Computer Aided Decision Systems Industrial practices using Big Analytics
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Lecture 08
Principles of Graphical User Interface

Good evening. Welcome to the continued lecture of 'Graphical User Interface' Design or Graphical User Interface Management System that what we were discussing in the previous class.

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And we had already been looking into the UI structure and the GUI design and what are the fundamentals about that.

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The dialogue, what is the dialogue and what does the dialogue design involves.

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And we stopped right, where what is the guiding principles of Graphical User Interface? Here, if you look into this, these principles are based on corporate/business DSS. What we are going to discuss here mostly focuses on corporate or Business Decision Support Systems. There are other principles also, but these are the main principles. So, let me give you the six major principles as part of it. We will go through each one of the principles separately later.

   i)   User in Control

   ii) Consistency

iii) Personalization and Customization

iv) Forgiveness

v) Feedback

vi) Aesthetics and Usability

So we will go through each one of them.

And, these are on the 'Order of Importance'. And that is the reason why we call it as an Order of Importance purely because of the fact that in this case, you are making decisions that are mostly related to operating a business or running an organization. So, let us discuss all these principles one by one.

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And the first principle we are going to discuss is the 'User in Control'. So, the main aspects of the User in Control is again, we talk about as (with respect to business/corporate DSS. So, the first one is the word that is typically used here is

1) "Great User Experience"- It is nurturing user's feeling of control over the 'User Interface' or what we call as (UI) they happen to be using. So, what we are doing? We are nurturing or we are imparting and growing consistent. So, this is like, reinforcing, positive reinforcing, the users feeling of control. Whether the user may have actual control is a different story, but the feeling of control or the perception of control, user perceive that the user is in control over the UI they happen to be using.

Why need a UI? The answer is to interact with the DSS in natural language. So, you use the user interface you interact with the decision support system in natural language so that the system will give you appropriate feedback in making the decision. So, when you are actually the decision maker and you are happened to using an UI, you need to have a perception of control that need to be consistently reinforced. And when you feel that the user gets this consistent feeling that he or she is in control of the user interface, we get what we called as a 'Great User Experience'. So, one thing you should understand is:

> ➢ Whether the extent of actual control is less relevant in comparison to the what we called as 'Perception of Control'. Whether you are actually controlling it or not is a different story, but the most important thing is the Perception of Control that is the more relevant part.

So, under this you can think about it as a few things you can do or you can assume as part of this. The first logic behind this we call it as:

- No Mothering Principle- User should feel that they initiate actions related to the usage of DSS in making decisions. And these decisions could be either strategic, tactical, operational, etcetera.

You already seen the type of decisions, whatever be the decision, the user should feel that they initiate actions related to the decision or related to the usage of DSS in making decision. These decisions would be either strategic, tactical, operational etc. You already seen the type of decisions. Whatever be the decision, the user should feel that they initiate the actions. The initiation of the actions related to the decision or the related to usage of DSS to make the decision. User should feel that they are doing it. This No Mothering Principle means, or some people call this no nanny principle means the action should be done without any prodding or pushing or encouragement from the decision support system. So, that is the no mothering principle.

- Feedback is extremely essential to realize such feeling. So, what we are saying here is, the system should be able to provide proper feedback to the user. You click a button says Okay, your button is clicked. I understand, now I am going to do this, is okay with you. So, the feedback that gives back to the user say that Okay, you initiated the action based on the initiation, now I am doing this and shall I proceed?

So, that gives the user believe that Okay, I initiated the action, the system acknowledge that I initiated the action, and it is asking for my confirmation. So, that is another way of enforcing this behavior.

- The Ability to easily get out of trouble will encourage exploitation by the user (decision maker) which will facilitate learning quick learning and discovery of features.

So, the ability to easily get out of trouble, it is like even if you make a mistake or if you get into trouble you can easily get out of it. If that is there, then that will encourage exploitation by the user (the decision maker). So, once you know that, I am not going to get into trouble and even if I get into trouble I can quickly get out of it. If that decision maker knows it then the quick learning and more feature discovery is achieved due to that. So, the User in Control principle of the GUI design is to promote or to achieve the Great User Experience, which gives the user a feeling or a reinforcement or a perception, that is the user is in control. User is the one who is initiating the decision process and the system is there to just support the decision and facilitate the decision-making process. So, that is the first major principle. Now, let us talk about the second major principle, which is 'Consistency'.

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And Consistency is another, it is used again in multiple terms, but we are going to again talk about it from business DSS viewpoint. Our viewpoint is fixed in this we are looking from the business DSS viewpoint. So, what does consistency involves? So, the primary consistency is:

1) Making sure that constituting elements in a UI or (User Interface) are uniform- So, when you say they are uniform, what do you mean by uniform? They will look and behave the same way. So a button means clickable button and that is it. Whether it is in the first page of the UI or the tenth page of the UI, it does not matter, button means you use the mouse go there click period, you will not be using a button for typing in a text at some point of time.

So, what does this uniformity entitles to? You can other way of thinking about this:

➢ Consistency limits the number of ways, actions and operations are represented, thereby ensuring that users do not have to learn new representations for each task.

So, the cognitive load you are trying to reduce that sometimes what people call it Consistency helps you. So, that means the user does not have to keep on learning new representation for each task. So, once you learn a button is to be click, that is it button click. If a textbox is there, and you need to type text in, that is it type text in. You would not look for a clicking in the textbox.

By seriously limiting the number of ways actions and operations are represented you ensure that the learning associated with each task is significantly reduced. The second part is:

2) Conformance to the GUI standards

➢ The underlying logic behind this is that a GUI developer must not be too creative and innovative in the interface design. It says the critical third is must not be too creative and innovative. So, this is a critical aspect. Should not do it over do it. So, this implies do not overdo it. So, more than violating the standards and trying in the name of being innovative do something else try to conform to the GUI standards. Then comes the third one
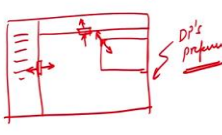
3) Conformance to the naming, coding and other GUI related standards. So, this is a much larger than other GUI related standards- The critical disk conformance to what that are internally developed by the organization. So, this is internal intrinsic to the organization. The conformance to GUI standard, this is you can say global, regional, etcetera or another way to think about is extrinsic, standards that are existing outside the organization. Whereas, the other one is you should also do naming, coding and other GUI related standards. It should also conform to the internally developed

standards of an organization. And, make sure that you do not be in direct conflict with the external six standards.

➢ So, includes menus, action button, screen fields (or form fields), etcetera. So, mostly menus, action buttons, screen fields are that you are using and this would also conform to the internal standards.

➢ It also includes standards for the placement of screen objects and consistent use of other GUI elements across applications. So, what we are saying here is, you have a screen or let us say called as a you have a screen real estate, where do I place what, where do I put the menu? Should I put it on the left-hand side? Or should I put it on the top like a drop-down? That aspect, where do we put the button the save button is here, the right-hand corner, left hand corner, so the placement of the screen objects. And it is consistent and along with the, so if you are using a red color, so for example, you have a button like this, and say save and it has, let us say it is red in color then in the, after a few, everywhere you should try to have this button. In another case you should not create scenario like this (as shown in the slide). Something like this and you call this a save. People will do not mean the same thing. That is the idea. So, the Consistency is also very critical, when a user is using the Graphical User Interface, especially dealing with a Decision Support System, that is supposed to support him or her in a very extremely undefined decision problem.

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We take into the next one, which we call it as 'Personalization and Customization'. As I said earlier, we are looking into this again from the DSS standpoint. And there are, the first aspect to consider is

1) GUI personalization is customization for personal use. The expectation here is that you are going to customize it for personal use, then that is what called 'GUI personalization'. So, few examples of this, what does it entails. User re-orders changes the order and re-sizes columns in a grid display and save those changes as personal preferences. So, what happens here is, it amounts to reordering and, like an example, let us say here is a screen and you have different menus here. And let us say you have a place where things are being shown. So, you basically drag and move this to either side, move this to up and down and you end up moving this resizing up and down and then you end up saving these preferences. So, let us say this is DP's preference or something. So, next time when I come here or when I use this particular Graphical User Interface, it should set to what I have already saved (as shown in the slide). So, that is the 'Personal Usage Customization', that is the first part. Second part is:

2) GUI customization is an administrative task. Compared to GUI personalization, GUI customization is an administrative task of tailoring the software to different group of users. So, Customization and Personalization is slightly different. The Customization is typically an administrative task. It is done all across, and the main thing is, it is trying to change or tailor the software to different group of users. So, one example of it is 'Strategic' versus 'Operational' decision makers.

So, this 'Strategic' person might be making the decision maybe every other year and this 'Operational' person is making decisions daily (as shown in the slide). So, these two will interact with the system in different fashion. So, the GUI will be customized for the Operational managers as well as the Strategic managers. Another example of this is 'The DSS operates differently for Novice and Advanced users'.

So, what we are saying here is that a Novice is a very new, less proficient user. Whereas an Advanced user is seasoned. So, the person who is a Novice you may want to give more menus, buttons, etcetera. Whereas a person who is an Advanced person you may want to give more keyboard shortcuts. So, that is the difference between Personalization and Customization of the GUI.

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Now, we go to the next one, what we call it as 'Forgivenes'. And, Forgiveness is another important aspect of the GUI. And again, from a DSS standpoint, what do we call it Forgiveness. So, the major aspect of it is:

- A good GUI always allows users to experiment and make mistakes in a forgiving way. So, when you call it as a GUI, the biggest thing is it should be forgiving. Forgiving means it should allow users to experiment and make mistakes. These are two interconnected aspects, you should experiment and not all indentations will be successful. So, making the mistakes and whenever the mistake happens, the user interface should be able to handle it in a forgiving way.

- Forgiveness of the GUI encourages exploration of the UI. So, if you have Forgiveness of the GUI, then it will encourage exploration of the user interface.

Why? We have two reasons to this:

➢ because the user is allowed to take erroneous routes that can be rolled back. So, you are allowed to take erroneous routes, you can travel the wrong path. Because you are guaranteed or you are assured that yes, we can roll back. What is this roll back means? Roll back is moving back to the previous point (we can go all the way back to start). We can only roll back one step (previous one), then that is one level of Forgiveness, we can just roll back all the way to the beginning, then that is a huge Forgiving system. So, that does not matter you do whatever you want. And, then keep
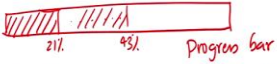
on asking for Forgiveness and system will continue to roll back. Then the second aspect of this is:

➢ Forgiveness implies GUI containing facilities or capabilities such as multi-level undo operation and the ability to cancel long running applications.

So, this is a critical aspect we will talk about it. So, Forgiveness implies GUI 'The Graphical User Interface' having facilities or capabilities, that allows for multi-level undo operation. Undo operation means roll back. And the ability to cancel long running applications which means infinite loops or something or resource hang-ups. Sometimes by going the wrong route, you give an instruction to the system which is tying up all the sources and it is not able to come to a solution. So, you should have the capability to stop that execution, free up the critical resources of the system like memory, hard disk, storage, etcetera, computing power and then go back to the previous scenario and then start new exploration.

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Now comes the next one, which we call it as the 'Feedback'. And, Feedback has four major aspects. So, number one is

1) The Feedback guideline is a spin-off of the first guideline that is the user in control. So, it is a spin-off, it means it is an augmentation, it is a new route of it. So, what does to be in control means?

2) To be "in control" involves knowing what is going on, when the control is temporary with the DSS program'.
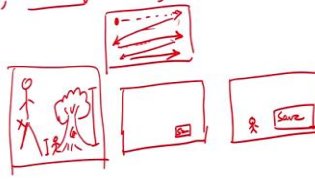
So, it is like, even when you click a button and the system is doing some processing, the user should not be kept in dark or user should be able to identify what is going on, should say computing it, should be adding, subtracting, formatting. So, sometimes when you are saving a large file, so you see something like these progress bars. So, you will see, like SS 21 percent and at some point it will go up here, and it will say 43 percent stuff like this. So, an example of this is a progress bar. So, this tells you that this system is doing something, do not disturb it and this is the current progress. So, the system is telling you, I am doing what you asked me to do, but I am progressing slightly slowly. And this is my rate of progress. So, that you are not kept in the dark or the user is not kept in the dark.

3) The GUI developer should build visual and/or audio cues for every user event.

So, an example is when you click a button, doing a circle or a beach ball or something, it tells you it is a visual cue, whereas when you click a button, creating a chime or a sound a 'ting' sound is an audio cue. So, for every user event that provides you a feedback to the user, which kind of gives you the user the feeling that he or she is in control. Some examples of this, hour glass, you might have seen this kind of design in and you have something and it shows that I am busy or beach ball, this is more like a Mac thing a ball there with multiple color disc rolling around, then there is a wait indicator sometimes etcetera (as shown in the slide).So, these are all different GUI elements that are used to give both either visual or audio cues for every user even so that the user feels that he or she is in control with that of the decision support system, even when the control of the program is given to the DSS to make decision.

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Aesthetics & Usability

- Aesthetics is about Visual appeal
- Usability is about the ease, Simplicity, efficiency, reliability in using the interface.

Major issues to Consider are:
- → the fixation and movement of the human eye.
- → Use of colors
- → Sense of balance & symmetry
- → alignment & Spacing of elements.
- → Sense of proportion.
- → grouping of related elements
- → responsiveness of the System.
- Simplicity – an additional & essential guideline (KISS)

Then comes the last part of this one, what we call as the 6th one 'Aesthetics and Usability'. So, main considerations here are:

- Aesthetics is about visual appeal of the user interface. Whereas,

- Usability is about the ease, simplicity, efficiency, reliability in using the interface.

So, what we are saying is that the Aesthetics is about the visual appeal whereas Usability is about the ease, simplicity, efficiency, reliability. Reliability means if you click a button this time this is what it does, next time also same button you click the same it happens so every time it reliably does the same action. So, that is what the Usability is about. So, what are the major issues you should consider as part of this? These are some of them. I am not going to give everyone but these are some of the major everybody uses it.

➢ The fixation and movement of the human eye. You have a screen do you want the human eye to start from here move in this direction, and from there, do you want to go this way and then go this way, go this way or do you want to go this kind of direction (as shown in slide). So how do you fix and the moment of the eyes that is one part.

➢ Use of colors. What type of colors? Foreground color, background color, font color, etcetera.

➢ Sense of balance and symmetry. Here we are talking about this what you have in page. This is one web page and you have a button of this size and in another web

page, which is a save button and in an another web page you have a button like save which is much larger than this one that has to be another thing that you need to do (as shown in slide). Make sure that it all looks exactly the same.

➢ Alignment and spacing of elements. So left aligned, right aligned same type of alignment to be followed. There should be sufficient whitespace given, so that things can be separated out and grouped also if required.

➢ Sense of proportion. So things should be proportionate. You should not have a human figure like this in a large save button. Things should appear in proportion. It is like a scenario where you are drawing a tree. And so, let us say I draw a tree like this. Generally, that means it is a very big tree. But then if I draw a human being like this in the same figure it is normally the ideal thing is something like this, so that the proportion is maintained. The proportion of the human, this is the proportion of the tree (as shown in slide).

➢ Grouping of related elements. So if the elements are having the same relationship, they should be grouped together.

➢ Responsiveness of the system. So, it should not take too much of time for the page to load, it should happen quickly. It actually creates a bad idea of the usability in that regard. Then on the top of this, there is another one a major guideline.

• Simplicity- an additional and essential guideline. Some people sometimes also call it as 'KISS' principle (Keep It Simple and Stupid).

So, that is the sixth aspect of the GUI design philosophy. And this brings us to the end of this topic and what we are going to do from here after is, we will go back to the database system, database design and see how to, we will go cover the fundamentals of how to design a database. What are the entity relationship diagram? How do you map a physical entity to a database element? How do you create tables, query the data that is in a database or extract information from the database? And then on the top of it, what are the things that you can do to the database so that your data access in a business or a corporate world when you are dealing with a large amount of data, how can you speed up the process, etcetera. So, we will quickly go through those. And once that is completed, we will give a small brief summary of what is Big Data and then we will move to the other elements of the Decision Support

System. So, thank you very much for your patient hearing. And we will continue in the next class. Thank you.