buses, so they outsource the facility

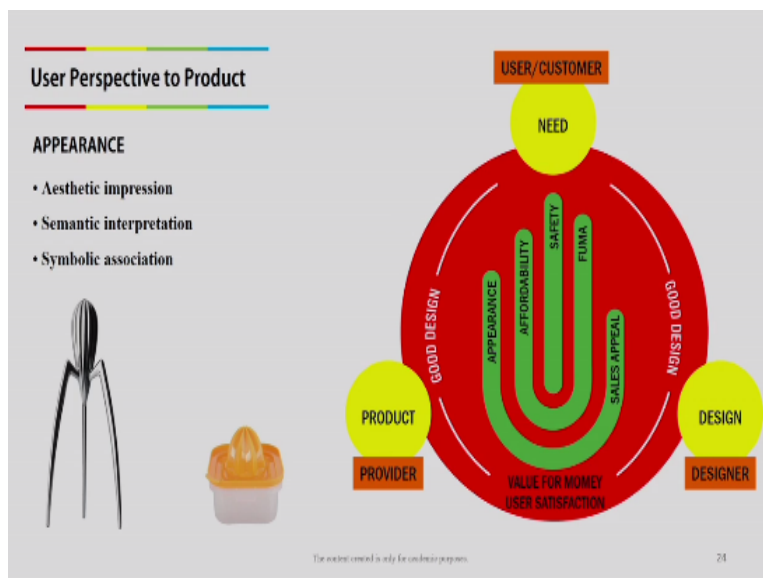
for example, IIT, Guwahati is outsourcing this facility from Greenville though they are not buying this buses, so they are taking this service; bus service from Greenville.

Second part is pay per service unit, good example is any kind of cab service, you are calling the cab, so distance basis you are paying them. Next level is functional result, so in this category you are going from point A to point B and you are not thinking about how you are going, the service provider will take you from point A to point B, it may be train, it may be aeroplane, it may be bus anything okay.

So, you are concerned about how to go from point A to point B for example, you are sending your parents to Vaishno Devi, so you are concerned about how your parents will go to Vaishno Devi and visit and come back okay, so the service provider, the travel agent will take them from your place to Vaishno Devi, so that is not your concern, so you want to go and you want to get a comfortable service that is it.

The third level is service based value, where you will get pure service. In case of pure service, service provider who will not give you any product, they will give you only services for example, any kind of amusement park or museum, if you are going there you are not getting any product, you are getting services, you are paying and you are experiencing the service.

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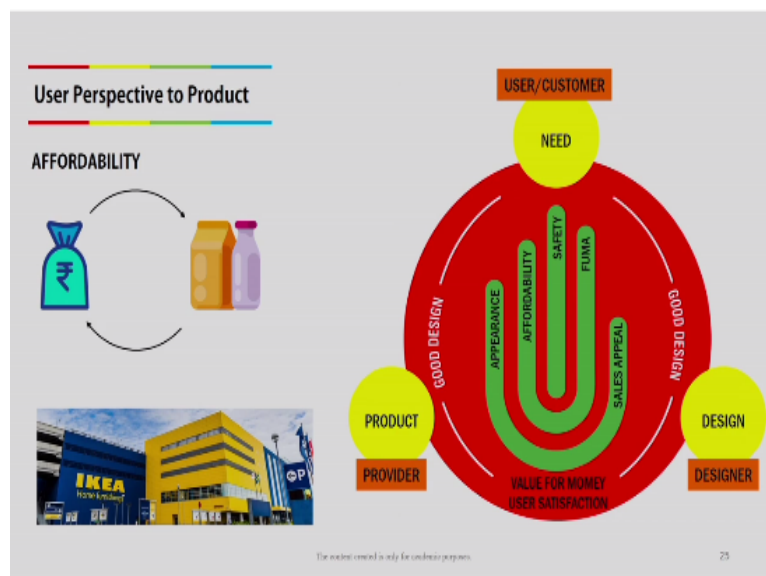
Now, we will discuss about user perspective to product, so there is a need and designer will design the product and provider will provide the product yes, the product is there in the market but whether it is a good product or not that consumer will decide based on some criteria and

these criteria are appearance, affordability, safety, Fuma and sales appeal. So, let us discuss aesthetic, now let us discuss appearance.

In appearance, there are 3 things; aesthetic impression, semantic interpretation, symbolic association, so what is aesthetic impression? This is the first emotional response between product and customer, customer look at the product and product evokes emotion, it may be positive and may be negative also. If it is positive, the customer will grab it and see the other details.

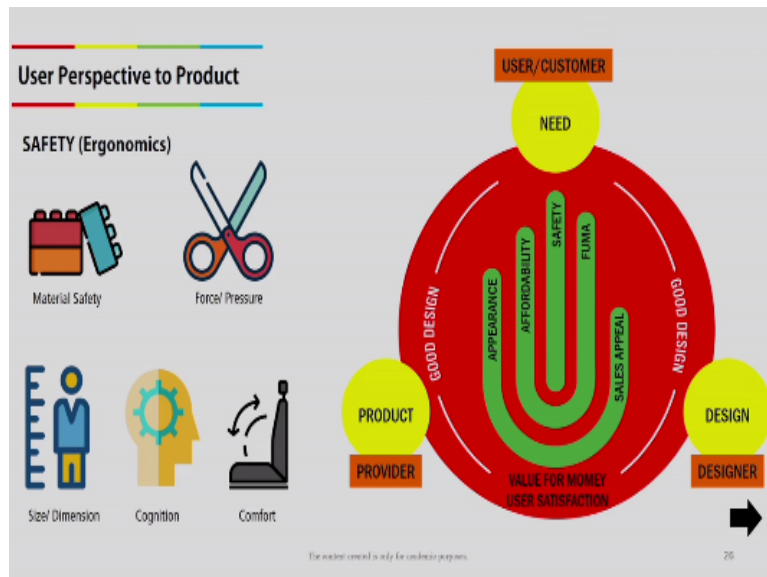
Next part is semantic interpretation, this can be defined as what the product intends to describe about its function performance and qualities, this can also be a response to the operation which the form is trying to underline basically it is affordance. The third part is symbolic association, this is the perception of social status and significance of the product, how is it fitting into my personal status, whether the design represents the owner or user.

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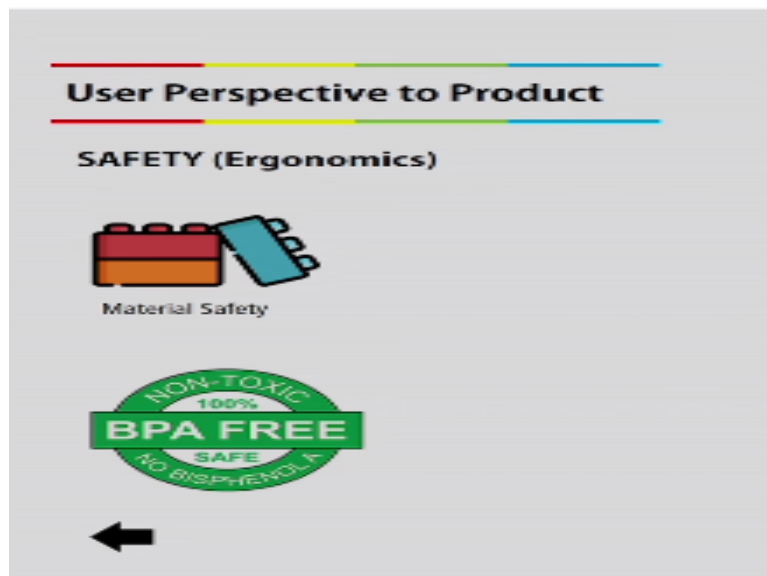
The personal significance of the design may outweigh the social significance. Next part is affordability; while purchasing a product, user always see first for rupees X what I am getting, second; what other brands are giving, third; what USP it has, so here for example, if you go to Ikea, you will get good products with less price, so consumer will always see for a price X what I am getting, what are the quality I am getting.

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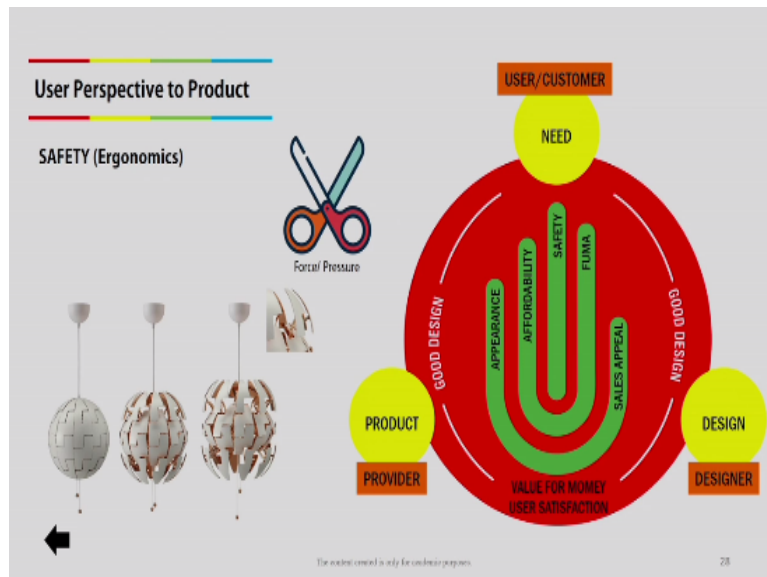
Third is safety, in safety there are many aspects like material safety, how much force and pressure I am applying, size and dimension, cognition, comfort.

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In case of material safety for example, if you are buying toys for kids or any kind of product for kids, you have to see whether it is BPA free or not, whether it is nontoxic or not, so this kind of things will come under material safety.

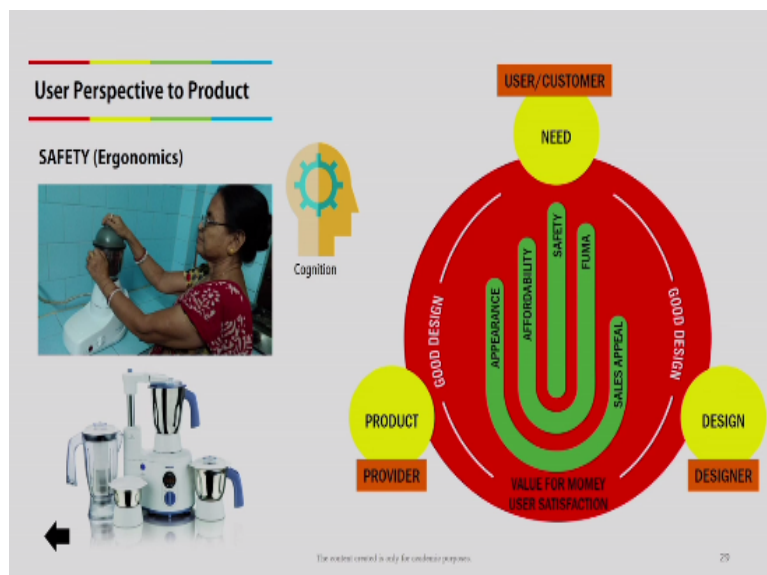
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Consumer will also see how much pressure I am applying to do a task for the product for example, this is a light in; if you go to Ikea store you will get this kind of light, so when you need this light to be functional, you can pull the strings and easily it will open up with very small amount of force, so this kind of facilities should be there in your product, then you have to consider size and dimension.

So, there are different anthropometric dimensions and your product should be designed in such a way that it fulfils human variability, consumer also see different kind of cognitive aspects.

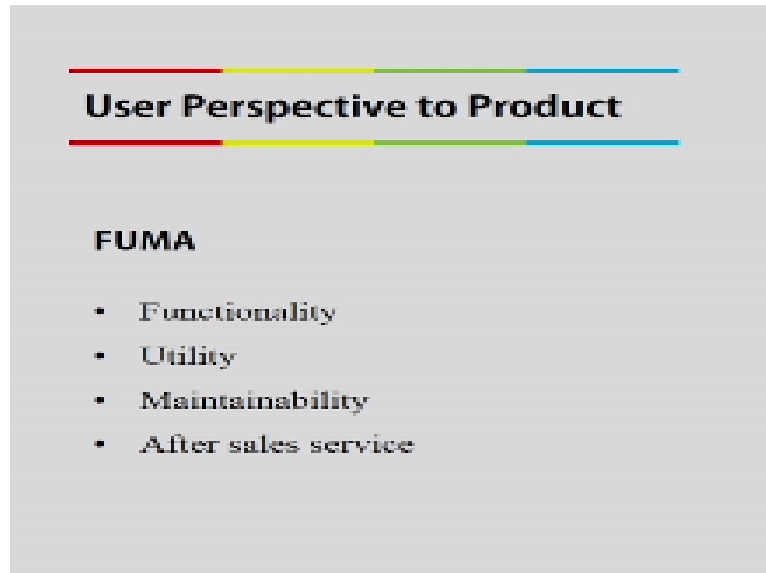
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For example, if you are using a mixer grinder, if you; you can see different kitchen and women's are holding the top of the mixer grinder it is because they have a fear that the top will open up and it will create a mess in the kitchen so and to fulfil this, the manufacturer should

provide product, such product which will satisfy their cognitive aspects. For example, Philips has provided this mixer grinder where the stand is there and it will hold the lead of the mixer grinder.

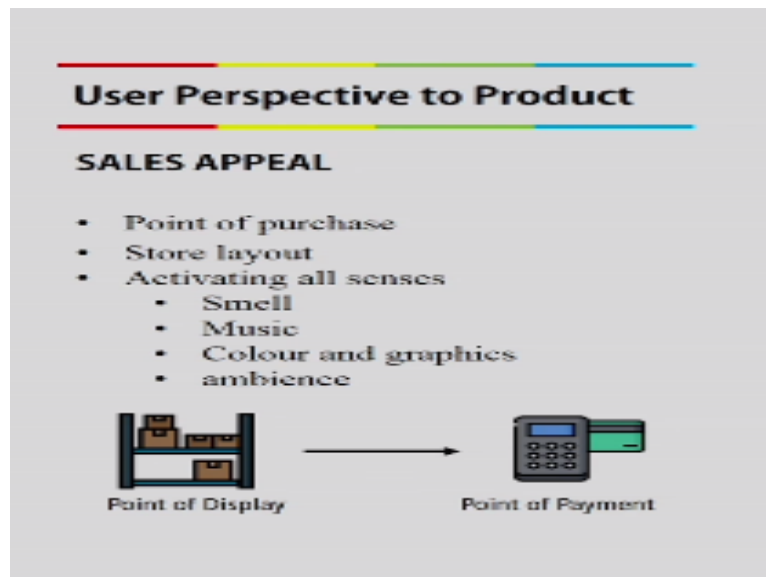
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Consumer will also see the comfort level where while using the product, the next part is FUMA. F for functionality, U for utility, M for maintainability, A for after sale service, so functionality is the quality of being suited to serve a purpose perfectly, an utility is the quality or condition of being useful, maintainability is the ease with which a product can be maintained in order to maximize a product's useful life.

And after sales service refers to various processes which make sure customers are satisfied with the products and services of the organization.

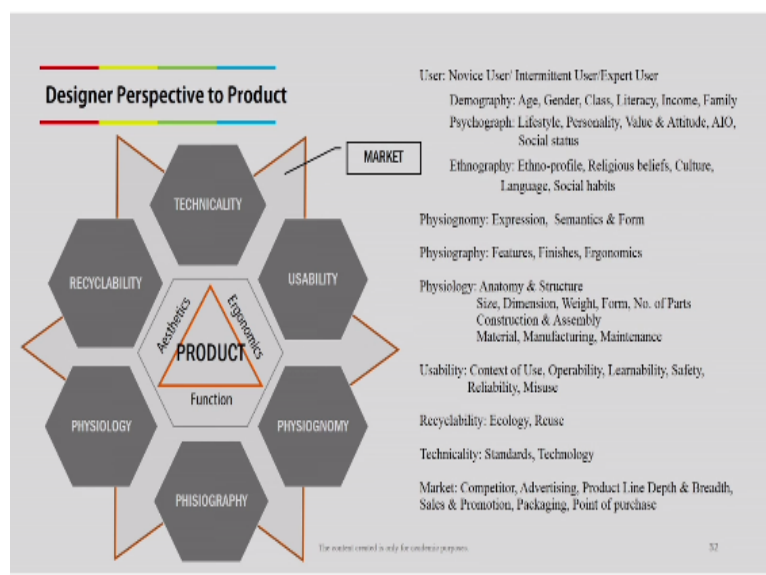
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Next part is sales appeal, as an industrial designer Henry Dreyfuss saw the emotional connect between product and the customer through sales; it is an exclusive psychological value the product must possess, it is the subtle silent selling the product must do over and above its eye appeal. The product must express quality through its unity of design, through texture, through simplicity and frankness soundlessly, it proclaims the excellence of its concealed mechanism and integrity of its manufacture.

It is a mixture of how a product feels to touch, how it operates and the association of please and ideas it creates in the purchases mind, so in the sales appeal point of purchase, store layout activating all senses using smell, music, colour and graphics, ambience, everything will come under this. Basically, point of display to point of payment is considered under sales appeal.

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Now, let us discuss about designer perspective to product, when designing a product, a designer should consider the holistic view, in this it started from the design space, what is the design space? The design space is consisting of 3 things; aesthetics, functions and ergonomics, so how to enter inside the design space? First thing designer considers whether should icons apply a functional strategy or aesthetic design strategy or ergonomic design strategy.

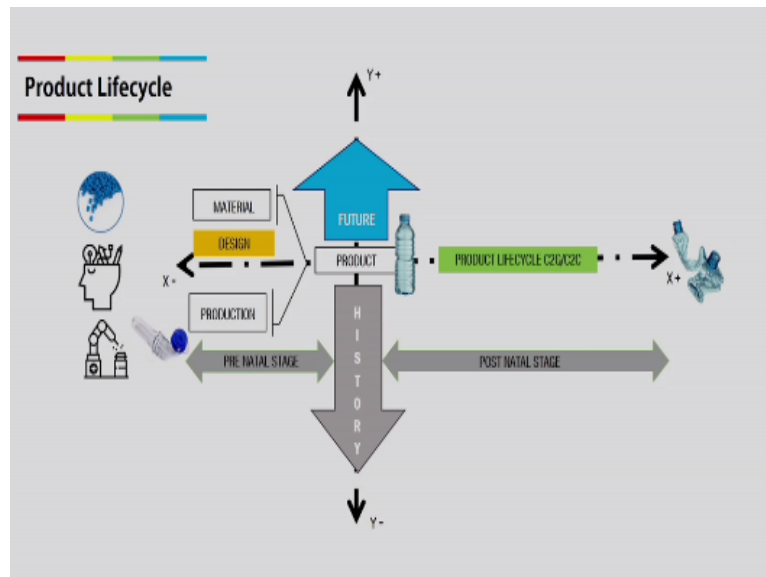
Then, it starts with user, whether it is Novice user, Intermittent user or Expert user, designer also consider demographic condition of the user, under this designer will see age, gender, class, literacy, income, family, designer will also see psychograph; lifestyle, personality, value and attitude, AIO and social status. So, what is AIO; activity interest and opinion. Designer next will see the Ethnography, the Ethno profile of the user, religious beliefs of the user and culture, language, social habits, etc., etc.

The next thing is Physiognomy; under this the expression of the product, the product form and its semantics will be considered. Next is Physiography; under this, the product features, attributes, the finishes and ergonomics will come under this. Next is Physiology; under this, anatomy and structure will be considered, the size, dimension, weight, number of parts, construction and assembly, material, manufacturing, maintenance, so this will come under physiology.

Under usability; the context of use, operability, learnability, safety, reliability, misuse has to be considered, designer also should see recyclability, how it is affecting the environment, the ecology, the reuse whether the material used in the product can be up cycle or down cycle that things. Next is technicality; designer should see different kind of standards; the technology every country has for different kind of standards like BIA standards.

And for each product, there are different kinds of standards, so designers should see all those standards. On top of all those, designers also should see how a product will be placed in the market, so designer also will have to consider the competitor, how it will be advertised product line depth and breadth, sales and promotion, packaging, point of purchase etc. and etc.

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So, now we will discuss about product lifecycle, so in the product lifecycle you can see there are 2 axes; x axis and y axis. In the x axis, the first material is considered design thinking comes and with the help of production, product is produced basically, it takes its birth. So, there are 2 parts; one is prenatal stage and another is postnatal stage. So, in the prenatal stage, design thinking comes and with the help of production techniques and different kinds of material a product is manufactured.

For specifically, in this case, I have taken an example of bottle, so to make a blue bottle, I have to take blue granules, the pet polyethylene terephthalate and I will procure preforms from other companies and with the help of blow stretching, I will make the product, so in the prenatal stage, the product will be manufactured and then product takes birth basically, product is introduced in the market.

In the postnatal stage, the product goes for use, user uses it and then after use, they can throw it. After use, there are 2 parts; one is up cycling and another is down cycling, if the material can be recycled and can be made other products, then it is up cycling, if it is going to the dump yard and it is down cycling. In the y axis you can see, in the positive side it is future and in the negative side, it is history.

So, before manufacturing this product, a particular design firm or manufacturing unit produce different kind of other bottles also, so product has its own history also and in future, they will make other bottles also which may have different kind of form, so a particular product has a future and it has a history.

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PRODUCT DEVELOPMENT	PRODUCT DESIGN
<i>concept</i> → <i>market readiness</i>	<i>Technical/ design activities</i>
New Product Vision Market study Concept generation Technical Engineering Design Prototyping Production Validation of the Product Design Marketing efforts Distribution channels Introducing the new product	Refinement of the Product Vision New Concept Development Detail design Prototyping and Production Functional testing and usability testing

So, let us discuss about the difference between product development and product design. Product development is from concept to market readiness, in this new product vision comes and then, design team do market study, they go for concept generation, technical engineering design, prototyping, production, then goes for validation of the product design, then goes for marketing effort and then distributing; distribution channels and introducing the new product in the market.

So, in the product development from concept to the market is considered and in the design, technical design activities are involved where a refinement of the product vision, new concept development, detailed design, prototyping and production, functional testing and usability testing is done but now, it is product design scope has expanded and product designer also do product development.

So, nowadays if you see in most of the design forms, there is hardly a distinction between product design and product development, so product designer should also know the different aspects of marketing, different aspects of manufacturing and etc., etc.