Design and Implementation of Human – Computer Interfaces
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Module No # 01
Lecture No # 02
Introduction to Usability

Hello and welcome to the course design and implementation of human computer interfaces. So today we are going to go for lecture 2 namely introduction to usability before we start we will briefly recap what we have learnt in the first lecture in the previous lecture.

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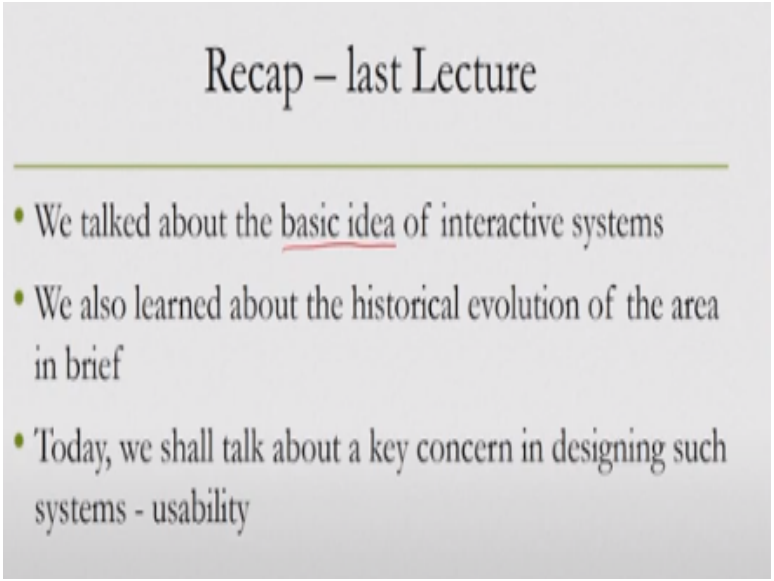

So earlier we talked about the very basic idea of interactive systems what it is and what are the concerns while going to design interactive system? We also learned in brief the historical evolution of the field and today we are going to talk about an important concept in the design of interactive systems namely usability.

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Now this course is all about design and implementation of human computer interfaces or interactive systems so design is the key term here one of the key terms here. Now we already have seen earlier the major design challenge when we are talking of interactive system. Today we are going to elaborate a little bit on that major challenge from the point of view of a user centric system designer. So what are the main concerns? In order to do that we will start with a definition which will be beneficial for our subsequent discussion?

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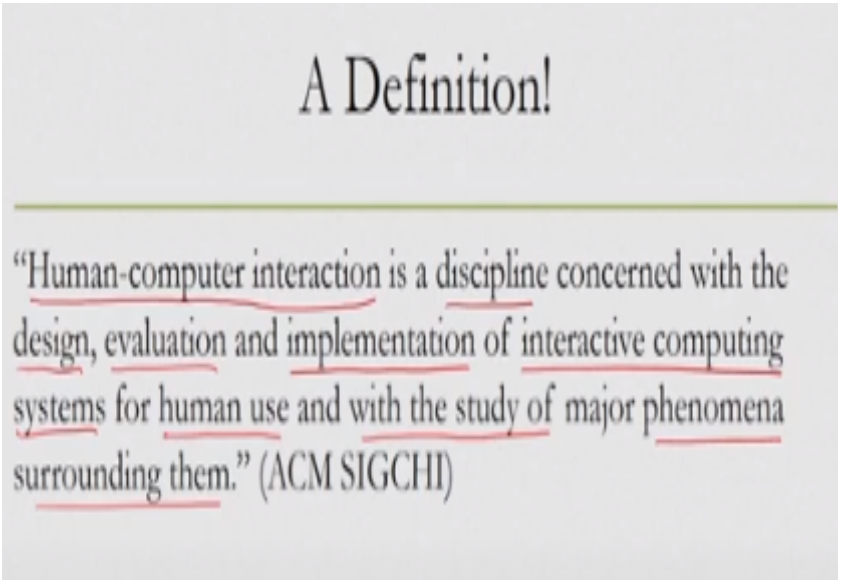

So it is a definition of the term human computer interaction so we are concerned here about design and implementation of human computer interfaces a related term is human computer

interaction. So what it is? Human computer interaction is a discipline which is concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. So this definition actually encapsulates whatever we are going to learn in this course.

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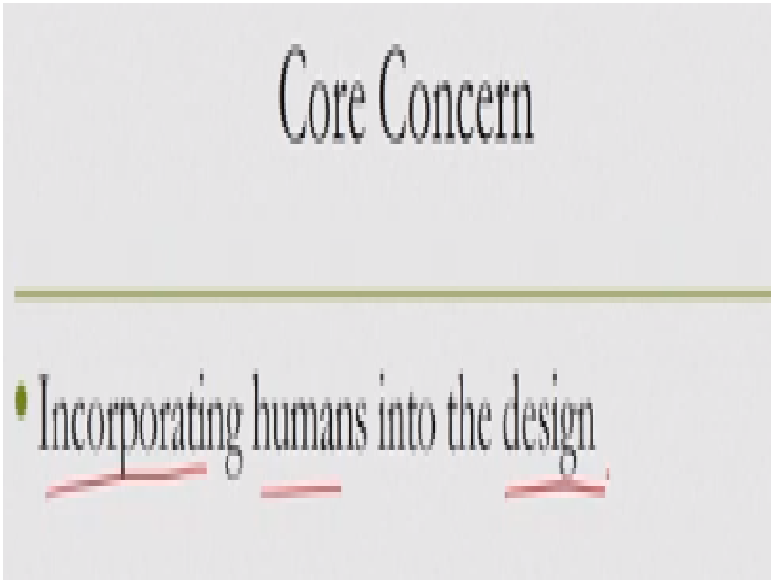

So the key thing to notice in the definition is that we are dealing with systems for use by the human users. So effectively it points to the fact that we need to incorporate humans into the design so that we can take care of their needs and expectations.

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This brings us to the important consideration of human factors what it is and how they are related to the design and implementation of human computer interfaces.

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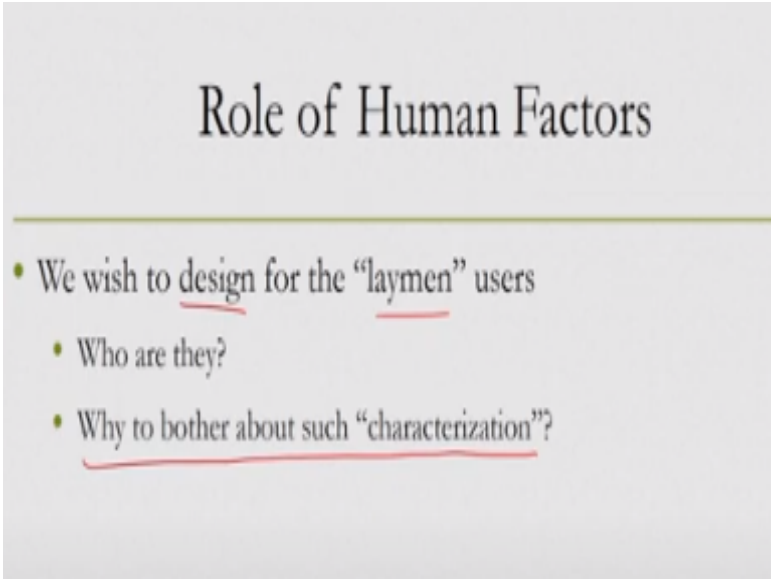

If you may recollect in our previous lecture we talked about designing for the layman users. Now we also elaborated a bit on who are the layman users and how they are different from other users of computers? Also it is important to note why to bother about such characterization why we are trying to differentiate between users such as somebody are laymen somebody is non-laymen. Why it is required?

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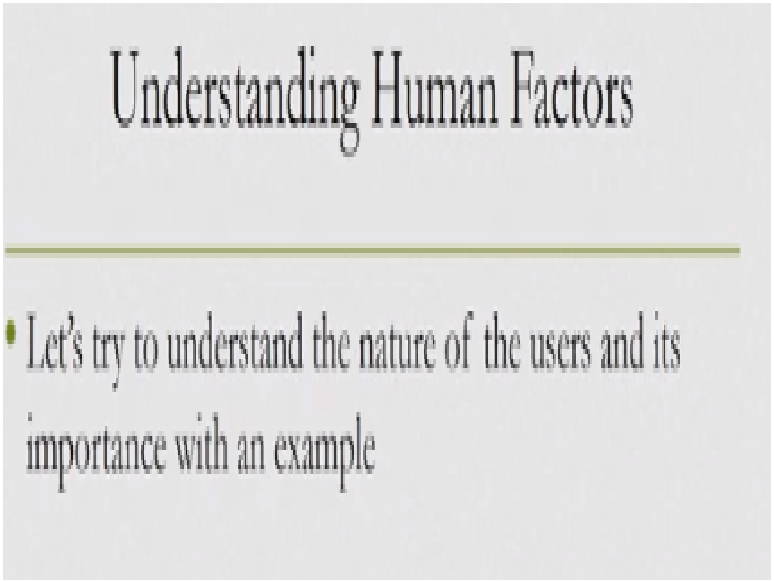

Let us try to understand the need for such a differentiation with respect to an example.

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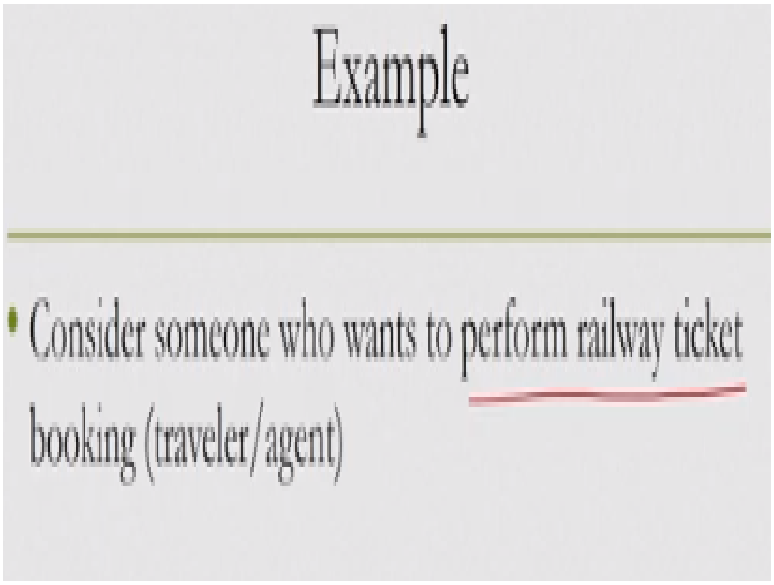

Suppose we are trying to perform a railway ticket booking task here we may refer to a traveler or an agent but the task is same booking a railway ticket.

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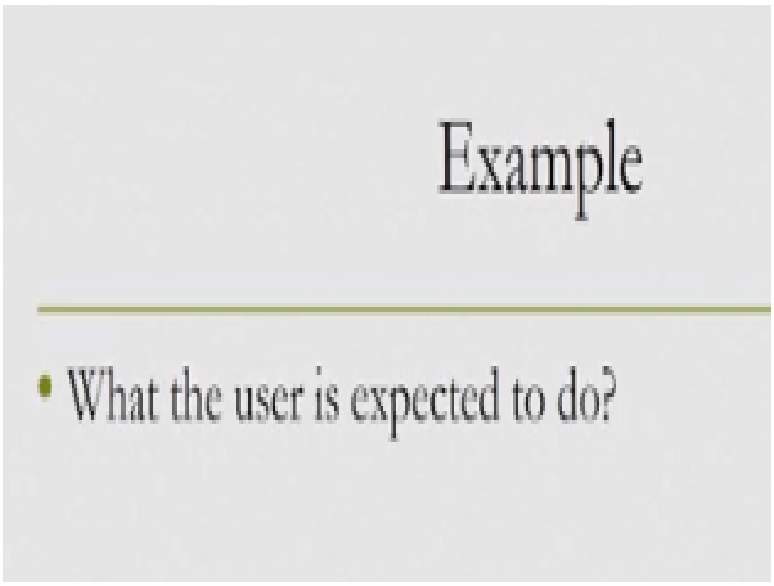

So what the user is expected to do that is the first thing we should be focusing at the expectations of the user.

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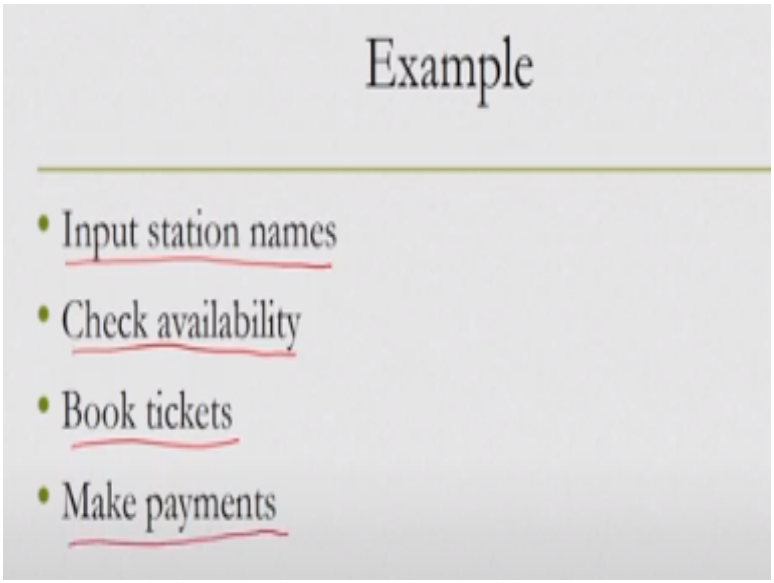

So the user should be able to input the name of the station, check the availability of seats in the train between stations. If it is available then the user should be able to book the tickets and finally once the ticket booking is done he or she should be able to make payments. These are the fundamental tasks that a user in this case a traveler or an agent is expected to perform in other words the system is expected to help the user perform these tasks.

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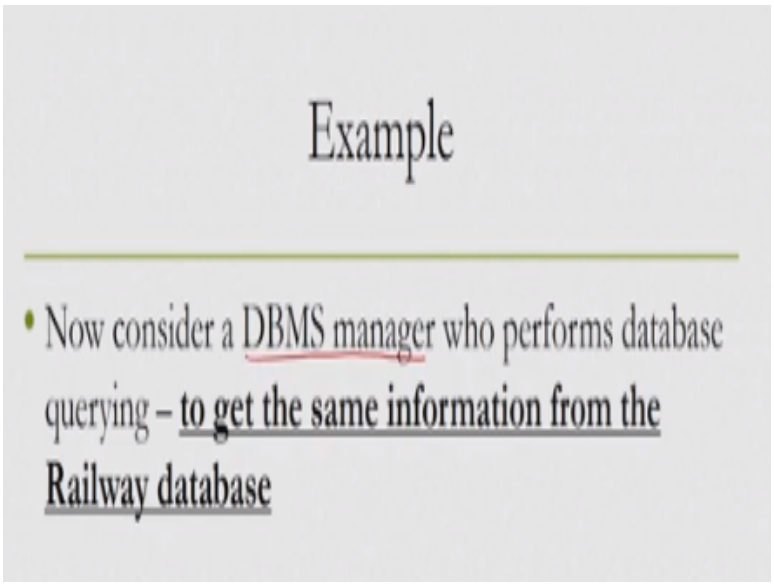

Now let us look at it from a different user's point of view a DBMS manager or a database manager who incidentally performs the database querying to get the same information from the railway database. So here we have 2 types of user we are talking about one is a traveler or an

agent who is trying to get some information about tickets between station and trains. And another user who is a database manager who is also capable of getting the same information using the same database that is the railway database.

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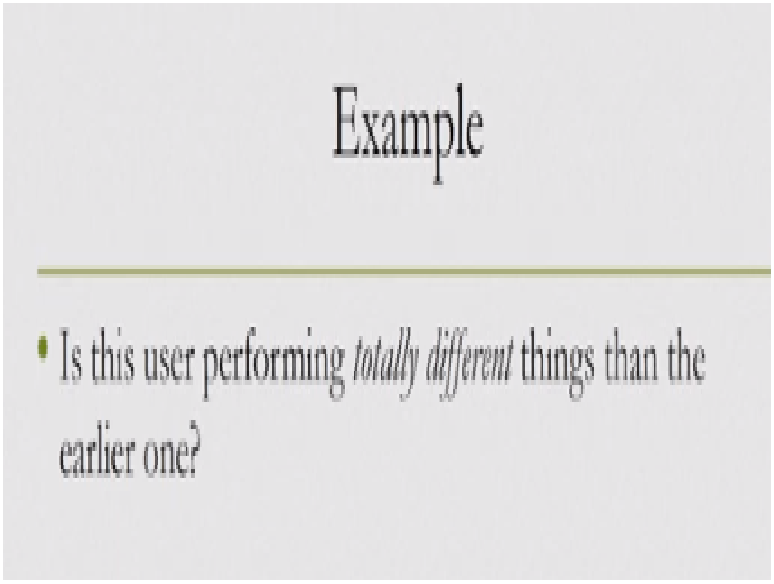

So the second user that is the database manager is he or she performing something different than the earlier ones that is the traveler or an agent so are these tasks totally different?

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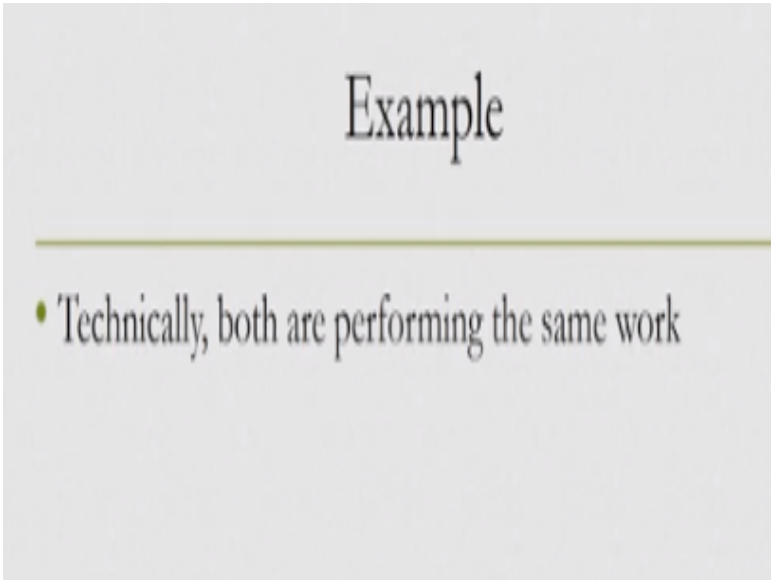

If we look at it from a pure technical point of view they are performing the same task or same set of tasks.

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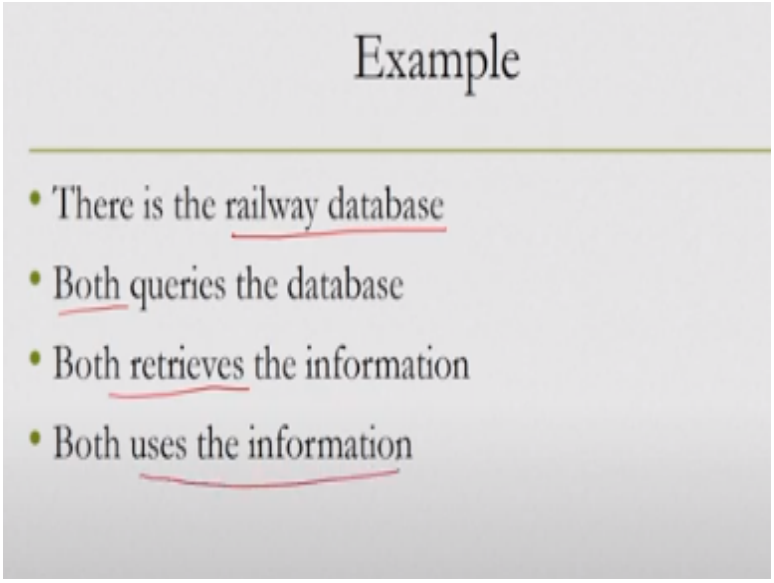

What are these tasks? So essentially what they are doing is querying the railway database? So there is this railway database containing all sorts of information about train's seat availability ticket price booking status and so on. Now both the traveler or agent and the DBMS manager both technically are querying the same database to get information for the same type of tasks. Then both retrieves the information and both uses the information but for different purposes.

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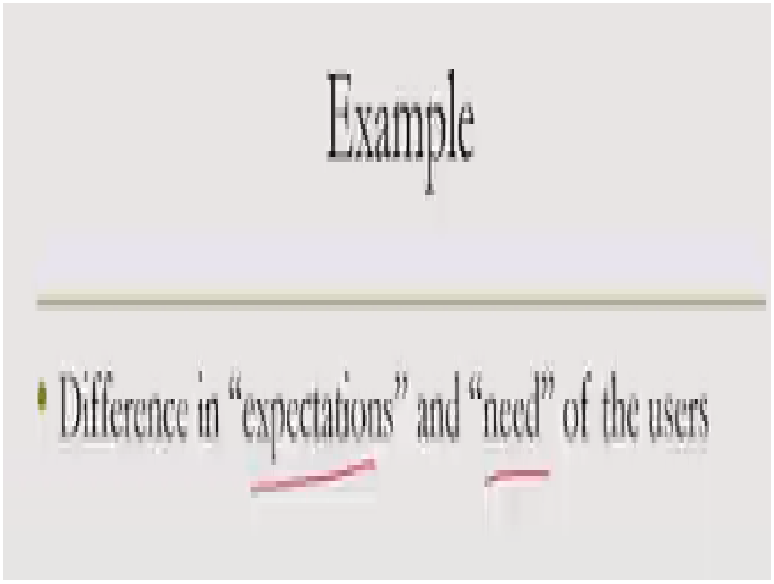

So what is different here they are performing same type of operations on same resource. So is there any difference why should we differentiate between a traveller or an agent and DBMS

manager the difference is in terms of expectations and need of the user. So when the user is a traveler or an agent his or her expectation and need are likely to be different than when the user is a DBMS manager.

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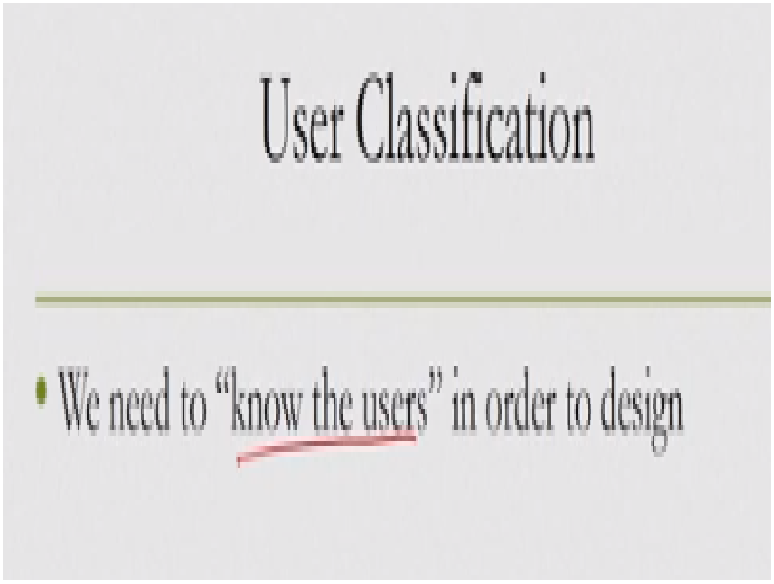

How so if you are a travel agent or if you are a traveller yourself then you are not bothered about how the database is structured, organized, what are the languages to be used to retrieve the information? What is the format of the information? How to interpret the format all these things are not of any importance to you? Whereas these are important issues for a DBMS manager so what you are bothered?

About is how to get the task done how to get the information about seat availability, about seat price about trains, about booking status in some form which is understandable without any specific knowledge required. So your expectation is that you will be getting this sort of information in an understandable form which is also your need. Whereas for a DBMS manager that is not the case for him or her, the information may come in different format through different process and he may not be interested in knowing the actual information.

But how to use that information for some other purpose so the need is also different. So the first thing that we should keep in mind while going for designing a human computer interface is designing for whom who is the user? So the first thing is we should know the user that is very important and crucial requirement for design and implementation of a human computer interface.

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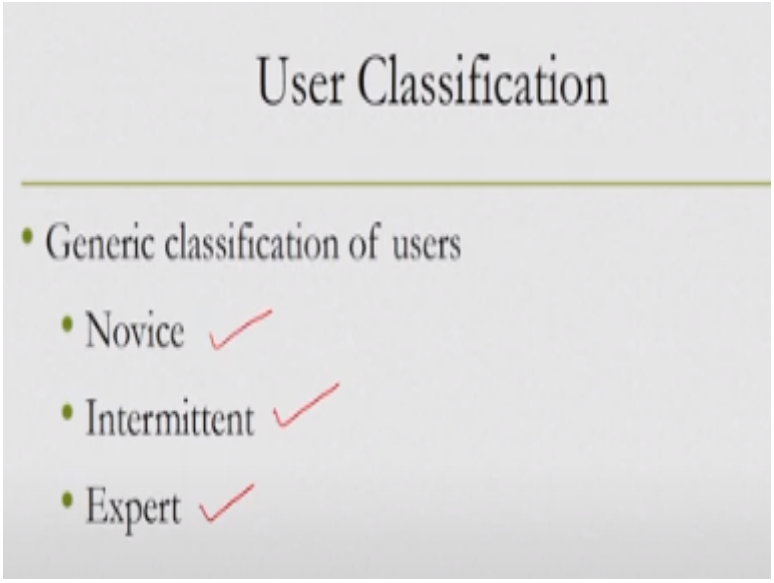

Now knowing the user is somewhat ill defined term so what do we mean by knowing the user? So we can start by classifying the user into categories a very broad and simple categorization is a 3 way categorization of users. Note that here by the time user we are not referring to users like a DBMS manager or someone who is technically sound. Instead we are referring to users like traveler or travel agents who are quote unquote managers who need not know about the technology behind.

So for such type of users we can divide them into 3 categories novice, intermittent and expert. Now with this knowledge we will be able to actually build systems that will be more acceptable to the particular user group.

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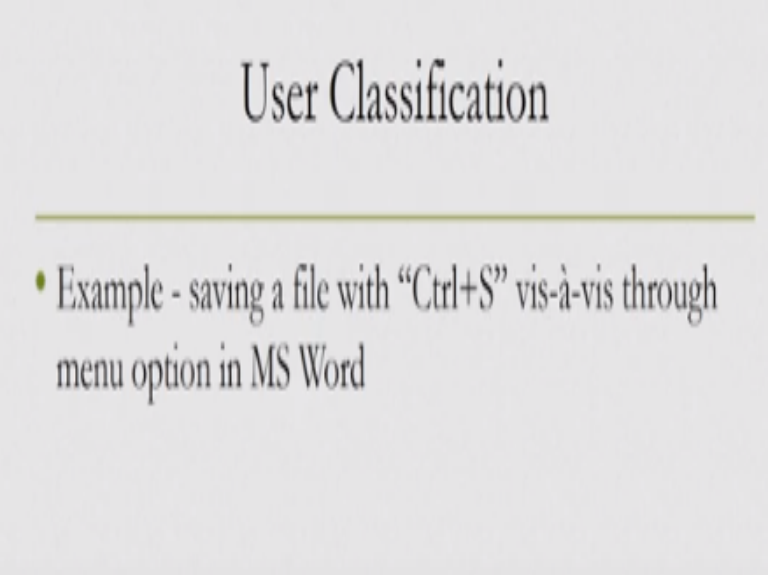

How it helps? Again let us try to understand with another example so many of you if not all have probably used a text editor to create a text document. Now while doing that often we need to save our work how we can do that? If you have used any text document you know that there are two ways to do it one is using a menu option where the save menu option is located in a drop down menu typically.

And you need to select that with your mouse or through some other mechanism to save the current work. Another option is you can use a key combination like control plus s together to save it. So 2 mechanisms provided to do the same task one is using menu option other one is using a hotkey combination in this case control and S these 2 keys pressed together will do the job. Why that is so? Because anyone would have been fine but then I just mentioned so these mechanisms are provided to cater to different user groups.

So when we are trying to use the menu based option we are trying to cater to basically the novice users who may not know the hotkey combinations. So novice users are those who are first time users of a system so every feature is not yet known to the user. Intermittent users are those who as the name suggests occasionally uses the system so they may or may not be able to retain the learnings during each use because they use it very infrequently although more than novice users.

Whereas expert users are those who frequently use the system now here the term expert does not mean expertise in the background technology instead expertise in use of the system. So when we

are using a menu based option it is typically meant to cater to novice users whereas when we are using a hotkey combination to perform a job like control and s to save that is typically meant for expert users. So these different features are provided to cater to different user groups.

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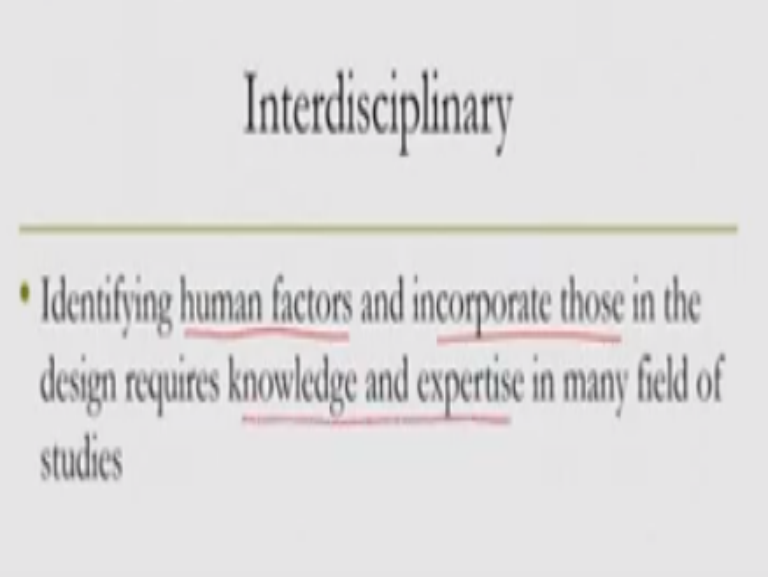

Now this is very important while going to design and implement a human computer interface we need to identify the human factors and incorporate those in the design which requires knowledge and expertise in many field of studies. So effectively what we are talking here is an interdisciplinary field of study where we take help of knowledge and expertise from various disciplines.

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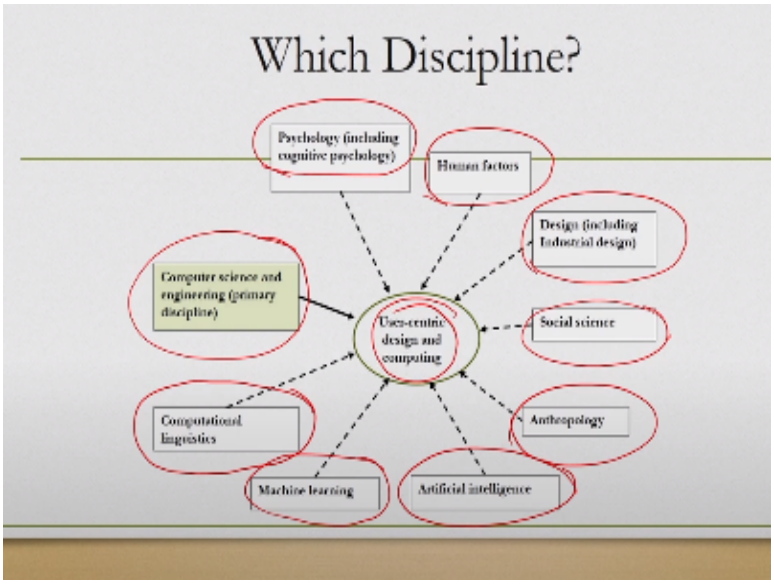

What are those disciplines? There are many but the important ones we can identify as computer science is the primary discipline according to (())(15:07) definition. Psychology including cognitive psychology that is another field human factors in itself it is a field then design including industrial design, social science, anthropology, AI, machine learning, computational linguistics.

These are only few of all the fields that may be involved in user centric design field which is the primary concern in this course. But as I said although there are many fields involved our primary focus will be computer science and engineering which is considered to be the primary discipline in this case.

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So the key concern here is how to consider the human in the design process?

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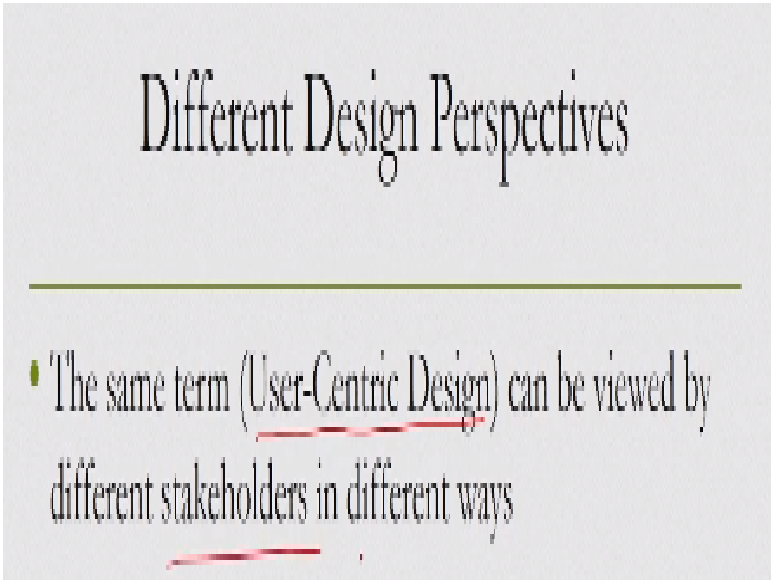

Now to understand that we; should be also aware of different perspectives of design. This term user centric design actually refers to different things to different stakeholders in different ways.

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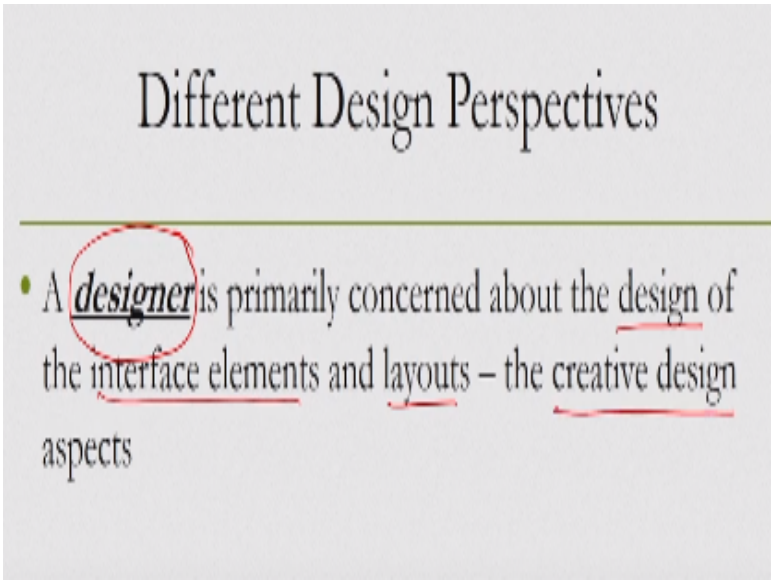

A typical creative designer to him or her, the term user centric design refers to the design of the interface elements and layouts or in other words the creative design aspects the look and feel of the design or of the system.

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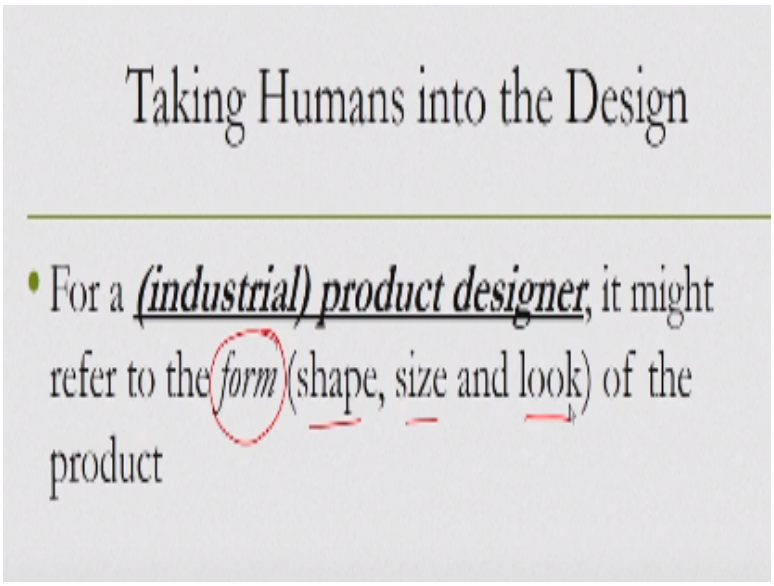

For a product designer particularly industrial product designer the term may refer to the form of the product in other words the same, size, look of the product.

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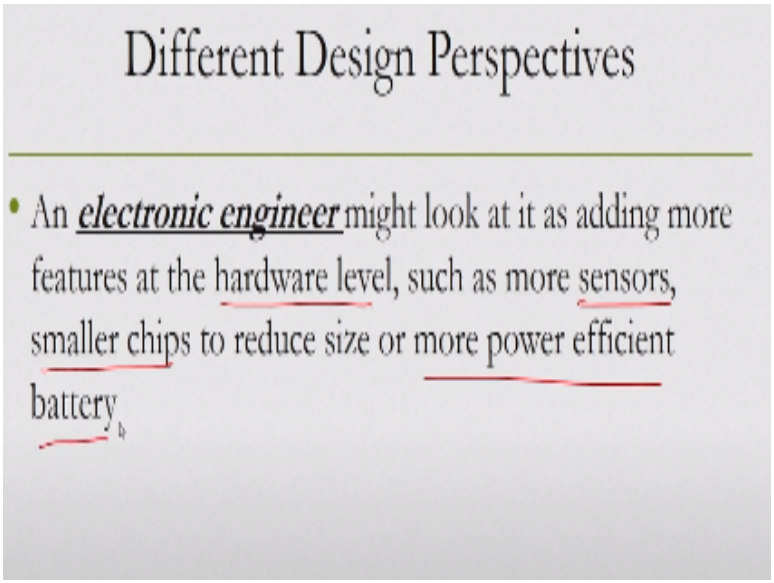

Similarly to an electronic engineer user centric design may actually mean adding more features at the hardware level in terms of more sensors, smaller chips or a more power efficient battery maybe so essentially some hardware features.

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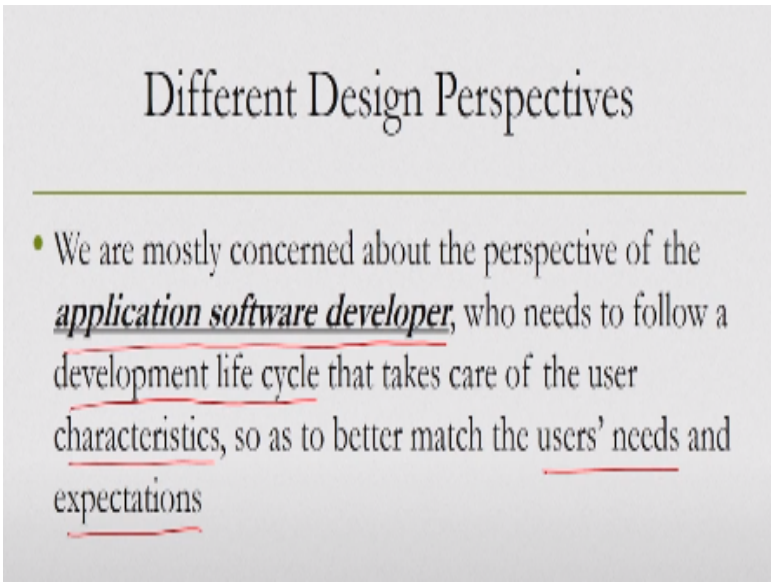

Similarly other stakeholders may view it in different ways but our concern here is from the point of view of or the perspective of an application software developer. So this entire course is actually meant to discuss how to build user centric software. So whenever we use the term user centric system or human computer interfaces we are implicitly referring to a software product or an application.

So our concern is the perspective of the application software developer who needs to follow a development lifecycle that takes care of the user characteristics so as to better match the user's needs and expectations. So effectively what it says is? That from our point of view or the application developer's point of view we should know about the development life cycle that takes into account the users expectations and needs. How to do that? How to take care of users expectations and needs in the development or in the software development lifecycle?

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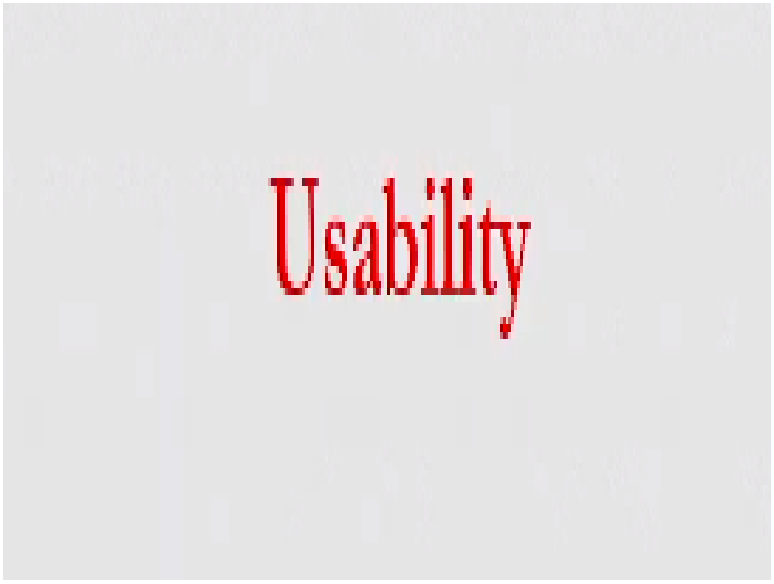

So that brings us to the important concept of usability.

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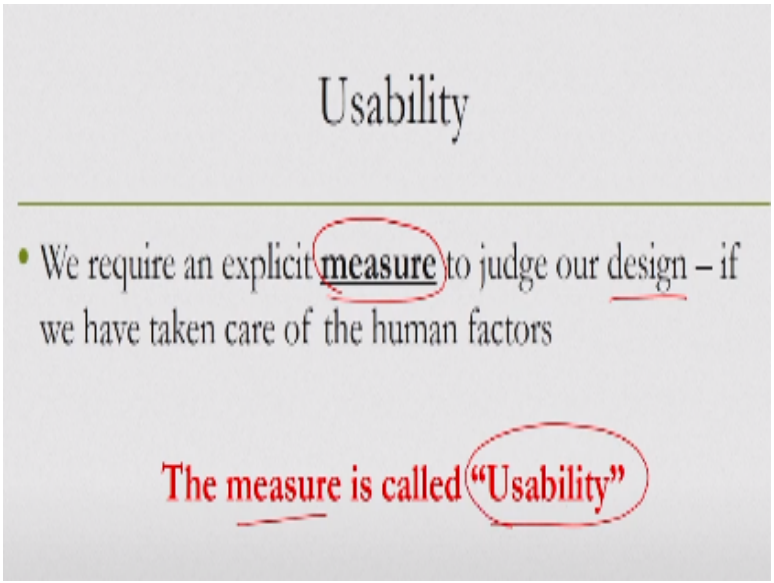

In order to incorporate the factors or the users' needs and expectations into the design of the software we need an explicit measure to judge our design whether we have taken the factors into consideration or not now this major is called usability. Let us learn more about this concept.

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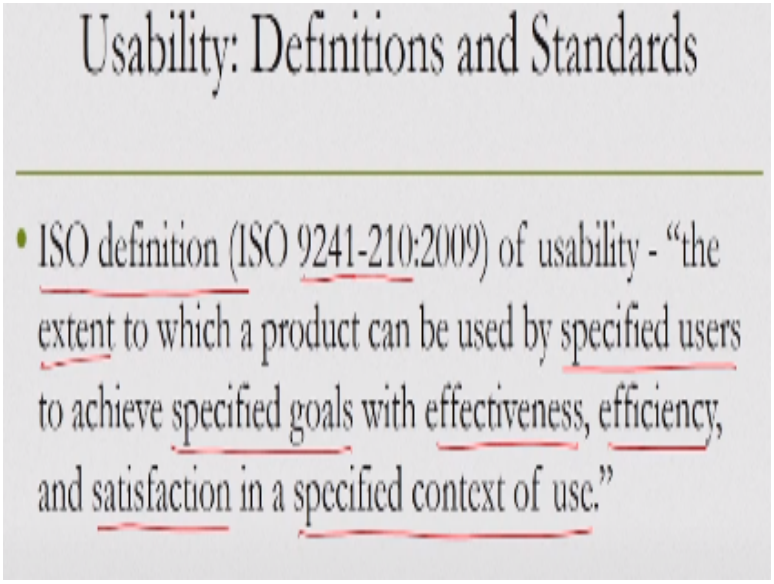

So it is a standard term there is an ISO standard definition of usability. Which; says that usability is the extent to which a product can be used by specified users to achieve specific goals, with effectiveness, efficiency and satisfaction in a specified context of use. So this is the ISO 9241-210; 2009 definition of usability which is a very standard definition. So if you look at the definition there are certain things that you should notice.

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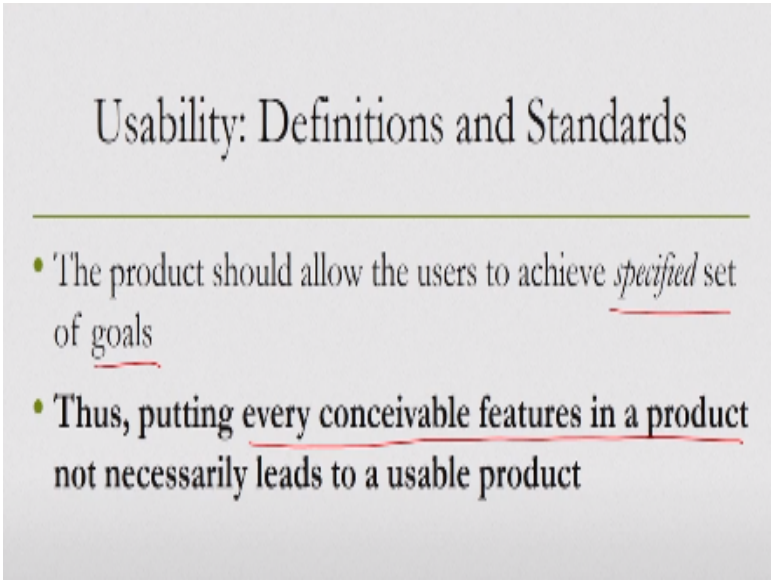

Namely 3 crucial aspects in the definition are the product is meant to be used by specified group of users it is not meant for all. So that is a very important thing we should note that whenever we are talking of a usable product we are talking of a product that should be used by a very specific group of users and we are not talking about a product which is usable to all. So we need not design a product as usable for use by all.

The second aspect crucial aspect is that the product should allow the users to achieve specified set of goals again it is also very important to note that. If we are planning to put every conceivable feature in a product so as to satisfy everybody that does not necessarily lead to a usable product. A usable product by definition or by standard definition is supposed to satisfy specific set of goals of the users.

So it is supposed to let the user achieve only specific set of goals it is not necessary that the user can achieve every possible goals that he or she might have that is the second thing that we should keep in mind.

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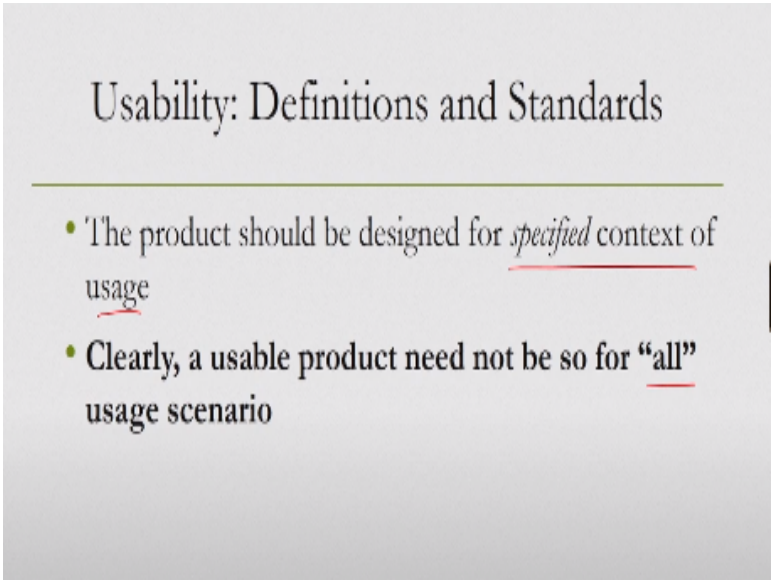

There is a third crucial aspect also which says that the product should be designed for specified context of use. In other words a usable product need not be so for all usage scenarios so we need not try to design a usable product which can be used in any context. So it has to be usable within some specified context of use not for every usage context.

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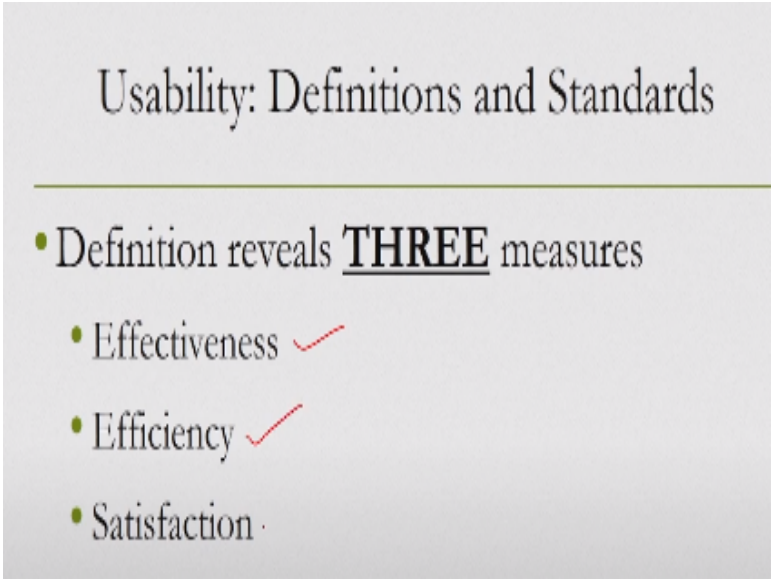

Along with these three crucial aspects there are also 3 explicit measures that are mentioned in the standard definition these are effectiveness, efficiency and satisfaction.

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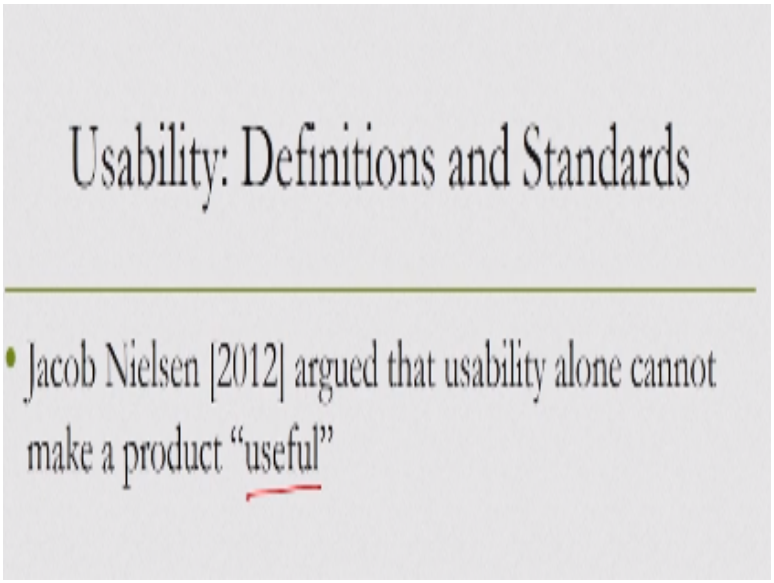

Jacob Nielsen in 2012 argued that usability alone cannot make a product useful. So there are 2 things one is usable other one is useful and we will distinguish between the 2. So usability is about a perception that the product is going to be easy to use to the user whereas useful means whether the product serves whatever the user needs to achieve. That is a very broad way of distinguishing the two and according to Nielsen usability alone is not suitable to make a product useful.

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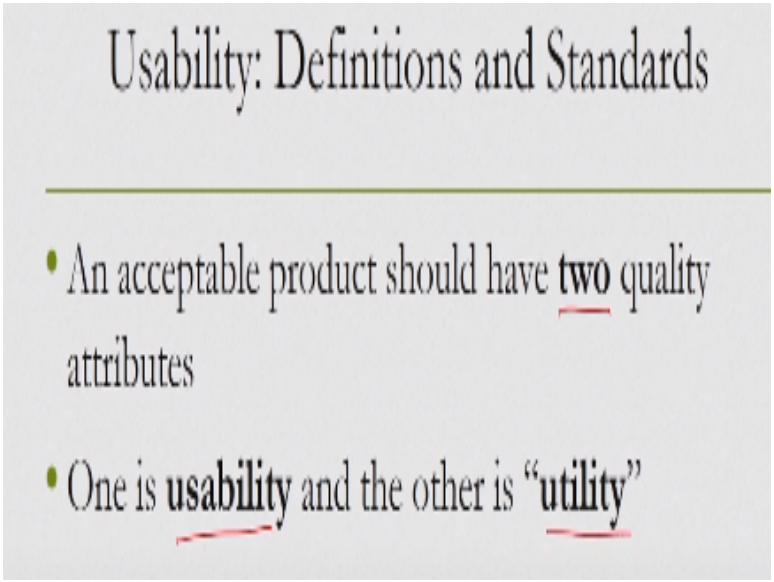

So according to Nielsen again so there should be 2 qualities in a product one is usability and the other is utility together they make a product useful.

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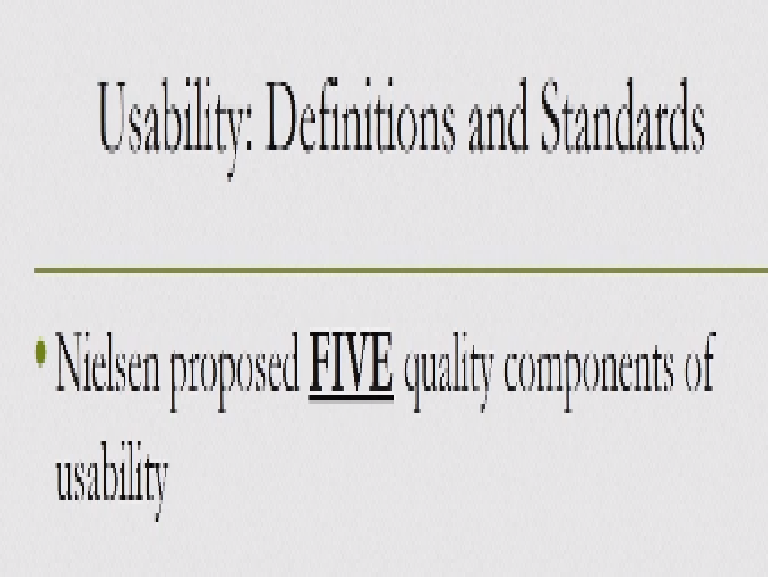

In addition Nielsen proposed 5 measures of or quality components of usability.

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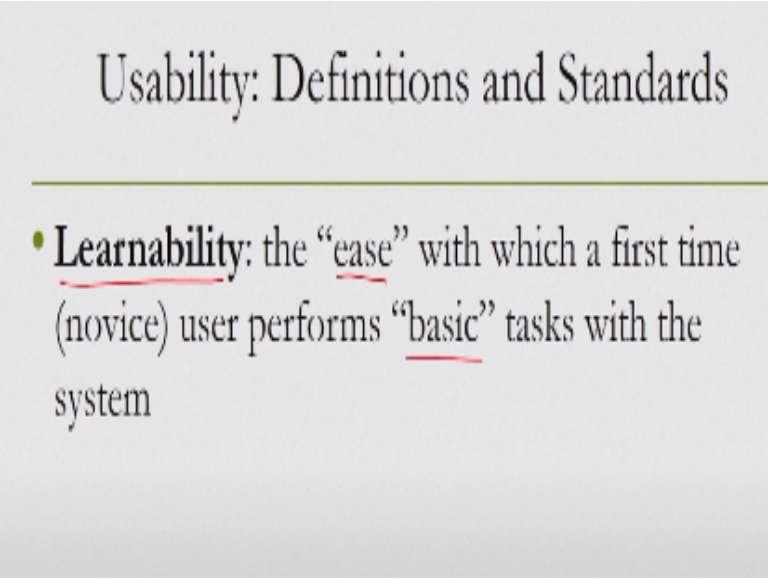

What are these 5 first is learnability that is the ease with which a first time or a novice user performs basic tasks with the system so that is the learnability of a system.

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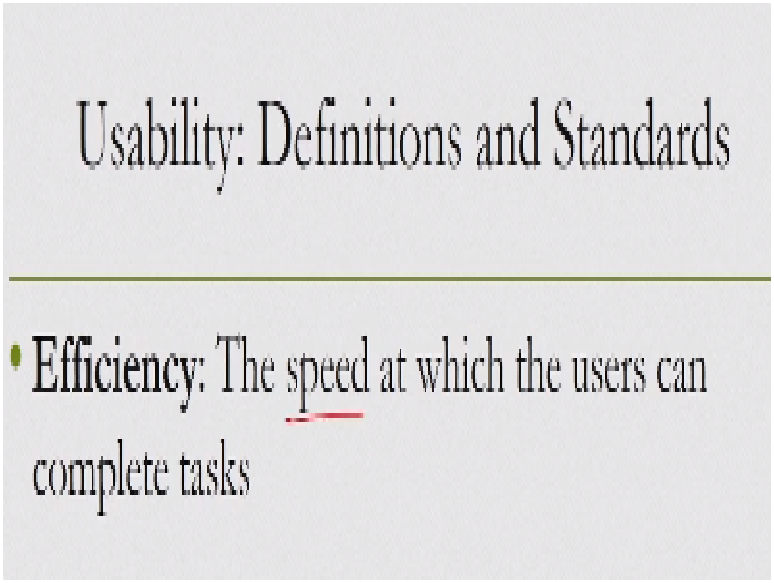

Then comes, efficiency which is the speed at which the users can complete tasks typically measured in terms of task completion rate.

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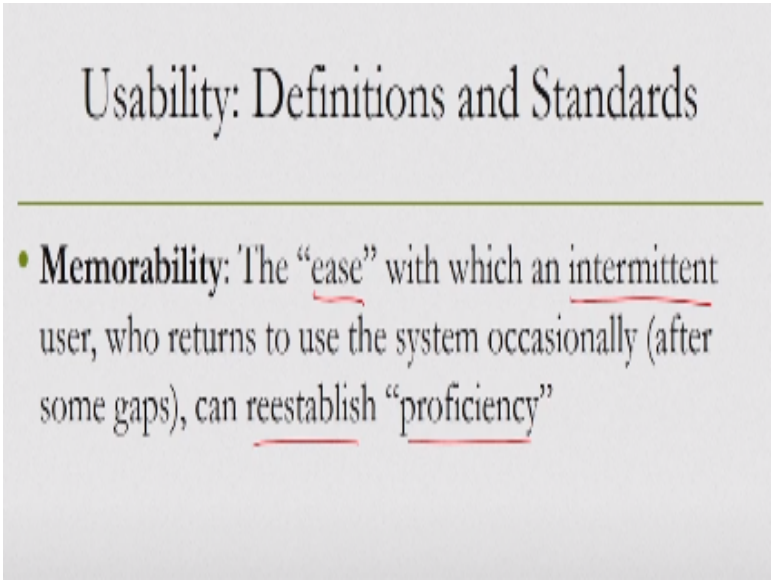

Then memorability again the ease with which an intermittent or occasional user who returns to use the system occasionally after some gaps can re-establish proficiency. But it says that for intermittent users after one use there is a gap before the next use happens. Now by the time whatever the user have learnt about the system may have been lost. So memorability quality indicates how much of this learner can or the user can retain during the next use even if there is a gap.

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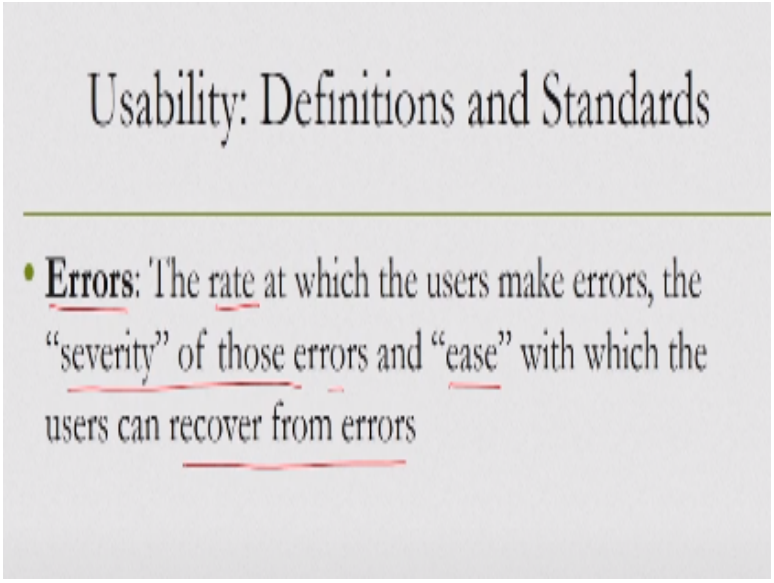

The fourth quality is errors or error rate which is the rate at which the users make errors. Along with that the severity of those errors and the ease with which the users can recover from the errors. So this quality errors actually contain 3 concepts one is the rate, one is the severity, another one is the ease with which error recovery can be made.

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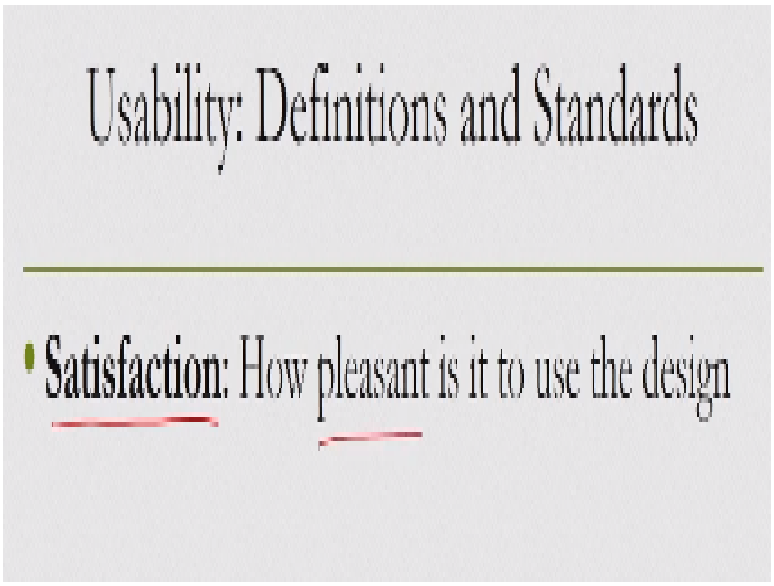

And the final quality attribute is satisfaction or subjective satisfaction or user satisfaction that is how pleasant is it to use the design.

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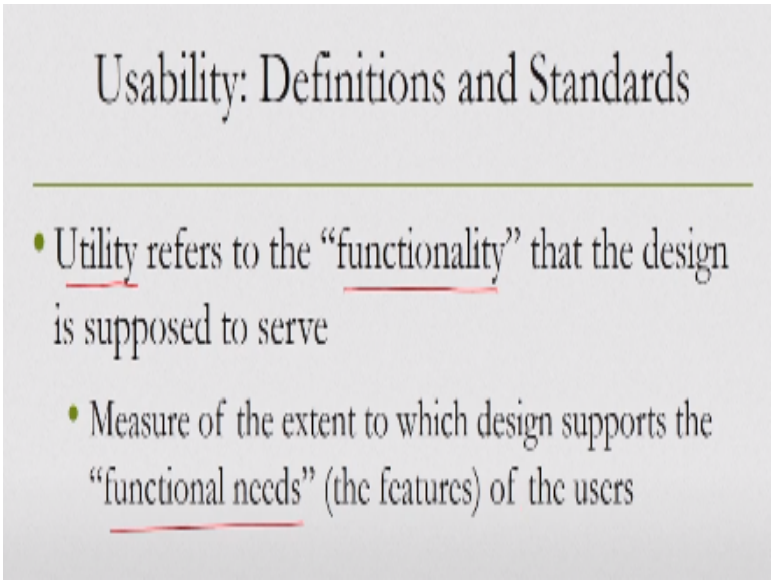

Those are the quality attributes for usability on the other hand for utility the other attribute of a system according to Nielsen it refers to the functionality that the design is supposed to serve. It is a measure of the extent to which a design supports the functional needs of the users or in other words how many features it support that actually serves the functional needs of the user?

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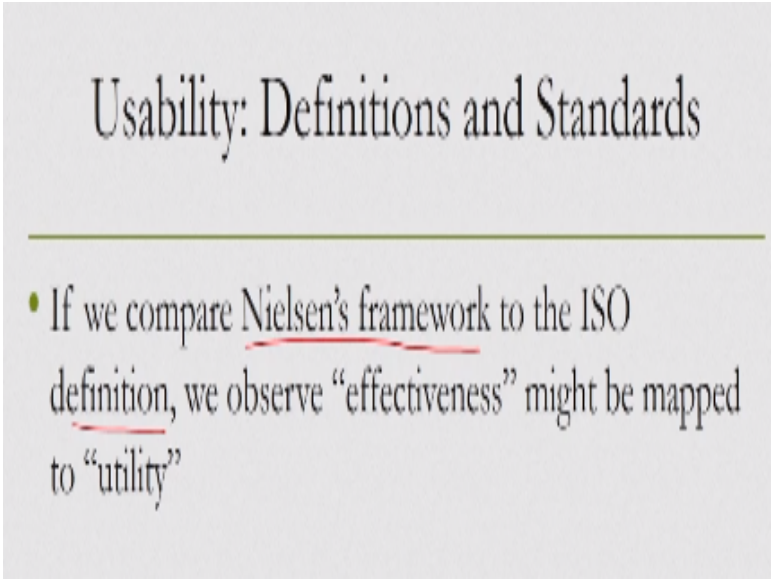

Now if we compare Nielsen's framework to the ISO definition we observed that effectiveness might be mapped to utility. So according to ISO definition effectiveness is one of the measures of usability however if we compare it with Nielsen's framework we can roughly see the

correspondence between this major effectiveness and the definition Nielsen provided about utility.

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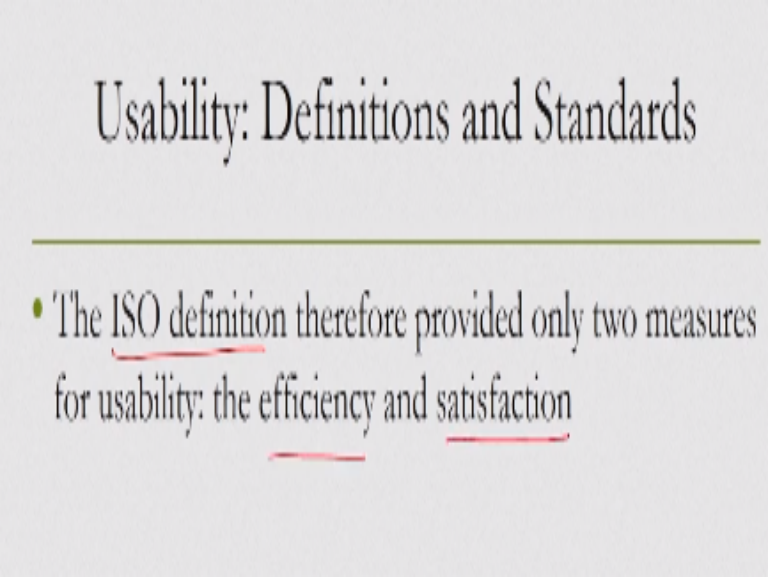

As a corollary to this comparison we can say that ISO definition therefore provided not 3 but 2 measures of usability efficiency and satisfaction whereas Nielsen's framework provided 5 measures of usability.

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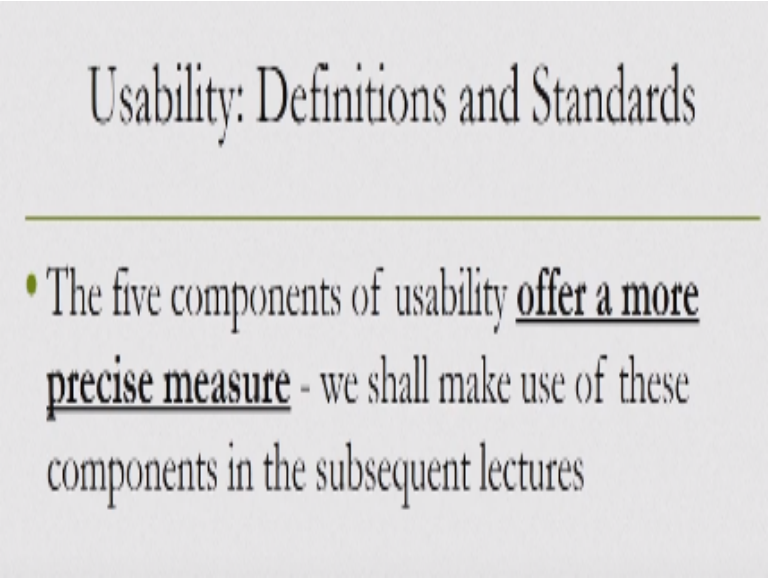

So it is likely that the 5 usability measures or quality components by Nielsen is likely to offer a more precise measure. So accordingly we shall assume that these are the measures of usability

and we will subsequently use these to measure usability in our subsequent lectures. So that is in brief what we can consider as usability so to recap we have this ISO standard definition which talks about the nature of usability.

That is an usable product need not be designed for all or for all context of use or for all sorts of tasks instead it refers to the fact that a usable product is supposed to be usable only for a specific group of users working in a specific context and trying to achieve a specific set of goals. It also says that there are 2 measures of usability whereas Nielsen's framework provides for 5 measures. And we will go by the Nielsen's 5 measures as a more precise measure of usability.

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Now with this knowledge now let us try to turn our attention to the concept of user centered design.

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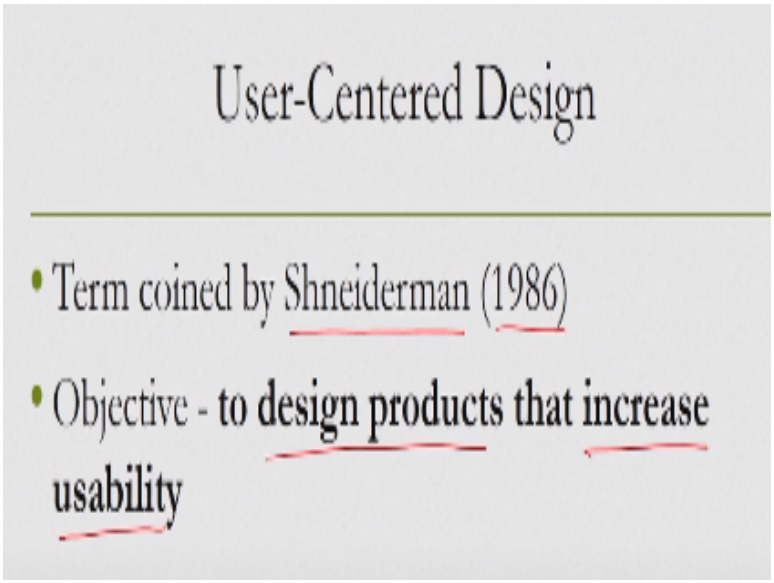

Now this term user center design was first coined by **S**hneiderman in 1986. What is the objective of this design process? The objective is to design products that increase usability. So when we are talking of user center design so we are essentially referring to the fact that we want to increase usability of the product by following this design approach.

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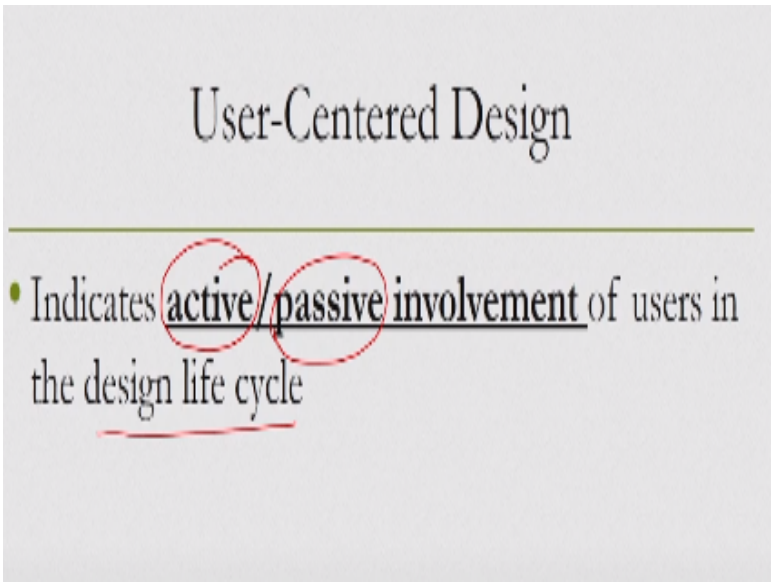

Now this user center design approach indicates active or passive involvement of the end users in the design lifecycle. So somehow we have to incorporate or involve the users in the development process. Now that involvement either may be active that is the users are actively participating in

the design or it may be passive. That somehow we are taking user feedback in a passive mode and then utilizing that to design the product.

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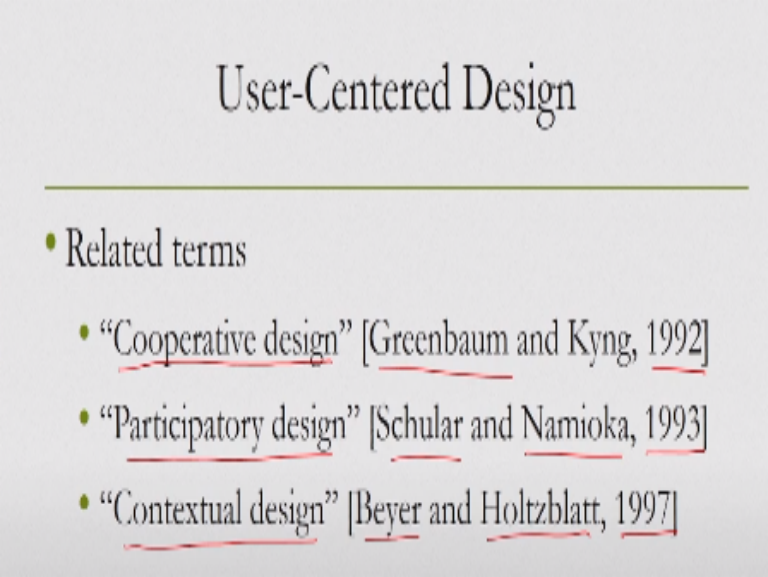

There are few more related terms also related to this concept of user centered design one is cooperative design proposed by Greenbaum and Kyng in 1992. Then participatory design proposed in 1993 by Schular and Namioka then contextual design by Beyer and Holtzblatt in 1997. So all these terms are broadly referring to the same fact that we are involving the users in the design process either actively or passively. Although there are minor methodological variations involved but broadly they refer to the similar concept of user centered design.

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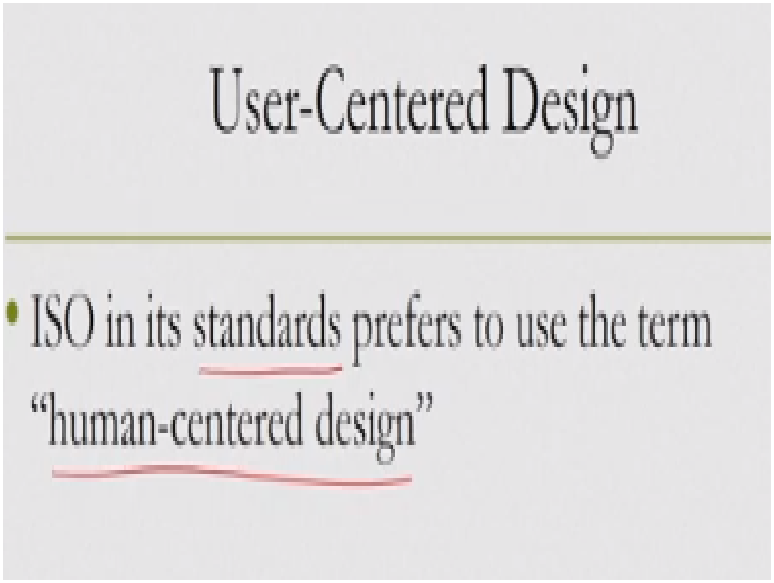

There is also this ISO term used by ISO in its standards which is human centered design. So the thing to note here is that all of them referring to the similar concept whether we are using the term user centric design, user centered design, human centered design, and participatory design cooperative design etcetera. What we are essentially referring to is that we are referring to a process a stage by stage developmental process which involves the end users in the overall development of the product.

Now this end user involvement may be active involvement that is the users are actively involved in the development process or it may be passive involvement that is somehow we are collecting input from the users and using that input to design and develop our product. So, how to do that how to follow this user center design approach? Will; be the subject matter of our subsequent discussions.

So with that we come to the end of this second lecture in summary what we have learnt today is the important concept of usability and why we need to know it? Why it is important? To recap it is important to cater to the need of layman users which are our primary concern in design and implementation of human computer interfaces.

So if we do not make the product usable then it will not be acceptable to the laymen users so our objective is to increase usability of the product and that is precisely what is called user center design which term we have learned in our previous lecture. So here we gave a more formal

definition of this term and in subsequent lectures we will see how to implement this user center design approach for development of human computer interfaces or user centric software applications?

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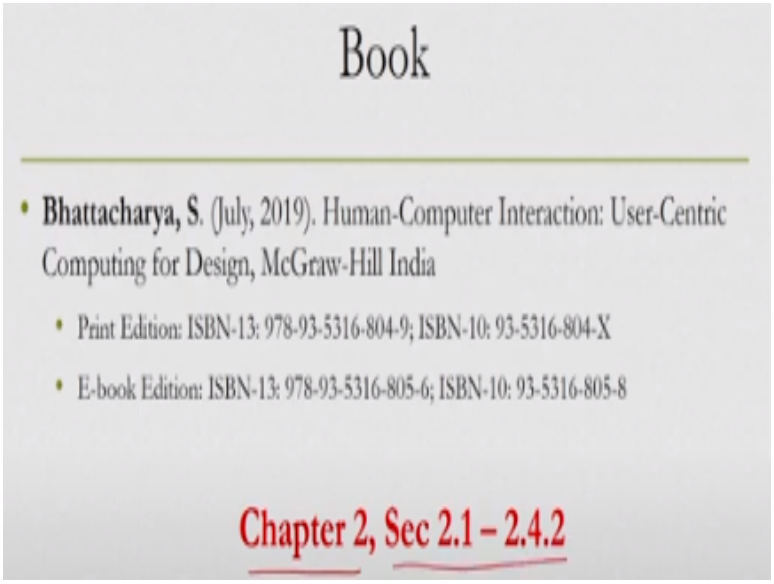

Whatever we have covered today the material can be found in this book you are requested to refer to chapter 2 section 2.1 to 2.4.2 that is all for today thank you and goodbye.