

**Product Engineering and Design Thinking**  
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**Module - 08**  
**Industrial Design, Design Entrepreneurship and Design Thinking**  
**Lecture - 37**  
**User interface and Experience (UI/UX) Design in Product Engineering**

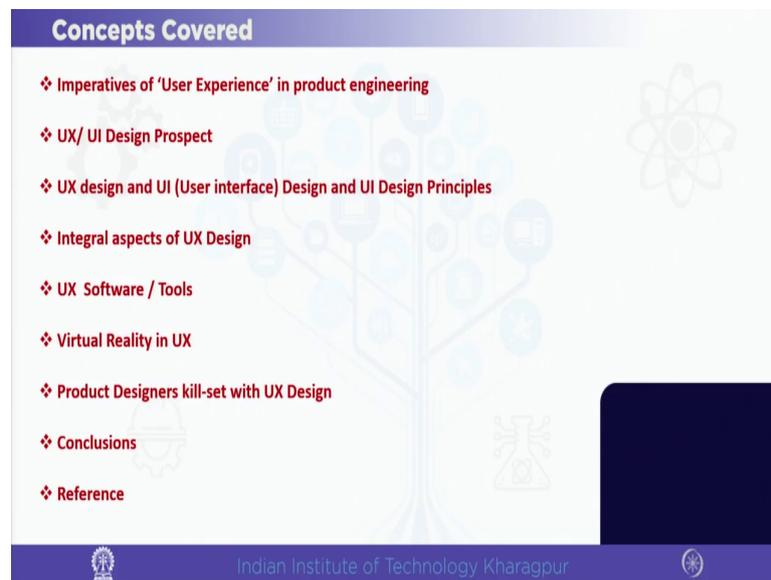
Welcome back to the course on Product Engineering and Design Thinking. Today we will be discussing on User Experience and User Interface which is a lecture number 37 in module number 8. The user experience is becoming a very important thing that the a the product has different features different functionalities yet the overall experience or overall liking or in other words which is called pleasantness or excitement with a product does not always happen.

So, what is that and how to create that because see if the user is excite or delighted with the product then automatically this product has a great prospect. In the sense that as we had discussed earlier also that one quality of a good product is how through its design and it is of course, realization it can go viral.

If the total experience overall experience is good about a product people will talk about it people would refer to other people and that is how this program this product will get attraction. So, this has become immensely important now this user experience and user interface.

In fact, as the realization has come that it is an important feature there are a couple of questions that who will do this whether there would be an exclusive professional for user experience designing or should it be the extension or part of product designers or product engineers. We will deal with that aspect also.

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So, we will and also we will discuss various other things, but. So, let us go to the concept cover covered part where we would see what exactly we will be discussing. So, one is that as I just started discussing with this imperatives of user experience in product engineering why it is essential that we will have to find out the UX UI design prospect because after all this is not a very old kind of a paradigm.

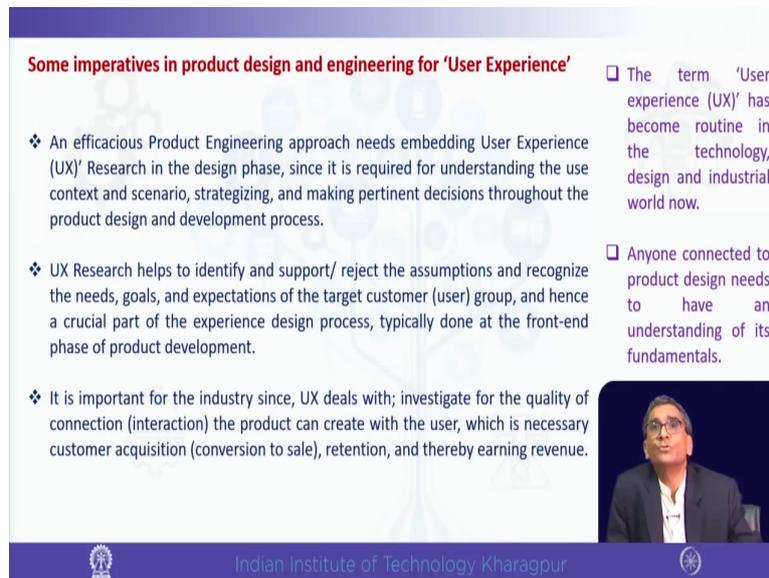
So, those who would be trying or planning to become the practitioner or researcher whatever in this field they will have to see what is the prospect in this how this particular market is going and what is the job opportunities and all. So, that is one then we will talk about the UX design and UI that is user experience called UX and user interface called UI in short and that is the acronym design and UI design principles.

Naturally the how the UX design is the integral part of the process that also we have to see without this how the product will suffer how the business or the enterprise will suffer that we will understand. Then we will talk about the what are the software and tools available for this because when something is to be materialized in today's context, we need certain tools.

And here for you know as a great opportunity and scope there are quite a few good software's have come up, which people can use and for a learner one can you download the free version or open source version and practice it I will tell you why. Also, interestingly perhaps you have heard broadly I am saying the virtual reality actually virtual reality is a very broad term, but under this virtual reality also comes augmented reality and also come mixed reality etcetera.

But for now, the overall technology as we know is known as virtual reality. So, how a product will actually be seen moving working etcetera that we can see in the virtual reality context and therefore, finally, we would try to find out what are the expertise skills skill set required to become or to learn this design methodology that is UX user experience design methodology.

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**Some imperatives in product design and engineering for 'User Experience'**

- ❖ An efficacious Product Engineering approach needs embedding User Experience (UX) Research in the design phase, since it is required for understanding the use context and scenario, strategizing, and making pertinent decisions throughout the product design and development process.
- ❖ UX Research helps to identify and support/ reject the assumptions and recognize the needs, goals, and expectations of the target customer (user) group, and hence a crucial part of the experience design process, typically done at the front-end phase of product development.
- ❖ It is important for the industry since, UX deals with; investigate for the quality of connection (interaction) the product can create with the user, which is necessary customer acquisition (conversion to sale), retention, and thereby earning revenue.

- The term 'User experience (UX)' has become routine in the technology, design and industrial world now.
- Anyone connected to product design needs to have an understanding of its fundamentals.

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Now, we will quickly go into this thing that says in an efficacious product engineering approach needs embedding user experience why we have partly discussed. It is required for understanding the use context the scenario strategizing and making pertinent decisions throughout the product design and development process.

So, at every stage and level how people the user would perceive it is to be kept in mind this research UX research that is UX research helps to identify and support or reject. See there are certain assumptions this that whether people would like it people would not like it. So, those assumptions will be either supported or accepted or it would be rejected.

So, and recognize the needs and goals and expectation of the target customer or user or the group and here crucial part of the experience design. So, research is a crucial part of this experience design UX research and typically it is done at the front end at the beginning of the

exercise of development where, it starts with the design which we have discussed earlier also when we discuss the front end part.

It is important for the industry since UX deals with the with investigate for the quality of interaction or connection the product can create with the user which is necessary for customer acquisition, which ultimately customer acquisition means it should get converted to sale. So, if we can give good experience, it will be converted to sale when we go to a good hotel say for example, or a good restaurant for example, we tend to go there more and more in other times also.

So, similarly when someone using a product or maybe a television, maybe a mobile phone maybe a car if they like it then naturally, they would go and repeatedly use that and buy. So, thereby you get the new business, you get retention that happens. Now, it has become a part of the technology and the design world. So, people now know that it is a one of the things to be done. So, anyone connected to product design needs to know this the what is UX.

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**UX/ UI Design: the prospect**

- ❖ Demand for UX/ UI (User Experience/ User Interface) professionals, based on a recent survey (simplilearn.com), is growing at a rapid rate, in India, with businesses going digital and had steady growth in the last few years.
- ❖ The UX/UI market was USD 465 million in 2021 and is expected to grow to around USD 1350 million by the end of 2028, with an annual cumulative growth rate above 15% year-on-year.
- ❖ This is presenting a good career/ job opportunity for UX/ UI Professionals.

□ The work domain and responsibility of a UX Designer is rather encompassing in product engineering.

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So, having said that we would see quickly a prospect that what is happening here that we found that there is a survey we find that in India the growth is quite steady and steadily it is growing the UX professionally UI professionals.

Now, the size of the business that you can see which was in 2021 which was USD 465 million is projected to be around 1350 million by 2028. If you calculate it would be about 15 percent growth year on year. So, there are very few branches or disciplines or work domain where this kind of growth can be seen.

So, here a good job prospect also lies. Therefore, if one is working in this area would be beneficial for career and prospect. And this work domain is rather encompassing it touches upon various other aspects in the entire design process. So, it is that we quite satisfy.

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**UX design and UI (User interface) Design**

- ❖ The terms 'UX design' and 'UI (User interface) Design' are occasionally used interchangeably, since some unthinkingly perceive 'design' is how it looks or the exteriority through which the first interaction or interfacing happens.
- ❖ While user interface is a salient aspect of 'user experience', it still is just the layer (veneer) that facilitates operating/ navigating for performing the target functions of a product.
- ❖ UX designers reckon beyond the initial interaction as they design the function underneath the interface layer, complementing the two, combined.

Quotes:

- ❑ *Most people make the mistake of thinking design is what it looks like. People think it's this veneer—that the designers are handed this box and told, "Make it look good!" That's not what we think design is. It's not just what it looks like and feels like. Design is how it works.*
- ❑ *You can't just ask customers what they want and then try to give that to them. By the time you get it built, they'll want something new."*

▪ **The design is not just what it looks like and feels like. The design is how it works.**

- Steve Jobs



Now, the term UX design and UI are occasionally they are interchangeably used that ok instead of UI they are calling UX etcetera. But that is not a very correct understanding. We need to understand these are two different aspect and we have to understand them in such a way that when we are making a distinction, we are also aware how that distinction will be used in that product system to fetch the maximum benefit.

So, user interface is salient aspect of user experience because through that interface we get the experience. How I operate my mobile phone buttons give me the experience of that system of the TV watching that particularly there is a remote controller. So, the buttons its layout its arrangement etcetera are those interfaces through which we get that experience.

So, that is what we need to understand how do we do the interface. So, that experience becomes very exciting or wonderful. Now, but this user interface is still the only the upper

layer says upper surface layer the veneer. But there is there are many other things inside, which goes into the main design where which makes the product attractive and functioning and purposeful.

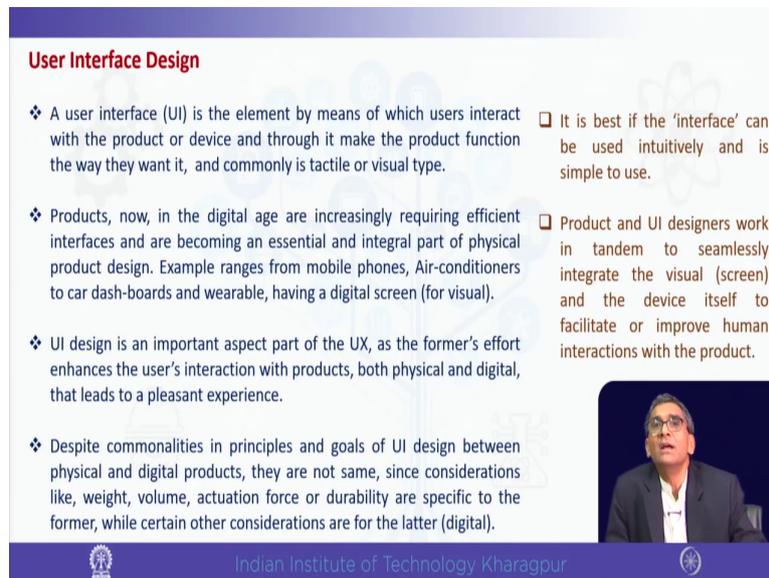
Now, we need to understand that and so, so it is just not that interface it is just not that superficial thing it goes much deeper the total functioning. Experience comes from the total functioning experience comes from how it is taking care of some needs how it is taking care of that the ultimate job to be done using that particular product.

So, that end this user interface all put together gives the total experience about the product. Now, the UX designer's recon beyond the initial interaction as they design as they design with the function underneath the interface layer complementing the two combined as I just now said.

Now, here I would like to like you to see the quote of Steve Jobs which you read, but in short, the concept is in the bold at the below I mean the on top is the complete quote at the bottom in the bold the summary of that quote which you can see is the design is not just what it looks like and feels like the design is how it works.

So, although we say its form, it is a utilities all are very fine, but on the whole how it works and how it functions how it caters to the basic need or meet or helps to solve that problem or do that perform that job for which it is intended is important. So, the overall experience is important. We will come to that also.

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**User Interface Design**

- ❖ A user interface (UI) is the element by means of which users interact with the product or device and through it make the product function the way they want it, and commonly is tactile or visual type.
- ❖ Products, now, in the digital age are increasingly requiring efficient interfaces and are becoming an essential and integral part of physical product design. Example ranges from mobile phones, Air-conditioners to car dash-boards and wearable, having a digital screen (for visual).
- ❖ UI design is an important aspect part of the UX, as the former's effort enhances the user's interaction with products, both physical and digital, that leads to a pleasant experience.
- ❖ Despite commonalities in principles and goals of UI design between physical and digital products, they are not same, since considerations like, weight, volume, actuation force or durability are specific to the former, while certain other considerations are for the latter (digital).

- It is best if the 'interface' can be used intuitively and is simple to use.
- Product and UI designers work in tandem to seamlessly integrate the visual (screen) and the device itself to facilitate or improve human interactions with the product.

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So, here we come to the you know user interface designs. Now, you see that many products have becoming are becoming partly digital is a physical digital product be it say I had talked about the mobile phones it can be air conditioners, it can be car dashboards, which have a digital screen for a visual etcetera. So, these are the say some examples.

So, [FL] overall user experience of a car driving is of course, the driving itself how good the power steering is and how the you know ergonomics is, how the you know automotive the you know specifications are whether it gives less vibration or what is the power or speed etcetera all those things, but at the same time overall experience that how it yeah whether it is spacious, whether it gives those comforts etcetera all are part of this whole design.

So, user experience design is important there. So, UI design interface design is an important aspect a part of the UX as the former's effort enhances the user's interaction with the products

through that it is actually being interact both physical and digital that leads to pleasant experience that is exactly what we are trying to do pleasant overall pleasantness.

Now, despite the commonality of user experience for both physical and digital there are certain commonalities, but then there are differences also. Like say for example, in a physical product one will have to consider see say the weight or durability the volume the actuation force all that for a digital say for a website those factors does not come in, but it has other factors how the navigation happens how the you know hyperlinks are done.

So, those are the features, but this gives a total user experience in the you know physical system and they are in the digital system be that as it may the idea is that the overall experience has to be present. It is best if the interface can be used intuitively and can be simple to use. In fact, I can tell you I mean instead of using a manual to operate musical system so, a synthesizer kind of a musical system.

If the buttons are such or the instruction of panel is such that looking at that one can go and learn it without the manual then that gives a huge a wonderful user experience that without with much simplicity one can learn it is not that everyone has to turn to that leaflet all the time. So, product and UI designers work in tandem very close to integrate say for example, the visual screen and the device itself to facilitate it improve better interaction with the product.

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**Some salient UI Design Principles**

- ❖ Each element of the User interface design must be functional and purposeful so as to meet the users' needs and helps to perform the tasks the product is designed for.
- ❖ Designers need to think through how the UIs will be usable while interacting with the product.
- ❖ Effecting interactions with the interface like a natural process is recommendable to UI designers to follow as a good design principle. Modern, sophisticated technologies, like voice or gesture-based controls, are helping to realize such goals.
- ❑ The purpose of UI design is to make the user's interaction most simple and efficient, in respect of accomplishing user goals, which is fundamental to **user-centered design (UCD)**.

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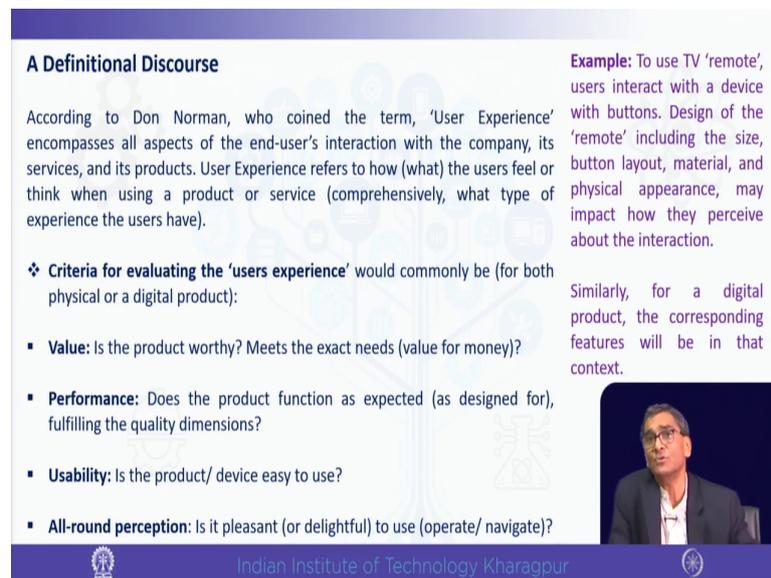
[FL], some salient features of UI design principles is that each element of the user interface design must be functional and purposeful. So, that so, as to meet the users need and helps to perform the tasks the product is designed for very natural that is rudimentary. Designers need to think through how the UIs will be useful usable while interacting with the product. Affecting interactions with the interface like a natural process is recommendable to UI designers to follow a good design principles.

Like say often you see that now the remotes etcetera are available where it is through voice control. Similarly, some are it is gesture controlled. So, it is natural the natural process if one can do does not have to type much and all. So, that gives a different level of user experience.

The purpose of UI design is to make the users interaction more simple and efficient. The more easily they can use it usability that is usability that is very important. If you can improve

the usability, it becomes more likeable. In respect of accomplishing user goals which is fundamental to user centered design.

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**A Definitional Discourse**

According to Don Norman, who coined the term, 'User Experience' encompasses all aspects of the end-user's interaction with the company, its services, and its products. User Experience refers to how (what) the users feel or think when using a product or service (comprehensively, what type of experience the users have).

❖ **Criteria for evaluating the 'users experience'** would commonly be (for both physical or a digital product):

- **Value:** Is the product worthy? Meets the exact needs (value for money)?
- **Performance:** Does the product function as expected (as designed for), fulfilling the quality dimensions?
- **Usability:** Is the product/ device easy to use?
- **All-round perception:** Is it pleasant (or delightful) to use (operate/ navigate)?

**Example:** To use TV 'remote', users interact with a device with buttons. Design of the 'remote' including the size, button layout, material, and physical appearance, may impact how they perceive about the interaction.

Similarly, for a digital product, the corresponding features will be in that context.

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Now, we will just quickly go through certain definitional aspect of it that criteria for evaluating the user experience. This was the term was used by Don Norman the user experience first and then where it is said that how the users how or what the users feel or think when using a product or service comprehensively what type of experience the users have.

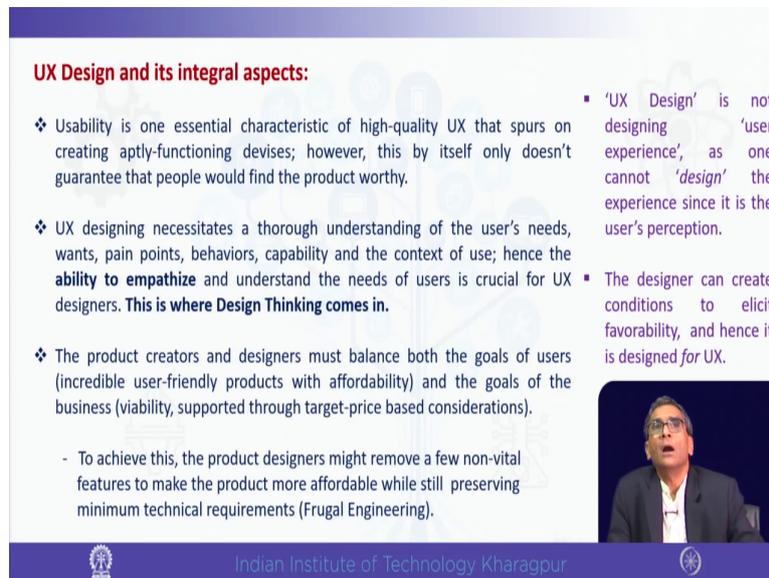
Now, what the criteria for evaluating that user experience the be it a physical product or digital product. First is that value for money or value in simple terms whether this is the worthy. Means the exact needs and that at that price or the cost that we are prepared to or we think it is just.

So, that is value performance. Does it function as expected that is mean how it was designed for does it function fulfill all the quality dimensions. That is the whether it is durable, whether it is robust, whether it is reliable, whether it is serviceable and performance even aesthetics.

Now, as I was just mentioning about usability which is a very important feature and that comes in the is the product or device easy to use that is the question if is then its usability is high. Then finally, is as you see under different areas these are the things and overall experience all round experience what is that all round experience is a delightful to use for a website is it easy to operate and navigate those are the things.

I gave the example of a TV remote that different that design of the remote including the size, button layout, material and the physical appearance may impact how they perceive about the interaction. Similarly, for a digital product the corresponding features will be in that context of course, as I was just mentioning about the website navigation.

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**UX Design and its integral aspects:**

- ❖ Usability is one essential characteristic of high-quality UX that spurs on creating aptly-functioning devices; however, this by itself only doesn't guarantee that people would find the product worthy.
- ❖ UX designing necessitates a thorough understanding of the user's needs, wants, pain points, behaviors, capability and the context of use; hence the **ability to empathize** and understand the needs of users is crucial for UX designers. **This is where Design Thinking comes in.**
- ❖ The product creators and designers must balance both the goals of users (incredible user-friendly products with affordability) and the goals of the business (viability, supported through target-price based considerations).
  - To achieve this, the product designers might remove a few non-vital features to make the product more affordable while still preserving minimum technical requirements (Frugal Engineering).

▪ 'UX Design' is not designing 'user experience', as one cannot 'design' the experience since it is the user's perception.

▪ The designer can create conditions to elicit favorability, and hence it is designed *for* UX.

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UX design and its integral part as this integral part of UX design. Basically, it is that UX design necessitates a thorough understanding of the user needs. That is where this integration comes in. It checks the pain points of the customer that what troubles or what problem it has to solve, behaviors, the capability that how one is capable to use that and the context of use.

Hence, the ability to empathize to understand the needs of users is crucial for UX. And now I hope you just recall as I use the term empathize you will immediately be able to connect with the our discussion on design thinking which started with the first item or first step which is called empathize.

So, the empathizing is an important thing in user experience generation. So, you see how these different paradigms are coming together to deliver the objective that is to give satisfaction to the user and customer. The product creators and designers must balance both

the goals. What the goals? One is that you know it should be user friendly with affordability and the similarly at the same time one has to remain viable in the business.

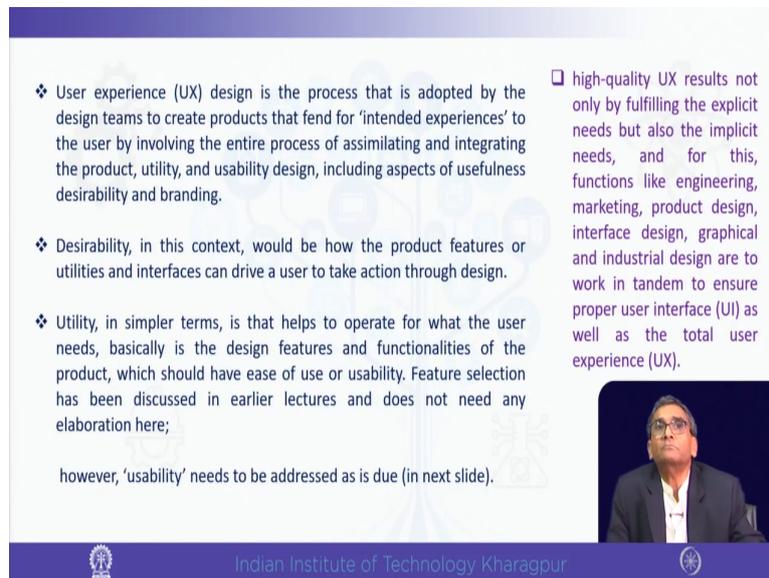
So, it should be viability, which viability we should be supported through the viability will come also when the sales actually happens and when the sales will happen that when it can produce at target price and sell at target price that is produce at target cost based consideration.

To achieve this the product designers must might remove a few non-vital things. You now recall the discussion on frugal engineering where some non-vital features if we can if we eliminate then we can make it more affordable and still preserving the minimum technical requirements that it needs, which reminds us of the frugal engineering.

So, frugal engineering here you see we are talking about user experience and we are talking about frugal engineering. So, the at some point in time we have to see when this are in sync now all frugal engineering activities are UX activities not all UX activities are frugal engineering activities, but there can be certain sync and if that sync can be created then that is a wonderful blend.

Now, question is people ask is UX design is a are you designing the user's experience? No, user experience cannot be designed. What it does is that the designer can create conditions to elicit favorability and hence it is designed for user experience or UX. So, we are creating the conditions. So, that the user would like it would experience better.

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❖ User experience (UX) design is the process that is adopted by the design teams to create products that fend for 'intended experiences' to the user by involving the entire process of assimilating and integrating the product, utility, and usability design, including aspects of usefulness desirability and branding.

❖ Desirability, in this context, would be how the product features or utilities and interfaces can drive a user to take action through design.

❖ Utility, in simpler terms, is that helps to operate for what the user needs, basically is the design features and functionalities of the product, which should have ease of use or usability. Feature selection has been discussed in earlier lectures and does not need any elaboration here;

however, 'usability' needs to be addressed as is due (in next slide).

□ high-quality UX results not only by fulfilling the explicit needs but also the implicit needs, and for this, functions like engineering, marketing, product design, interface design, graphical and industrial design are to work in tandem to ensure proper user interface (UI) as well as the total user experience (UX).



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Now, in continuation that we see that user experience design is a process that is adopted by the design teams that fend for intended experience. We want that ok they should get this kind of a presentness that experience whether we are designing to actually meet them. So, what we are doing? Involving the entire process of assimilating and integrating the product utility and usability design two words I have used utility which is more like a feature and usability that we have been discussing so long.

Now, when these two things match ideally the utility and usability then truly the usefulness comes. So, the utility and usefulness together we have to see both are complied. Utility in simpler terms is that helps to operate for what the user needs. Basically, is the design features and functionalities as I have said and functionalities of the product which should have ease of

use or usability. So, utility should have ease of use that is usability. So, utility of the feature should be easy to use and then it becomes useful.

Feature selection has been discussed earlier we have discussed that how the feature should be discussed detected, but it is not that issue now. So, we will take care of that in a different context we have already done that. So, we would assume that whatever feature is there we are talking based on that. However, usability needs to be addressed as a due we will go to the next slide for that.

But in the meantime, the we have to remember that high quality of user experience does not come only from the explicit need that is the stated needs. It also comes from the implicit needs that need that has not been stated, but that, but one has to understand what the customer expects.

So, that so, naturally we do not have to tell that in a remote what the customer expects. If we can understand ok customer expects that ok, the button should be such it should be able to hold, it should to make forward, it should be those features if we can have and then if some features they have not mentioned, but we can keep that then give this great satisfaction.

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❖ Usability refers to methods for improving 'ease-of-use' factor and pleasantness of using the features during the design process and conceived to be comprised of quality elements, namely, Learnability, Efficiency, Memorability, Manageability, Recovery from Errors, and Deriving Satisfaction (below):

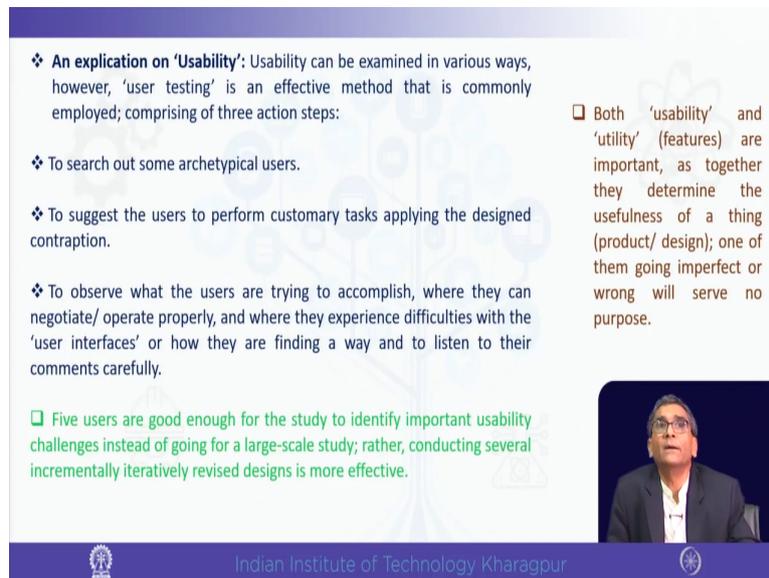
- **Learnability:** Ease of accomplishing basic tasks the first time the user encounters the product (design)
- **Efficiency:** Quickness in performing tasks, once the users learned the operation
- **Memorability:** Ease of redoing the operations after returning to after a time-gap.
- **Manageability:** Storable, compact, portable, lightweight etc.
- **Recovery from errors:** The degree of ease with which the recovery from the errors is possible (the extent of severity and frequency of errors the user makes.)
- **Deriving Satisfaction:** The degree of pleasantness with which the design is used, **Both the 'usability' and 'utility' are important and together determine the usefulness of a thing (product/ design).**

❑ 'Usability' ensures the users to efficaciously complete the tasks, using the interfaces, and is an essential for survival, since, user refuses products difficult to use.



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❖ **An explication on 'Usability':** Usability can be examined in various ways, however, 'user testing' is an effective method that is commonly employed; comprising of three action steps:

- ❖ To search out some archetypical users.
- ❖ To suggest the users to perform customary tasks applying the designed contraption.
- ❖ To observe what the users are trying to accomplish, where they can negotiate/ operate properly, and where they experience difficulties with the 'user interfaces' or how they are finding a way and to listen to their comments carefully.

❑ Both 'usability' and 'utility' (features) are important, as together they determine the usefulness of a thing (product/ design); one of them going imperfect or wrong will serve no purpose.

❑ Five users are good enough for the study to identify important usability challenges instead of going for a large-scale study; rather, conducting several incrementally iteratively revised designs is more effective.



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So, implicit needs also to be taken care of for UX. So, usability although we have explained it already usability can be examined in various ways. One is the user testing is an effective method that is commonly employed comprising of three action steps. What to search out some archetypical users, but in those who would be using it and in real life actual life.

So, that is to find out first to suggest the user to perform customary task applying the design contraption the device that is a prototype (Refer Time: 28:30) has been developed. To observe that the users are trying to accomplish what they are trying to accomplish, where they can the negotiate or operate properly and where they experience the difficulties with the user interface or how they are finding the way to way and to listen to their comments carefully.

This is how we can do the usability test whether they usability part. And for that say you can start with the five users not a big group, but if we can start with the five users that would give you give us a fairly good idea as to how it will work instead of a large scale study.

So, as I just mentioned a little while ago both usability and utility are important as to whether they are determine the usefulness of a thing or the product or design. One of them going imperfect or wrong will serve no purpose. If the utility is bad or the usability is bad it is not going to be good. So, both have to be good for usefulness and give satisfaction.

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**UX Skill-sets (Software / Tool):**

- ❖ Expertise in standard UX software such as InVision, Figma, Zeplin, or similar tools, and knowledge in Web designing particularly for digital products, will be handy.
- ❖ Exposure to planning and conducting user research, usability testing, A/B testing, and rapid prototyping.
- ❖ Communication on the design processes, problem statement, ideas, and solutions to the development teams, product management teams, and the concerned stakeholders.

These software (InVision, Figma, Zeplin) have free versions with limited features.

**UX and Virtual Reality:**

- ❖ UX Researchers may not be able to picture how a design, created in lab setting, would work in the actual environment, often hazardous, or different in application condition due to geographic dissimilarity.
- ❖ The designer can interpose the factors into the lab setting, using virtual reality (VR) tools, to test the design accommodating these conditions to get a proper and realistic perspective before committing to build a final solution that usually are effort-intensive and expensive.

□ The 'VR' is a general terminology and includes augmented reality (AR) and mixed reality (MR)



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Now, what are the skill sets? Because we know what is to be done, now how it is to be done? So, what is the preparation? How one can use it in this profession? So, actually for that there

are several software's software that is that can be used such as envision, such as Figma, such as Zeplin and there are several other tools.

Good news is that that they have also certain versions which are free downloadable and student versions they are called. Now, also for UX designer one will have to have the you know experience of conducting user research, usability testing, alpha beta testing and rapid prototyping, which we have already have discussed. So, you are already prepared for this.

So, you have learned many things already and possibly you would be picking up one or two things to become a user experience designer. Communication on the design process, problem statement, ideas and solutions to the development teams, product management teams and the concerned stakeholders that that one has to have reasonably good communication. Communication means understanding and clarity of the exchanges thought that is what is called communication.

How you express in writing or verbally what exactly is the technical requirement you know? So, the software's this as I have named have free versions that you can check I have given the names of the software's you can go to the website and check. UX researchers may not be able to picture how a design created in lab setting would work in the actual environment often hazardous or different in application condition due to geographic dissimilarity.

So, actual condition we this worked in the lab condition. So, to verify that people can use VR. The designer can interpose the factors into the lab setting use using virtual reality. So, how in real condition it will work? So, give the settings of the work and put the product in so, that in that how it will work. As I already said the VR is a general terminology it has you know augmented reality and mixed reality is a part of it, broad terminologies this.

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**Why should the Product Designers extend the skill-set with UX Design**

- ❖ Organizations or units may not see the value of having a dedicated UX designer on the team, particularly when associated costs matter critically.
- ❖ There is a prevalent notion that if UX designers are rather isolated from the actual process since they are not involved in the core development process of designing, building, testing, and marketing in a project.
- ❖ Due to the subjective nature of UX Design, Evaluating the effectiveness and return on investment of a UX design using quantitative measures remains a challenge.

□ Small units and startups cannot usually afford to engage dedicated employees for UX Design. Training existing product design staff, in such a situation, in the principles and processes of UX would be purposeful, besides the options of contracting out the UX work as needed.

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Now, question is why should we why the product designer will become UX designer? What is the benefit? The thing is that there are few reasons. One is that organizations may not find value that in exclusive user in experience designer should be there, but they want that the person who is already in design they pick up the necessary component and do that work.

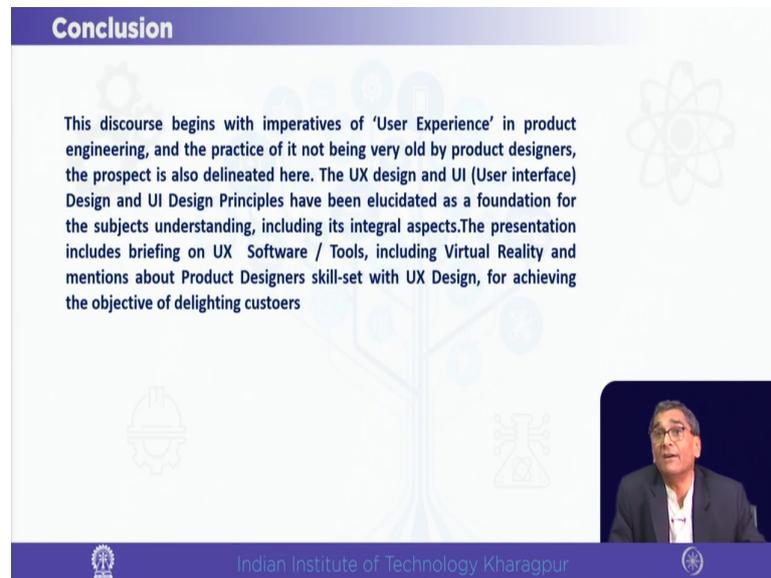
So, product designer if you are also gaining some experience or expertise in this is very useful. Some people also view that UX designer is not very you know close part of the design team. So, they are a bit isolated. So, if the design group itself can absorb that the core design group that is useful. And due to the subjective nature of UX design evaluating the effectiveness and return on investment UX design using quantitative measures remains a challenge.

So, that is another question I mean whether this gain is through UX design or not that remains a question. So, it is always you know a good that if the product designer also can have a good grasp on user experience that is both way good from the product design aspect also and that getting that job done also.

Particularly see the small units and startups cannot usually afford to engage dedicated employees for UX design where there is a great scope. That as a product designer you are already a product engineer product designer and now if you can do that your value will increase training existing product design staff in corporate organization in such situation in the principle and processes of UX would be purposeful.

So, by training them up would be beneficial by training the you know product engineers and product designers in UX design. So, that is why we have brought in. So, that you have the exposure here.

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**Conclusion**

This discourse begins with imperatives of 'User Experience' in product engineering, and the practice of it not being very old by product designers, the prospect is also delineated here. The UX design and UI (User interface) Design and UI Design Principles have been elucidated as a foundation for the subjects understanding, including its integral aspects. The presentation includes briefing on UX Software / Tools, including Virtual Reality and mentions about Product Designers skill-set with UX Design, for achieving the objective of delighting customers

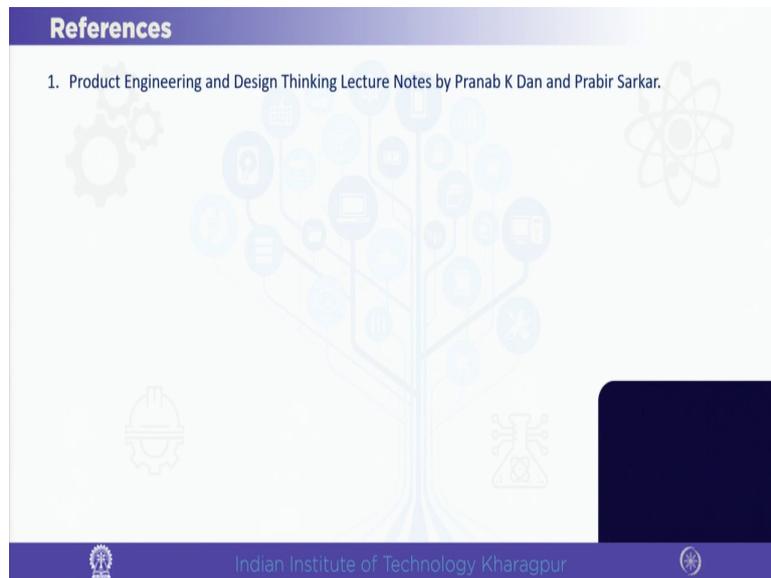
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The slide features a blue header with the word 'Conclusion' in white. The main content area is white with a light blue background pattern of various icons (gears, a tree, a person, a brain, a gear, a person, a gear, a person, a gear, a person). A small video inset in the bottom right corner shows a man with glasses and a dark suit speaking. The footer is a dark blue bar with the IIT Kharagpur logo and name on the left, and another logo on the right.

So, that you can take it up as scope of course, of your future action. So, that is what we wanted to come to that once we know what is to be done and then in the course of action what is to be done. So, in conclusion we know that what we have discussed the discourse begins with the imperatives of user designing user experience in a product engineering and the practice of it not being very old as I said we started with the prospecting.

[FL] what will happen if you learn this kind of a thing and we discussed the principles of this UX and UI and finally, the we have talked about the software's and the tools and methodologies of different software's VR, AR, MR etcetera. And we have discussed also the skill set that is required to achieve the objective of the UX. So, that the overall product improves, overall business improves and the opportunity of that engineer or designer improves.

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So, this is the reference and I am sure that as you would be using some of the software's that I have given downloading and using that the free version you would get more interest in this and you will become more knowledgeable and we will be able to use it. I hope this discussion helped.

Thank you very much.