Product Design and Innovation
Dr. Swati Pal
Department of Design
Indian Institute of Technology – Guwahati

Lecture – 12
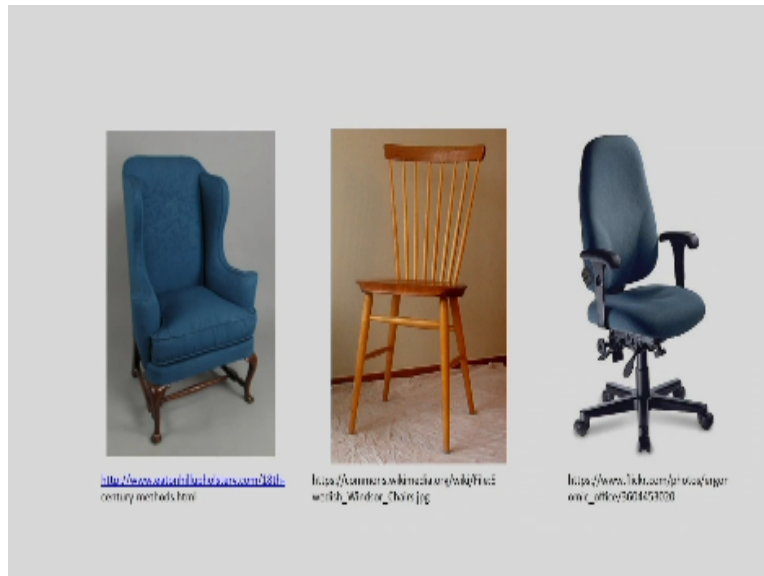**Physical Ergonomics Principles and Issues (Part 2) Biomechanics**

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Welcome, going to the next thing we will discuss the cognitive and emotional aspects of Human factors with respect to product design and innovation. So, what are the cognitive and emotional aspects?

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Now I can show you one picture and 3 chairs are there so as you can see a product is whatever we have discussed up to this point it is mainly the physical feet and how it will be useable from the point of physical aspect of the person what is the ability and limitations. But in a product something more is there, if you see all these products like these three it is obviously going with you criteria that it is fitting or body we can sit here something like this.

Yeah we see the adjustments is there but mostly these 3 chairs is usable but obviously these products are giving you some more message. So, conventionally we used to follow that form follow function what we have discussed and how physical ergonomics aspects you should incorporate in your product. But it is something more if you see this product from the first glance you can understand that this product though it is the same chair.

But it is obviously one is different from other. So, how it is different because this is something you can understand it is obviously used for office, it can be used at home, it is something very relaxing when you are watching TV you can see it is more comfortable. So, it has very soft cushion is there. It is very nice but it is wooden and you have something you can adjust. You can move from one place to another all those things.
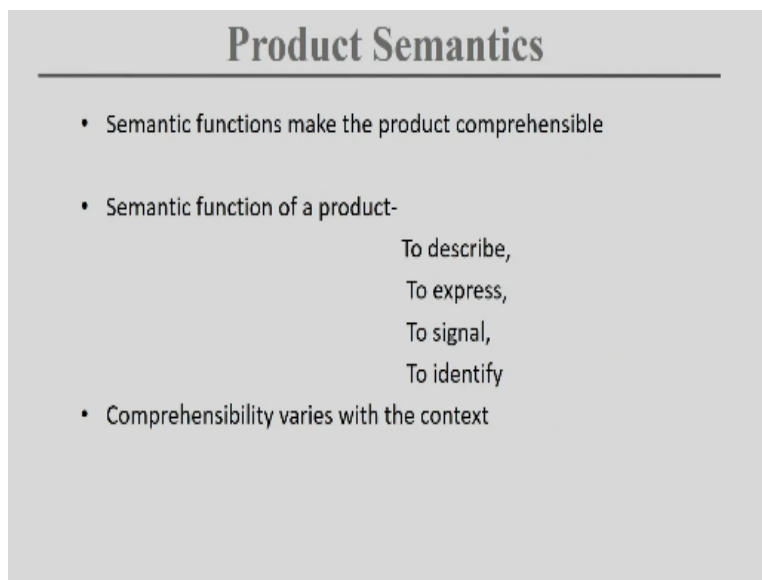
So, this product or this picture has some message. This product has some messages more than the physical feet and physical ergonomics aspect. So, each and every product is conveying some

message to you. So, we need to think what type of message so if you think this product just from one glance of this product. You can identify where you can use who can be fitted there where you can put it how soft that can be with this thing you can think of softness.

It is not soft and it is hard or this can be mobile from one place to . So, whether it is portable and whether you can fold it or so whether you can move it very easily so all those messages are inherent in this product. So, that we will discuss in the cognitive and how soft we are expecting softness here and we are thinking that this product will be soft. Those things we can understand from these cognitive and emotional aspects of human factors.

With respect to product design and innovation we will do an overview.
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Product Semantics

- Semantic functions make the product comprehensible

- Semantic function of a product-

  To describe,

  To express,

  To signal,

  To identify

- Comprehensibility varies with the context

So, first is what we are doing is from this picture you can understand this we can use this picture we can adjust this thing, we can rotate here it will come down. So, we are trying to comprehend some information after seeing this after looking this thing we are expecting something this is very obvious when we are seeing some tap or something in few cases we understand we have to rotate it.

May be it is circular so that is why in some cases you will see you have to pull it or you have to push it down so then your tap will be opened. So, these are the features of the visual clue it is

given by the product. So, in the product design if it is inherent so you can use that product very easily that is called product semantic. Semantic function makes the product more comprehensible so it is giving some message.

If you can understand that message very easily you can use that product that is very much cognition. So, now we will see one product.

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If you see this is handy cam so first you see if you have not used it before also after seeing this thing. It is giving you some visual clue that you have to put your hand here okay so and here also you can see this thing. So, if it is not getting fitted you can tighten it. so it is another clue after seeing this thing. You see this thing you can see a notch is there so this is giving another message that can put your thing and you can open it.

So, this is not only the physical thing because it is giving some message so that is an affordance. We have discussed about affordance in introduction and next also. So, this is giving some information here after that if you see this thing so here once you open and here you have certain start and stop which is very prominent here. So, once you see this thing another thing you see not only the physical fit once you hold this obviously your finger will go this place.

So, once you hold you will try to start or stop so in this case you can start or stop this thing. Next

once you open this thing you have certain slots here so few cases you will see something like this what it is and as it is put some affordance is there, clue is there. I can understand you have to put like this. You have to open like this or in other cases you have something here so if you want to change the battery you have something here.

So, if you see there is something called battery and if you can put and then you can release your battery from here. And also when you are pushing it is just you put it and it will be and also if you see this are the affordance. So, after seeing this thing you can obviously understand these regions are this way. If you do this thing or this thing it will enlarge or it will reduce the size of the picture. So, these are the physical appearance.

And if you see something so once you see this thing so you know here is some slot you have to put open it like this. So, like this so these are the semantic physical visual clues or the physical features of the product. What it is giving to you what it is conveying some message to you so that you can understand how to use so mainly there are 4 things. It is semantic function of the product we have taken this example of video cam.

Which is to describe to express, to signal and to identify. So, these are the main function what we have seen from this but it is very important that the comprehensibility varies with the context it will be very much dependent whether this person has used this product before or whether he has certain idea or something like this.

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Product Emotion

• Concept of "product emotion" is broad and indefinite

• Emotions are personal

• Products often evoke 'compound emotions'.

• Product emotion can influence customers to select a particular product from a range of similar products

Next we will go to the emotion, so what is emotion? Emotion can be once we are talking about emotion it can be happy and you can be sad. So, all this you can be irritated you can be very playful, joy, happiness. So, all these are emotions so how this emotion is relevant for incase of a product design. So, now we will discuss about the product emotion. So, what is product emotion? First we will go through a video then we will discuss what is product emotion.

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Here you can see a person using a sharpener and he has used that thing and later he has cleaned that sharpener and he has put this thing remaining in the desk. If you see this sharpener so this sharpener is not a very common sharpener as you are using in day today. So it has some form and it is something very cute type cute thing that it is rabbit and once you are using that thing you can

see it here that this teeth is coming down and up, up and down okay.

So and you have a very different sound also so this is actually solving the same thing that is you are sharpening your pencil. The activity is same but it is a very different way so if you ask this thing when you are going to some market or you want to buy some product once we are seeing few products or range of products is there where the product is function is same if you take the sharpener all the sharpener is doing the sharpening of the pencil.

But if we see very specifically this sharpener is bit different because it has some different form it It is giving you it is different and the experience is different. Because once you are using it with some sound it is doing something and its teeth is coming down and up so you have certain different experience what you are not getting from usual sharpener. So, that is how you can have some joy or once you have this thing you can show your friend.

And everybody will tell it is something different so those thing is inherent to this product so this is something called product emotion. Once you have this thing it will be bit special from any other sharpener what you have so this is something called product emotion. Obviously product emotion in this case it can be joy, pleasure but it can be in a negative way also.

So, that why this is one example how in product design emotion matters. So, in this type of cases when you have a same type of activity and functionality is same then emotion or product emotion is matters a lot. So, how you will design your product it is very inherent so concept of product emotion is broad and indefinite. How it is broad and indefinite? As I have discussed that in this case it is pleasurable.

It can be possible you are using a remote control to operate your TV and it is not working. So, you will get irritated so that can be a negative emotion. So, that is why it can be very board and very indefinite emotions are personal and sometimes we are seeing that may be you have a watch. So, that watch is may be as simple as other watch but if you are inherited may be your grandmother, grandfather then it has some different value.

So, product emotion is actually you are assigning some value to the product. So, in this type of product watch example it is very personal it can be as simple as any other watch but from your point of view personally you are assigning more value to the less product. So, product emotion is assigning value which can be very personal. Products of an compound emotion, compound emotion means it is not only about, for example if we take the sharpener example.

It is not about saying how it is looking nice looking cute and it should also actually work properly and its usability if you think, yeah it should actually sharpen this thing. Its performance should be good and if you see it is also keeping the remaining of the thing inside and once you feel free you can put that remaining in the dustbin later on also it is not messing up your table. So, those things usability functionality performance also those things should be there.

That is why it is an compound emotion only the look or the product visually what you are seeing, it is not the one single thing which can influence the emotion. Product emotion can influence customers to select a particular product from a range of similar products that we have discussed. So, once you have once it is more if you like this thing and that like it is not the logical thing that it should not work something.

Once you have the range of product most of the times more consumer product we are going with this emotion is very important what it is influencing us.

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Emotional Design Model

Emotion and behavior are determined by different level of the brain. According to this model there are three levels of brain organizations which are related to emotion regulation.
- Visceral Level
- Behavioral level
- Reflective level

So, if we go very briefly they are few models we will discuss so we can use this models when we are designing something. So, emotional design model is one model given by Norman. So, Emotion and behavior is determined by different level of the brain. So, they are three types of level three levels are there. One is visceral level, behavioral level and reflective level. Now what is visceral level?

Visceral level is very obvious automatic so what we know from our childhood what is very obvious automatic all of we like sweet not bitter taste of any food so that is visceral level. Behavioral level is how you are using that product. That is your behavioral level what we can understand how you are using this thing. Behavioral level is another thing is that when you are using some toy okay it is not only you are doing some function.

If you are using a rubic cube or something there is some challenge you are trying to achieve so that is how to operate so that is behavioral level, another is reflective level so reflective level is very in these two are unconscious of not very consciously these are influencing us. But this reflective level is influence us very consciously.

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Pleasure Model

Pleasure model proposes four conceptually distinct types of pleasure in user product interaction. These are:
- Physio-pleasure
- Socio-pleasure
- Psycho-pleasure
- Ideo-pleasure

Now going to the next pleasure model, in pleasure model we are thinking that emotion is only that happiness. Mainly this pleasure model proposes that pleasurable positive thing so pleasure model proposes 4 conceptually distinct type of pleasure in user product interaction. For example, pleasure model we are thinking that that will give you pleasure so how it matters. If you think of certain object, they are mainly 4 types of pleasure.

Physio-pleasure, Socio-pleasure, psycho-pleasure and ideo-pleasure. So, what is physio-pleasure? Physio-pleasure is physiologically means when you are holding something or gripping something the texture, interface whether it is soft or how comfortable you are how much happiness you are feeling once you are holding something. That pleasure after holding something what is the pleasure.

If you think of this product, they are some smooth surface so once you are holding and feeling very happy so this texture can matter. So, that is how if something regions are there that is different pleasure it can be and that is called physio pleasure. Socio pleasure is how you are socially getting connected or inter connected with other person. It can be and you can have a very nice dining set or very nice coffee maker at your place.

Or very nice jewelry or something or you are inviting some person and that is you are showing to others and you are getting connected. They are saying you something and that it is very nice or

precious so that is a socio-pleasure. Now it is very also another example is that Facebook, WhatsApp so you are using and you are getting connected so that type of pleasure getting that is under socio pleasure.

Psycho pleasure is how easily you can use it for example you can get a phone so may be a cell phone and you got it. And after seeing that thing from that feature you can understand very easily how to operate it. If we take this same example of this thing, after having this thing you can very easily understand how to operate it and how you have to put this thing so, how easily you can operate.

And sometimes it happens is it just worked and you do not need any manual to learn to operate it in a first time. Definitely may be you have to do certain functions then you have to read go through the manual but it will be easy to handle just it happened or just it worked very easily So, that is psycho pleasure so how easily you can use that or how much consistent is that and if you are using something feature is being repeated next time also.

So, you do not need to learn this for second or third time you can very easily do that is called psycho pleasure. Last but not the least is ideo pleasure, ideo pleasure is what type of product or something that is representing idealism or let us take an example now we are using some recyclable product or organic food. These are representing the values or it is representing something to the environment. So, that type of product is under ideo pleasure.

So, this type of pleasure is considered under ideo pleasure when you are designing some product you can think of all these type of pleasure. So, it can be valuable and ~~as I~~ it can assign value more than a product what is usual it is market available you can add this type of pleasure in your design to make it more acceptable and more preferred by the consumer.

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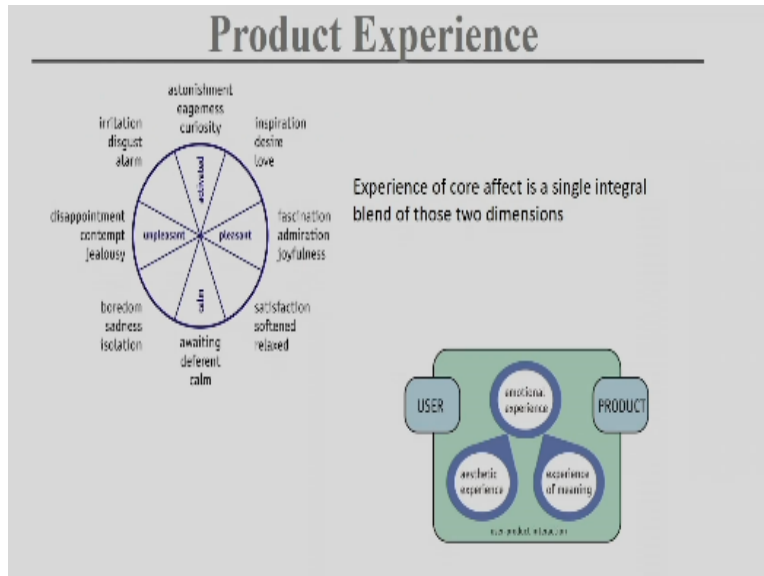
So, very briefly if we go through it is a circumplex model by Russell that this is the model . So, once we are talking about that is more positive means pleasure and how it is. We are accepting that it is pleasure but in this case another model is more about experience. Experience it can be pleasurable and it can be not pleasurable. It can be very frustrating and it can be boring like this. So, in this case according to this model.

So, our experience is mainly the combination of this valance. That is unpleasant to pleasant and is aerosol that is calm to activated. So, these two parameters interplay of these two parameters actually we will change the experience so once in this different position if you can see it is the interplay of these and these or maybe it is pleasant activated. All these 4 parameters interplay will influence the experience.

So, experience of core effect is single integral blend of those two dimensions which is this and that is called valance and this is called aerosol. If you see valance it is from unpleasant to pleasant and this is neutral and from calm to activated this is called aerosol. So, once this combination will happen you will get different experience. So, once you will have this pleasant and activated then you will find inspiration.

So, depending on this position of the circumplex your experience will be different. Okay so this is the product experience circumplex so now how it matters experience what we are talking

about experience how it matters. Say mainly there are three types of aesthetic experience, emotional experience and experience of meaning. If we take this example of a watch which you have inherited may be from your grandmother.

And so if you see the aesthetic it is very obvious you can understand from this thing aesthetically it is nice it can be that experience is there. Now experience of meaning so experience of meaning and emotional experience once it is you have inherited from your grandmother so it has different meaning for you. Another is when once you are wearing this you are emotionally getting connected your feeling may be nostalgic.

You are having emotionally more valuing this thing. So, these are the 3 experiences that emotional connection once you are wearing you are getting that. So, in this type of case user product interaction once with respect to these example and you are having this aesthetic, emotional and experience of meaning. So, in any user product interaction mainly these 3 experiences one can have according to Desman and Eckard.

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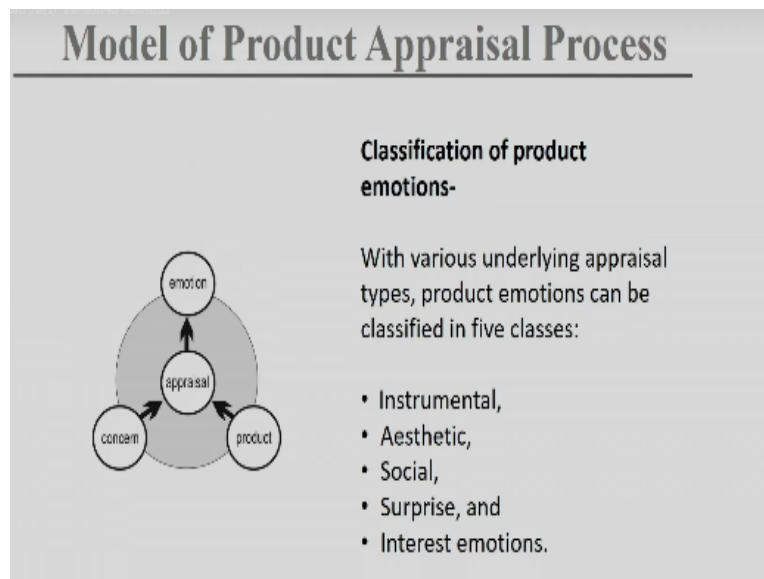
But when we are appraising something may be as we are talking about the assigning some values and we are evaluing something so that is actually appraisal. So, how it matters just we will go through very briefly that this is the classification of the product emotion. What we are talking about so how it matters if you see first is the concern another is the product next another is

appraisal. So, these 3 parameters that is product, appraisal and concern.

These 3 parameters these interplay of parameters will evoke or elicit certain emotion okay so this is with various underlying appraisal types, product emotion can be classified in 5 classes. So, we will take one example from each so concern, appraisal product and all these 3 interplay we will evoke emotion and now taking one example which is instrumental. Instrumental can be what you are operating. May be one example can be very high heel shoes.

So, high heel shoe you want that once you wear it this thing you feel more elegant or something so that can be under this instrumental appraisal process. So, by that you are appraising instrumentally appraising this thing. Aesthetic can be different may be one chair or something and the shape, form, color. Aesthetically it is very nice so you are appraising that your emotion can be very happy with that thing.
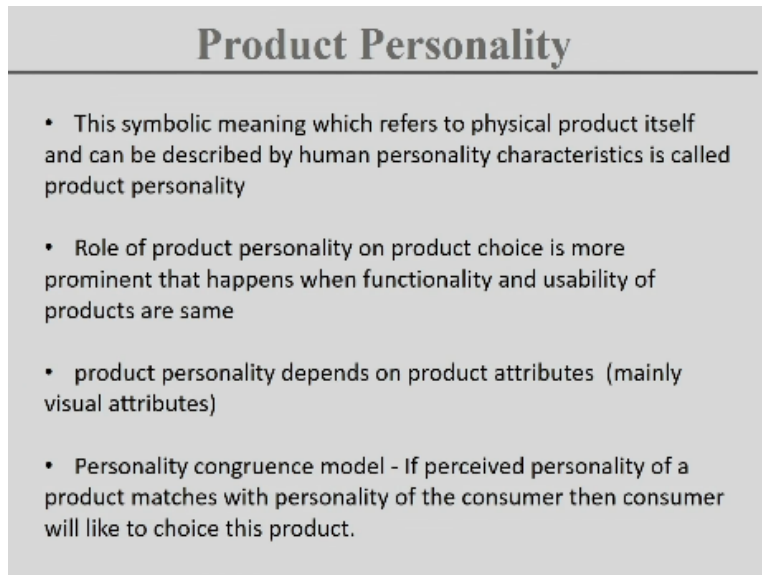
So, that we can be under aesthetic appraisal aesthetic emotion and another can be social, social can be one example can be something may be gun. So, it is very dangerous so you are thinking that type of product should not be used should not be misused something So, that product emotion is social product emotion that will be become in this so that is may be terrifying so this is not accepted this should not be.

So, this type of emotion is under social emotion, surprise is surprise element if your product has some surprise element which you have not thought of innovative. So, may be if you take this example of the sharpener it is bit different and it is innovative and it is surprising you so that can be 1 example of surprise emotion. Last but not the least is the interest emotion sometimes we are seeing few products may be some keyboard, mouse.

Once you are seeing we are not looking it for the second time and if you ask so that we will tell that it is nothing s important it is very dull color and it is very monotonous we are seeing this every day. So, that interest is not there so that is lack of interest so in that case emotion will be very bored nothing is very important to look second time. So, that time of emotion is called interest emotions.

So, these are the main 5 types of emotions which are classified under this product appraisal process model and in this case obviously it can be positive or it can be negative.

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So, another thing is that personality of the product. So, once we are seeing this thing in this case after using this thing we are feeling something, in this case in case of product personality what we are doing after seeing something let us say an example of product personality. Once you are seeing the sharpener and may be after seeing this thing first you will tell it is cute usually if you think very logically.

After seeing any kid or somebody we are talking that we are telling that she is very cute or he is very cute something like this. This kid is very cute so we are assigning something that type of thing when we are assigning for some product that is called product personality. Or sometime we are thinking something sharing instrument or something after seeing that we are telling that may be sports guy we are saying that it is very muscular and look is there.

So, that is the personality we are assigning to the product usually we are talking about how we are assigning personality to any human being. Like the same thing we are assigning some personality to a product So, that is called product personality so this symbolic meaning which refers to physical product itself and can be described by human personality characteristics is

called product personality.

And role of product personality and product choice is more prominent that happens when functionality and usability of products are same. If you get a range of may be shaving instrument, then sometimes or you may be watch after seeing a range of watch you will see that this will go in my hand better and it has some masculine look it has some feminine hook and something it is more ornamented.

It will go with my character or something like this. So these are the though all these watches will give you time perfectly so it is more than this functionality and usability. When you have a range of products mainly for consumer products you are thinking how it will go how it looks and whether it will go with you or not. So, those are the thing that happens when functionality and usability are same.

Then this can be influencing factor that product personality and you can design the product personality in a product. So, product personality depends on product attributes it is mainly visual attributes. If something is more angular usually we are seeing it like a masculine if it is bit rounded it may be bit feminine So, it is more like the visual attribute of the product what it influences to tell that how the product personality is.

What we will discuss in with one product in evaluation. Last but not the least personality congruence model sometimes we are thinking that it will match with my personality and it is very obvious in case of sunglass or watch or dress. So, which is almost extended part of our body so it is once we are selecting in any preferring something or choosing some sun glasses we are thinking okay it will go with my personality.

And it will go very well with my personality this watch so that is called congruence personality congruence. So, once the personality of the user and personality of the product will match or congruent then it will be more preferred by the consumers. So, if perceived personality of a product matches with the personality of the consumer then consumer will like to choice this product.

So, this is very important when you are taking the considering the product personality in your design So, what we have discussed these are the mostly the overview of this cognitive and emotional aspect how you can incorporate from the point of view of human factors and ergonomics. And how you can incorporate this thing in your design. So, once you will incorporate this thing that product will be more user centered.

Few features are very important in case of consumer product because the preference will be very much important when the consumer is choosing that product and it is very important that once you are designing some product. It is very important to balance the usability that is physical fit cognitive fit. And also the pleasure value of the product balancing both the usability and pleasure is important in a product to make it more user centered and successful. Thank you.