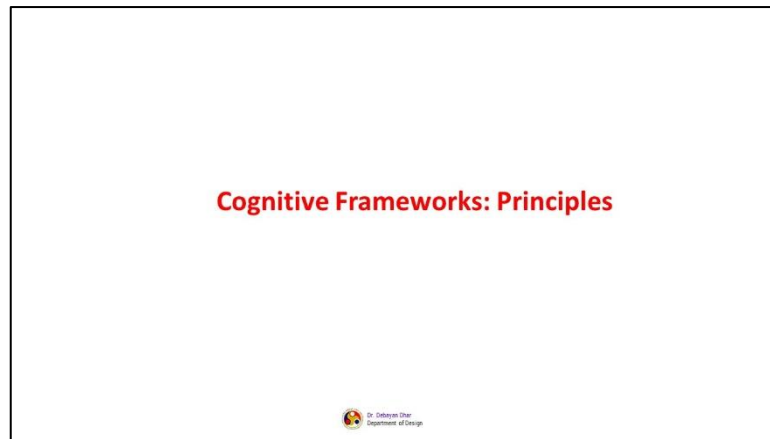**Usability Engineering**
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Module - 07
Lecture - 25
Cognitive Issues

Welcome to module number 7, lecture number 25, in this session we are going to discuss about Cognitive Issues.

(Refer Slide Time: 00:47)

Specifically, we are going to talk about various frameworks, principles, related to cognition and thinking processes that would direct the way we design our interfaces. So, in short these are going to these are the principles which are going to influence the way we design our interfaces. And these are influenced from the cognition aspect of human brain. And therefore, it is important for us to understand and discuss them in order to ensure that whatever you design during your conceptualization stage falls in a way that is meaningful for your customer or end user.

(Refer Slide Time: 01:33)

First let us start discussion about persuasion. And in persuasion we would start with the principle that is called picture superiority effect. Now, it's very simple, but then I would like to give you a background to it. Now, picture superiority effect relates to the fact that human brain learns and retains information much better when it comes in the form of images. So, images are visual form of information is learnt very easily from by your brain. And it is learnt more than what we understand from words and therefore, visual sources can have a much greater and more lasting impact than text.

So, Allan Paivio in 1971 explains this principle which is known as the theory of dual coding that we retain images better than words because they are coded twice in our memory. So, images according to what Paivio has said according to the dual coding theory images are coded twice in our memory than the words. And that is because of their visual richness and the amount of information that can be related from images by your brain and that is also in relation to the experience that you had earlier.

So, in digital interfaces and pages lay out, advertisements and packaging all benefits from the strength of images to convey meaning as well as the accompanying copy that may be placed alongside; this helps to scan the page rather than reading each line. It needs to be memorable which makes conveying message more powerful in the process of persuasion. We must understand the fact that persuasion is so important for us, because we intend to ensure that adoption of our product happens. And persuasion at the first level of engagement happens at the visual realm.

And it is therefore, important for us to know that this adoption can be further triggered, if you ensure visual images as a way to communicate your message which has a support from what Paivlio Paivio has said as a principle of dual coding theory. So now, you can understand that the same message if you are communicating through words and texts have less impact than the one if you can communicate through messages you know.

So, therefore, in order to ensure that the persuasive effect of your communication happens, ensure that the visual realm of communication is activated, messages are conveyed through visual illustrations and images. But, yes you do need textual data, but ensure that the visual realm is much clearer and more active. So, that the level of persuasion can be attained and adoption can be attained at a faster rate from the perspective of your end user.

(Refer Slide Time: 05:17)

The next after picture superiority effect theory is the framing theory. Now, the concept of framing is a related to the agenda setting tradition, but expands the research by focusing on the essence of the issues at hand rather than on a particular topic. So, the basis of framing theory is that the media focuses attention on certain events; so, it is event driven principles. So, media focuses attention on certain events and then places them within a field of meaning; so, events within a field of meaning.

The language that we use to frame a decision process also influences people's perception greatly. By manipulating the way, we present information, we can change how users make their informed judgements and decisions. This the application of framing theory can be widely seen in advertisements, in media.

Where you can see in a particular field of meaning facts and information are introduced, are manipulated in such a way that the audience believe that to be true and get persuaded because of that, that is a framing theory. So, it is more like focusing on the narrative essence of the situation, but ensuring that you only put those facts which you want the audience to be carried away and reach to a conclusion which you as a designer intend them to reach.

(Refer Slide Time: 07:13)

Now, framing techniques according to Fairhurst and Sarr in 1996 has some characters to it and these are metaphor. To frame a conceptual idea through comparison to something else. We also talked about a metaphor when we talked about in the last lecture about the essence of designing and the role of metaphor, how metaphors can relate, what you intend as a designer, what you intend to communicate through these visual languages.

And these are the products which has a meaning in the life of your user, because they have been using this. So, based on those experiential data they can interpret what you would like to communicate if you use a metaphoric representation of a particular feature as a visual data. Stories; myths and legends, to frame a topic via narrative in a vivid and in memorable way; so, these are the characters of framing, factors based on which framing is done.

Tradition; rituals and ceremonies; so, cultural mores that imbue significance in the mundane closely tied to artifacts. Slogan, jargons, catchphrase, to frame an object with a catchy phrase to make it more memorable and relatable.

(Refer Slide Time: 08:50)

Artifacts objects with intrinsic symbolic value, a visual cultural phenomenon that holds more meaning than the object itself. Contrast to describe an object in terms of what it is not; so, this difference in terms of perception happens between what it is and what it is not that is how the persuasion gets affected. Spin to present a concept in such a way as to convey a value judgement; it can be positive or it can be negative, but that might not be immediately apparent. And the idea is to create an inherent bias by definition; so, these are some of the factors that designer uses as framing techniques.

(Refer Slide Time: 09:48)

Our next discussion on the principle of behavior would be cognitive dissonance. Now, it is an uncomfortable feeling caused by holding two contradictory ideas simultaneously. Cognitions we mean by thoughts, feelings and ideas when are in harmony can cause consonance. But, when they are not in harmony when we have two contrasting ideas that

are holding their places in your brain, in your thoughts, in your mental processes simultaneously two unrelated thoughts cause dissonance.

Expectation effect, now if our audience of potential customers are at their most receptive in terms of being persuaded when introducing or promoting a new design. So, you see whenever a new design is being intercepted and it is being introduced into the market the expectation effect takes over for the audience. The very first time when a product is introduced the potential customers are at their most receptive terms.

So, you make sure that whatever you want to plant you want to convince you want to convey, you can convey to its highest effectiveness during the moment when the product is launched, that is called the expectation effect.

(Refer Slide Time: 11:28)

And the next very important law that is part of our behavioral principles is the Hick's law. Now, Hick's law is a simple idea that says that the more choices you present your users with, the longer it will take them to reach a decision. The more the number of choices; so, the more the number of choices the longer it will take them to reach a decision. So, it's a function of; so, choices is a function of decision making. So, number of choices can influence your decision making; if it is higher it will take longer time for the person to decide.

Now, it might look simple, but when you look at the applications of Hick's law in interface design. In designing a product which our customers will use, you would guess aghast by its application, by its seriousness, by its importance and by its effect that it causes on the people in terms of their interaction. So, as a designer you will use Hick's law to examine

how many functions you should offer at any part of your website and how this will affect your users overall approach to decision making.

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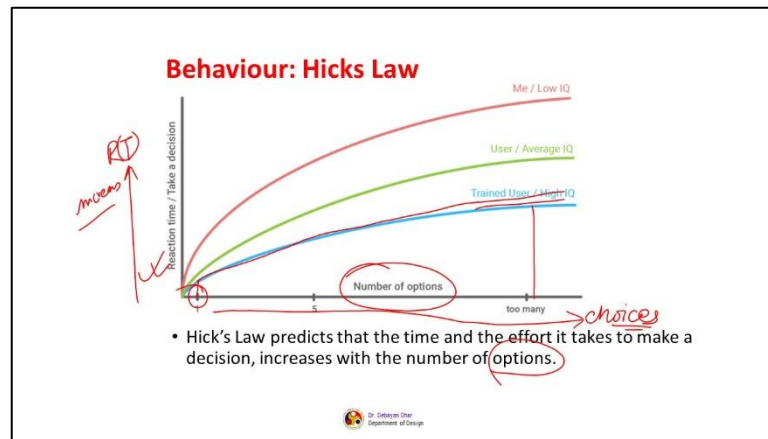
Let us look an example to understand that better. If you plot a graph between two functions, one is the reaction time and the other one is a number of a options along with the xy axis what you will see that as the number of options; that means, these are the choices increases the reaction time also increases R T also increases.

You see when you had one choice, the decision time was less and it gradually increased as you had many. So, Hick's law predicts that the time and the effort it takes to decide increases with the number of options. If you have too many options, you will take too many times too much too longer period of time to decide on what you want to do. Take an example of the number of dishes that are there in front of you. If you have 2 dishes, you can quickly decide which one you would like to taste first and which one to go next.

But if you have 10 15 number of dishes in front of you and you want to try, but then you really want to see which one would be tasty. How would you decide, how long will you take rather to decide which one would you start first; that is what Hick's law for us. So, the moment the options that are given to you increases in number your reaction time also increases. That means, you take a higher processing time in order to process and react to the options that are being provided to you.

(Refer Slide Time: 15:06)

Now, when do you use Hick's law? So, you can use Hick's law when response times are critical. See there are situations when it can be applied to simple decision making with multiple options. And this is especially important in control system environments; control system environments are really tough and challenging. When things go wrong and alarms are triggered users need to be able to make quick decisions. And when users enter the stress zone they get tunnel vision; so, their vision is constrained, they are loaded with a lot of stress.

In those situations, if you combine that with the input from all the body senses; you can get a pretty-pretty serious situation, a nasty situation. So, when response time is critical keep the choices to a minimum that is the idea. It will speed up decision making. Consider the situation when there is a hospital emergency cases, decision making can really play an important role in saving the life of a person.

(Refer Slide Time: 16:34)

Now, how to get start with Hick's law. Card sorting which if you remember which we have discussed earlier is a great method to find out about the categories of information that make more sense to your users. It will help you define the groupings of functionalities and terms.

(Refer Slide Time: 16:58)

And when not to use Hick's law? This is a very important aspect to understand when do you choose Hick's law and when not to choose or go ahead with Hick's law. Hick's law is a law that will not give you result if you are using it in a situation which has heavy learning component. So, Hick's law does not apply to complex decision making.

If decisions are requiring extensive reading, researching or extended deliberation; Hick's law would not work. Hick's law would not be able to predict the time to decide, that is one issue that you must remember while applying Hick's law. Whether the situation where you are where you intend to apply Hick's law is a situation that requires extensive reading, researching and deliberation or not; if that is a situation you would better stay away from application of Hick's law.

Consider the situation; choosing dinner at a fancy restaurant or picking an Airbnb place to stay for your vacation next week. Now, these types of choices are complex. Now, why these situations are complex? Users need to consider and weigh many options before making a final decision. There are many factors that will influence the way you are going to select your final day that is on not one factor.

So, in these cases Hick's law prediction will fail. So, it only applies to simple quick decisions in the right context, the idea for you is to understand scanning behavior versus

reading behaviour. When in the morning you look at your newspapers, you are scanning it while you are reading a book because you are go going in detail of the papers, pages, sentences, paragraphs to understand the entire meaning of the story. That is the difference between scanning and reading.

So, when you are scanning something you go for Hick's law when you are reading something you go for not applying Hick's law. So, do not apply Hick's law in a situation where you are reading.

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Now, let us discuss about the practical use of a Hick's law. What you see in the image is a TV remote. Now, humans are very strange you know, we like to say we want as many options as possible, but when we get them we get confused and we cannot decide. Look at the image, the number of options it has probably every activity, every task that are possible for the TV unit to be performed has a button in this remote.

Now, when response time is critical keep the number of options small. One to five is a good rule of thumb to design such complex situations and minimize it to smaller number of decision-making options, but here is a caveat, look at the next picture.

What do you see here? You also see here a TV remote. Now, remember what we said, having too many options can be perceived it you know very strange because too many options increase our time to respond. Now, having too many options with equally perceived hierarchy can cause analysis paralysis that frequently leads to frustration having too many options.

But, what you seen in the image is that in contrast systems that have fewer or lesser options are frequently rated by users as having a better experience. But, then how many few is manageable? If you have too few it will also lead to issues where you would an you would not be able to figure out how to choose an option, how to take a path and reach an option.

So, there is an optimal path, there is an opt ideal number that you should consider. Because as I said, too many options with equally perceived hierarchy; that means, when you are providing these options and you are providing them in a hierarchy they may cause analysis paralysis. So, paralysis of the analytical brain happens, it breaks down and therefore, you take longer time to respond or to take a decision and this leads to what this leads to frustration.
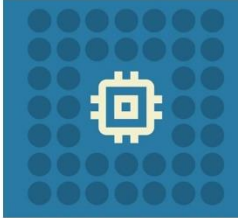
So, in contrast what we do we take fewer and clearer options see, this remote has fewer and clearer options, but then what? But you must remember that too fewer is not is not a good option either. Because why? It will also lead to a situation where your thought processes your brain will not be able to take a call on the various options that needs to be understood that needs to be accessed by these fewer options. So, there is a situation where

say, threshold value and optimal optimally optimal number is required. So, therefore, we say that four to five options are good options for having a better user experience.

(Refer Slide Time: 23:26)

The next one highlighting see the image, what do you see here? You see here that there are so many visual cues or illustrations; you see a figure where there are so many visual points up there right. And among all of them one is highlighted; so, highlighting is another way to use Hick's law. Make a few important options to stand out among the cluttered user interface to speed up the response times.

(Refer Slide Time: 24:06)

The next principle for behavior which many a time is extensively used in design of systems complex systems is the Maslow's hierarchy of need. So, Maslow's hierarchy of need can be translated to design for which the hierarchy from low to high would be functionality, usability, functionality, reliability, usability, proficiency and creativity.

So, you have functionality and then reliability; so, you have functionality, then reliability, usability, proficiency and creativity, proficiency and creativity. So, I have just written down all the factors that we have discussed in this last slide here, now we can see. So, when we talk about Maslow's hierarchy of the of need, we can actually translate them into design factors. And these factors can be translated either by this or by the factors that have been depicted in the image. You can see safety starts first, then it becomes utility, from utility it becomes effectiveness and then to efficiency satisfaction and self fulfilment.

So, when we talk at the lowest level when it is we are talking about you know functions right. We are talking about, if you see in the last slide we discussed about functionality and from functionality it is moving down to reliability. So, here you see the first is safety and safety is related to the functions to the activities that are being performed.

So, is my reputation safe, is my identity safe, is my data safe, will it hurt, will I hurt anyone, is it dangerous. So, these are all related to the activities to the functions and the associated aspect is the safety aspect of it. Then come utility; we have already discussed when a product is considered as a utility product; is it better, does it get the job done, do I want it, do I need it right.

And then effectiveness; does it do the job well, does it work, can I do it. Then efficiency; will it support me when I am an expert, will I make mistakes, is it fast to use, can I learn it quickly. And then to satisfaction; does it understand me, do I prefer it, can I control it, is it confusing, does it make things better and quicker or easier, does it understand my

work, will it annoy me, is it repetitive in nature or mundane, does it fit in with everything else.

And then finally, what you see is self fulfilment; is it fun. So, we are now talking about the experiential part of it; is it fun, do I lose myself in it, does it make me feel good or look good, does it empower me, can I use it to communicate, does it let me be me. Now, you see only when these stages are fulfilled; so, 1, 2, 3, 4, 5, these 5 stages are fulfilled then a person comes to this stage when he is more concerned and focused on this.

So, what I am trying to say that when you design a product, you start with having the basic aspects being addressed and that starts with safety, utility, effectiveness, efficiency and satisfaction. Only when these issues are satisfied that relates to functionality, reliability, usability, proficiency and then creativity.

So, at this level; at this level he is now an expert you know, he has went to a situation each stage he is evaluating. First of all he is talking about functions, and whether the functions are safe and these are utility functions and whether then whether the functions are reliable or not effectiveness and efficiency and then he is talking about usability right and proficiency.

So, the level of satisfaction where he is focusing on these things, and then finally, he is talking about creativity. So, now, at the level of self fulfilment, he starts looking at the product in a completely new way. He is more concerned about the experiential value that it brings into his life rather than looking at it as an activity as a medium to fulfill his goal right.

So, Maslow's hierarchy of need provides you with the guidance of how a product should ensure that it starts fulfilling these requirements and should be able to help him reach a stage where he goes for self fulfilment right. So, that is the role of Maslow's hierarchy of need.

(Refer Slide Time: 29:31)

Now, we will talk about visual design, though we will talk about visual design in the conceptualization stage in detail when we talk about wireframes and UIs. What we understand by this is aesthetic usability, you know user it is a very important principle like users are more tolerant of minor usability issues when they find an interference visually appealing.

So, consider this if your interface is visually attractive it is aesthetic in nature, then they are going to excuse you for the minor usabilities that you might commit while designing the product. Now, this aesthetic usability effect can mask the UI problems and can prevent issue discovery during usability testing. And that is one of the reasons you would see majority of the software product there is a; there is a realm paradigm that the focus should be on how aesthetically pleasant and beautiful the interfaces are right.

So, identify instances of the aesthetic usability effect in your user research by watching what your users do as well as listening to what they say. Because, that is how you ensure that their preferences are being taken care of while those visual designs are made that are aesthetically appealing. And that is one way to ensure that they look up they actually mask or forget those primary smaller UI problems or the usability issues that your interfaces have.

And is going to excuse you forgive you for the issues that you might have done. Otherwise, if your site or product is not aesthetically usable, then you have to pay the wrath of your users. They will not only abandon your product, they will ensure that the adoption of this product is not taken does not take place by word of mouth. They will spread the news they

will ensure that this product does not get accepted in the market right. So, therefore, you must pay attention to these components that we term as aesthetic usability.

(Refer Slide Time: 31:59)

The next one is very exciting and interesting which is called progressive disclosure. Now, progressive disclosure is an interaction design technique which is often used in human computer interaction to help maintain the focus of user's attention by reducing clutter, confusion and cognitive workload. This improves usability by presenting only the minimum data that is required for the task at hand.

We will see an example of progressive disclosure after this. The next one that we will discuss is Fitts law; now, Fitts law has a profound effect on the way interfaces are have been designed. And Fitts law provides us with the sense that it says that the time to acquire a target is a function of the distance to and size of the target. So, alike making elements you wish to be selectable large and position them to close to users.

This law especially applies to buttons which the purpose of these elements is to be easy to find and select. We will now see some examples of progressive disclosure and Fitts law.

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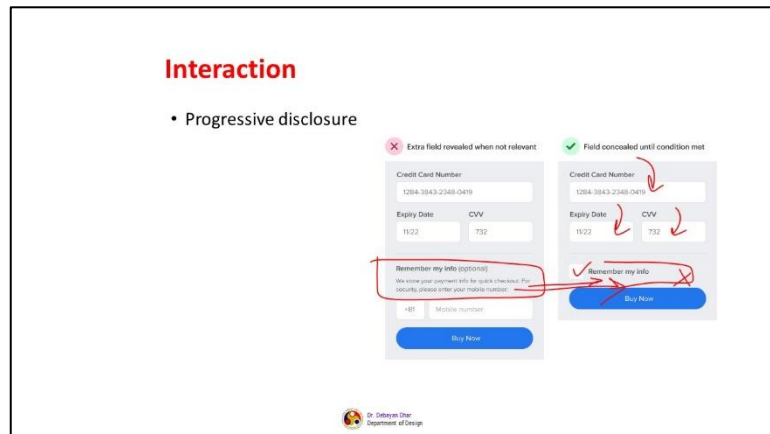
Now, this is an example of progressive disclosure, what you see here is that the extra field which is remember by info this is not at all required at the very first instance when this information is being shown to the user. So, instant fills this field gets concealed here, it's only being shown this gets only shown if you click here and this information gets here, it is shown then.

Because, understand a person needs to know only this when it is required for him, at as of now his importance is to fill up his credit card number and the expiry date and the CVV number. As and when he intends to go down and focuses here, then only this information is being provided, that is called progressive disclosure. So, it means showing or giving only necessary information required to complete the task at hand. You give only that much information based on the contextual requirement this is called contextual requirement.

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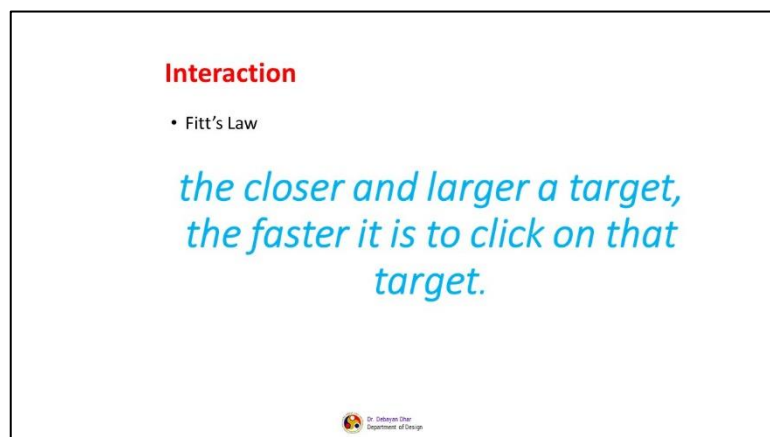
Next one which we have discussed is the Fitts law. Let us discuss Fitts laws in a detail. So, what Fitts understood or provided us with the sense is that, the closer and larger a target. Target means you use the mouse, you use the you see the cursor and you go somewhere and double click select, left click, right click whatever you do right. That is called you are go target where you are clicking and you are moving your mouse, dragging your mouse to select that. So, the closer and larger a target the faster it is to click on that target.

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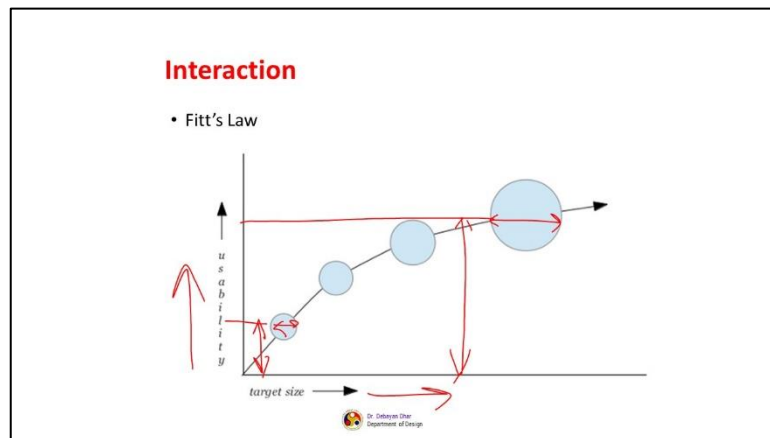
That means if you look at the graph that is plotted across the x y axis between usability and the target size. You would see as the size of the target increases, the usability also increases; as the size target size reduces, usability also reduces this is what we mean by the effect of Fitts what Fitts provides us. So, if the target size is bigger the usability of that feature also increases.

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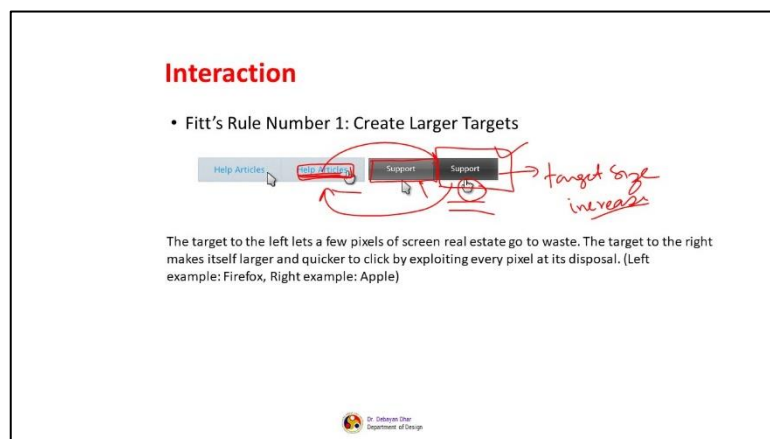
What we understand this impractically let us take this example, Fitts rule number 1 create larger targets. What you see here in this image are two buttons, the target to the left let us say few pixels of the screen real estate to go waste. Now, what it means that unless your cursor is on this text, this hands icon does not come. Otherwise, if your cursor is on this it becomes like this I mean the it has only the cursor symbol.

The cursor symbol does not get converted into the hand icon, means that it is clickable. In comparison to the other button you see the entire zone here; that means, when this entire zone is a clickable zone.

So, whenever your cursor goes into this zone it gets converted into this hand icon right; That means, what this area the target size is increased, is not it target size is increased; what do you see here that the target size is reduced to this place only the texts. So, comparison from this to this what you see the sizes increased. And therefore, the usability of these buttons is much higher in comparison to this. This is a classic example in Firefox this was there these are Firefox buttons are there the example of Firefox buttons, this versus these apple buttons right.

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Now, it has a downside also, the downside of large targets is of course that they can break the balance of your interface, you know. As well as quickly take up real screen place, I mean screen size is a very very precious space. I mean a lot of money is pumped into, if you see in your interface where you have adverts everything. So, real estate's, the screen real estate we call it the screen real estate is a really pricey space; people are vying paying a huge amount of price to actually get some space into the screen real estate. .

So, now, to what extent you can make a button or something that is clickable bigger that must be some limit to it. Now, when say for example, a target is already 10 percent larger, we say that initially it was less, but it is already 10 percent larger. Now, if you make it much larger, it will not increase your usability drastically.

If you already make a larger button larger, it will not gain much more in terms of usability. So, there is an effect; for example, to a lesser from a lesser one to something larger, but from a larger one to larger that is not going to fetch returns in terms of usability.

(Refer Slide Time: 39:50)

Fitts rule number 2, the same whatever Fitts we have discussed can be interpreted in so many way instances. So, we are discussing the instance number 2 which is minimize cursor movement.

Now, if you place the links and buttons if you place the links and buttons users which are most likely to access on a regular basis next to each other, rather than distribute them across the interface you will speed up interaction by reducing the amount of pixel the cursor will have to travel. That means; you are ensuring that the amount of path the mouse has to the cursor has to move will get reduced, how?

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Let us take the example of a Ubuntu Unity interface. Now, what you see here is that the person can type here as well as you have these icons here, he can quickly select from here, he can quickly go to here from here, he can go to here. Now, it allows you to browse various sources, so you can browse various sources. And also use two different filters on the results; text filter and a file type filter. So, you have a text filter also and you have a file type filter also.

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And what is the benefit for this? So, when performing such queries users often access the input field and file type filters in quick succession to adjust their search results. So, in order to do that, here the cursor would have to travel quite a distance is not? It not would have to travel quite a distance. Instead placing the file type icons next to the input. So, if you place the file type icons next to the input field, here what happens? You would have

minimized the cursor movement and speed up the interactions that is what the rule 2 says that minimize the amount of distance the cursor has to travel.

(Refer Slide Time: 42:05)

Now, this Fitts rule number 2 has a downside also. So, conflict arises with other important design principles; you know such as the principle of grouping and separating from different classes of functionality or content. Many a time you see that important functions are grouped together, you can see in this image important functions have been grouped together.

Now, that is a purpose to it why these functions have been grouped together. So, its purpose is to give you in you an interface which is clear and consistent structure as well as increase its discoverability. So, these functions are clubbed together in order to ensure that they are being discovered by the user. Now, this allows user to create a familiar mental map of where to access certain kind of information or tool.
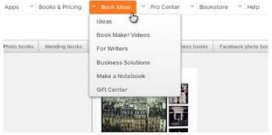
Now, by contrast if you analyze the buttons purely by the frequency in which they are being accessed. You would probably choose a different arrangement to minimize your cursor movement. So, this; however, would break the functionally consistent structure of your interface. So, this is a downside, if you can analyze them either by their clubbing there in terms of their functionality or content or you can club them in terms of how frequently they are being accessed.

So, choosing the second one frequency of access can actually break the main intention of how you design the interface by clubbing functions that are being grouped together that is a downside of the rule number 2.
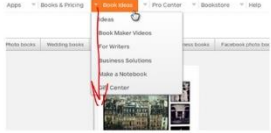
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The next downside is that you know another principle Fitts law can interfere with, is the principle of providing a clear a clear clean and tidy interface. When you have too many options, when you have too many functions and features what do you do in order to clean up their interfaces many websites group their content into drop down menus. What you see in the image that make to ensure that it is a clean interface they use this kind of drop-down menus.

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But, this now if you remove this drop-down menus, it is going to be a horrendous situation for the user to figure out information. So, the reason Fitts law does not recommend the use of drop down is that, they involve a long cursor movement.

So; that means, you start moving a cursor like this so many long list is there right. And you start moving your list down if the list is too long you start moving down like this. So,

instead users will have to first click or over hover over the drop-down menu and then move the cursor down the list and possibly across sub menus if possible is if it is there or not until they eventually reach the desired entry.

But, considering the benefits of drop-down menus a longer cursor movement can be acceptable trade off. See in design, decisions are always taken in terms of trade off. There are contradictory views; there are some principle that contradicts against each other. In that situation you have to consider if I take this decision will it make more sense or benefit for my return on investment for my product adoption for my users or will it hamper that.

So, it is a trade off, which one to choose and which one to leave, based on the benefits that it provides. So, because drop down menus ensures there is a lot of information can be clubbed together and the interface can be clean and remember aesthetic usability is always a priority, the first level of adoption happens at the visual realm. So, if he or she would not mind if you design and interface having menus, because if you do not use these menus the interface is going to be cluttered right. So, that is one of the downsides of Fitts law the rule two that we have discussed.

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A third very important principle that may force you to defy Fitts law. We are now discussing a third one is the principle of building forgiving interfaces which aim to prevent and minimize the cost of mistakes. Considers this situation that you know Fitts law suggests that placing elements directly next to each other to minimize cursor movement that is what Fitts law suggest, now which would also save some space.

Now; however, saving those few spaces or pixels can result in users accidentally clicking the wrong item that is very dangerous, no especially, when the item boundaries are not easily discernible defined or when focused items are not highlighted distinctly enough.

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Accidents are waiting to happen the placement of interface elements can either cause or prevent mistakes. Consider the situation, if I open the wrong link I can simply click the back button to revert my mistake, is it not? Thus; so, when it comes to the links in your header or side bar or your side bar, there is no real harm in leaving no space between them, that is ok.

So, when it comes to navigating during consumption your consuming information, things can become more annoying. Consider this situation when playing a video or audio files or displaying text files accidentally you click the stop or eject, you know initially we had this CD and DVD all this time timeline. So, you accidentally click the stop or the eject or next item or clear playlist buttons, what will happen? It is a nightmare is not that. Your buttons will require more effort on the user's part to revert to the original state.

However; so, when it comes to editing and especially sharing functionality mistakes can become destructive. If I click a button such as send, print, delete, download, upload, burn, rip, close, shut down, connect, disconnect, accept or decline many actions can be of much more severe consequences and may not be undone as easily.

And therefore, what we said is that putting buttons so closely may have its downside as well. So, take a call based on the severity of the situation if the consequence of clicking having clicked on a wrong button is so drastic ensured that it is separated the space sufficient and a user is alerted be before he clicks on a button which has so severe consequences.

Therefore; how do you solve it, how do you solve it? Especially for elements with editing or sharing functionality you should take precautions to minimize mistakes and the

consequences of mistakes. Offer, you must offer easy ways to undo the unperformed action; one options is temporary undo buttons right. Try to leave a few spaces or few pixels of space between the buttons.

Make item boundaries clearly visible, so the boundaries are clearly visible. So, they are aware of what action or decision they are taking your users. Highlight the focused items right. And group buttons to minimize the damage if a mistake occurs.

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The 3rd rule Fitt's rule that we are going to discuss is, avoid muscular attention. Now, what does that mean? For the goal of Fitts index of performance is to quantify the information capacity of the human motor system. So, Fitts suggests this idi this index of performance it actually provides you a quantitative aspect of the information capacity of the human motor system.

And what does it mean is that, it aims to rank input methods in terms of the amount of physical effort they require to execute a certain command. So, whatever you know features you have, whatever input method; that means, you are you initiated an function in order for the interface of the system to respond. It can be gesture based, it can be touch based, it can be click based, it can be sound based whatever it can be.

Now, the issue is that the index of performance allows you to rank these input methods in terms of their physical effort that is required to execute them. So, you were ranking this ranking this input methods input method 1, input method 2, input method 3 in terms of effort that is required. Some take less effort, some are some take more efforts to execute

the functions. So, the most prominent example is vertical touch screens which are typically deployed in professional environments to create visualize and manage large sets of data.

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An example I would like to show with you guys and the example is this, see the image in this slide. Powering off or rebooting the device are quite weighty commands; once triggered they cannot be undone, these are you know highly severe commands. Therefore, they are made into sliders, if you seen these functions the they are made into sliders, which require a higher precision.

So, if you see an Apple iPhone you would see there would be sliders. By contrast the cancel command, now what you see these requires effort know you have to slide them like this. But, you see the cancel command is of no comparable consequence here hence it is made a, but you cannot compare these features these input methods. A second reason to implement more awkward input methods is to take advantage of the space efficient nature of gestures.

According to Fitts index of performance, gestures which involve some degree of dragging. So, Fitts says that those gestures that involve some degree of dragging require a higher muscular tension that is what we call it the index of performance is higher. It requires a higher muscular tension which is why Fitts law favors pointing and clicking rather than these input methods.
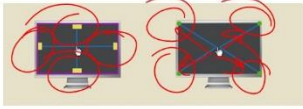
However, now this is the case; however, the advantage of these gestures is that they trigger functionality without re requiring UI controls. Consider the situation when this kind of you know powering off or rebooting just get triggered because of an accidental activity. Now,

when you have designed in such a way that it requires dragging, you are ensured that accidentally no such activities can be performed. So, there is a little effort that is required to trigger that function.

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Fitts rule number 4, exploit the prime pixels; you can see at the image which are the prime pixels. And we will also you can also you must have also seen them during the eye movement recording study. So, the benefits of placing items at the corners and edges of the screen are that the screen frame guides and positions the cursor once it reaches that location. The user could basically throw the cursor to any corner.

So, if you have the cursor just throw it any corner or edge to select the respective item without having to readjust the cursor position; the result, the targets will be much easier and faster to click. So, if you place your information in these items, positions.

You know these are faster to access the user can just throw it them without actually dragging them to that particular situation position. So, important features can be put across those areas. So, these are some of the principles of interaction which is related to what we call cognition and perception that we have discussed here.

The next part is on content. Now, there is a very classic and exciting rule on content that is called 80 20 rules. Now, what that rule says? The rule says that the principle of setting priorities. So, users will use 20 percent of the features of your product 80 percent of the time. Focus the majority of your design and development effort 80 percent on the most important 20 percent of the product; that means, this can be applied anywhere.

So, if you are going in the in an organization you would see 80 percent of the work is done by 20 percent of the people. Similarly, in a software product 80 percent of the work that you can do with that product can be done by 20 percent of the features that are available in that software product. So, what does it mean for the designers? It means that focus, focus your effort in identifying those 20 percent of the features that will render 80 percent of the outcome of the product services and that is 80 20 rules.

Now, this is related to content remember, we are talking about content the next one is the five hat racks is very interesting. The five hat racks was first developed by Richard Saul Wurman in his book Information Anxiety. And what he says is that in a nutshell there are five ways to organise information and these are by location, by alphabet, by time, by category, and by hierarchy.

So, these are the five different ways through which information can be grouped or categorized; one Location, Alphabet, Time, Category and hierarchy. So, now, you can use it in a way to design the information in your interface. Because, people have that in their sense in their perception that they look for information that are actually categorized in these terms, in these groups right; that is we call as a five hat racks. So, this ends our

discussion on the frameworks, we will now move forward and discuss about the specific details of frameworks that we say that we know as GOMS and KLM.