Usability Engineering
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Module - 12
Lecture - 37
UI/UX design based on Garret model: A case study

Welcome everyone to module 12 of Usability Engineering course. My name is Neelarnab Dutta. I am a research scholar at Department of Design, Indian Institute of Technology, Guwahati. In this lecture, we will discuss how Garrett model can be used as a strategy for designing good UX design.

So, I will discuss a case study where Garrett model strategy is used for developing a real life medical product which is used in AIIMS, New Delhi.
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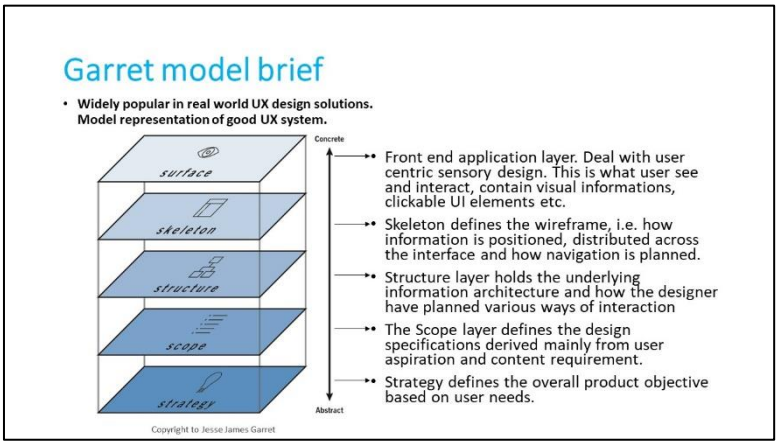

So, let me give a brief about the Garrett model. So, this is part of the recap which already we have studied in lecture 4. So, Garrett model is widely accepted and popular in real world UX design communities as a tool to create good UX solutions. It is a theoretical model representation of good UX systems. So, as a system it has 5 layers and for a user perspective a user always interacts the surface layer.

So, what is the surface layer? The surface layer which is called a concrete layer from the user perspective is the front-end application layer. So, basically it deals with user centric sensory

design where the user can see and interact with various visual informations and clickable UI inter elements.

So, what kind of sensory design we can have at the surface layer? So, as a human we have five senses like eyes for vision-based interaction elements, we have auditory senses for creating nice sound effects, then we have the sense of touch to create UI elements that is needs tactile feedback. Those kinds of things are implemented at the surface layer.

And, as a user we always interact the surface layer. So, whether we deal with any website or any sort of machine interface so, we always interact with the UI element and as a user we had a very limited understanding of the actual working principles how the system has been developed. So, as we go from the top layer to the bottom in a Garrett model the things became a bit abstract.

So, what beneath surface? Surface layer is the skeleton layer. The skeleton layer defines the wireframe that is how the informations are positioned and distributed across the interface and how navigation is planned. This is where things get little bit technical and it is little bit abstract from the user perspective in actual implementation of the system.

So, under the skeleton layer we have the structure layer. The structure layer holds the underlying information structure architecture and how the designer have planned for various interactions. So, the structure layer is the one based on which the skeleton layer has been get developed and on the top of skeleton layer the surface layer get developed. So, these top three layers are mostly the work of a designer, they do as a part of a user-centric design process.

The scope layer which is under the structure layer defines the design specifications and these are mostly derived based on understanding of user requirements user aspirations and content requirements and they are mostly done as a part of design research activities. And, based on these content requirements the interaction ideas have been generated to be implemented at this structure layer.

So, underneath the scope layer, we have strategy. The strategy layer defines the overall objective that has to be accomplished as a part of the overall UX design solution and this is based on user needs. So, it is very important that efficient contextual enquiry take place in capturing the user needs well.

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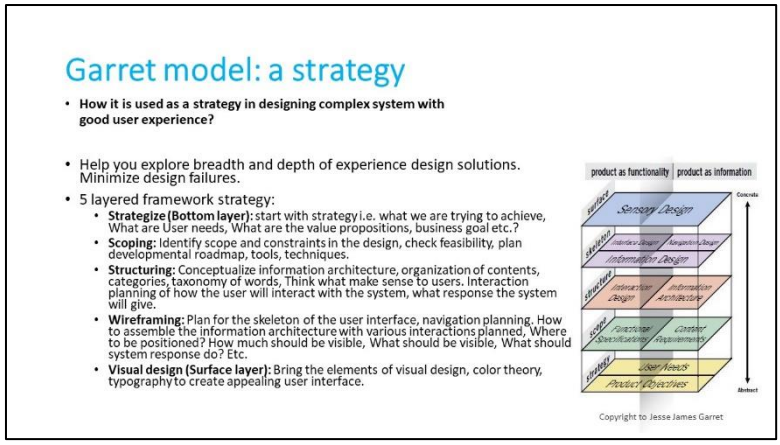

So, if we look at Garrett model as a strategy. So, we need to think how this can be used as a strategy in designing complex system that have good user experience. So, the what we learned in lecture 4 is a perspective from a user, but for a designer perspective nothing in these layers are abstract. Everything from top to bottom needs to be concrete from design and development perspective because it helps to explore the breadth and depth of user experience design solutions to minimize design failures.

Here is how a designer can use this Garrett model as a strategy in designing good UX design solutions. So, the first activity he can do from the bottom of the layers. So, for a designer the first layer of activity is in the strategy layer he needs to strategize. So, in the strategy layer he needs to look for what our user needs, what kind of value propositions he is trying to bring, what are business goals and what he is trying to achieve as an overall objective of the UX solution.

This is this strategy layer. So, once this activity is over the designer then work on the scope layer. So, the activity is scoping. So, scoping means identifying the scope and constraints in the design. So, needs to check what are various functional specifications, what are the contained requirements of users and can this be feasible in terms of product development and what kind of tools and techniques it needs to be used in the overall design process – those are taken care in the scoping phase.

After that we go to the structure phase. So, in the structuring process, we conceptualize the information architecture, the organization of contents, categories, taxonomy of words, think that we make that make sense to users' interaction planning how the user will interact with the

system. And, these interactions the interaction ideas have been developed based on what we have identified in the scoping layer.

Next is the wireframing. So, in the wireframing what we do is in wireframing this is where we plan the skeleton of the user interface how we navigate how we will navigate across the interface. And, how we assemble the information architecture with various interaction elements we have planned beforehand and where it needs to be positioned.

So, after the wireframing has been done the overall skeleton of the interface is a bit visible and then the role of last layer comes which is the visual design the surface layer part. So, it is not only visual design, this is the layer which is the front end the application layer for the user. So, in this layer we brings various elements of visual design, color theory, typography, sound etcetera to make this surface layer more realizable for the user.
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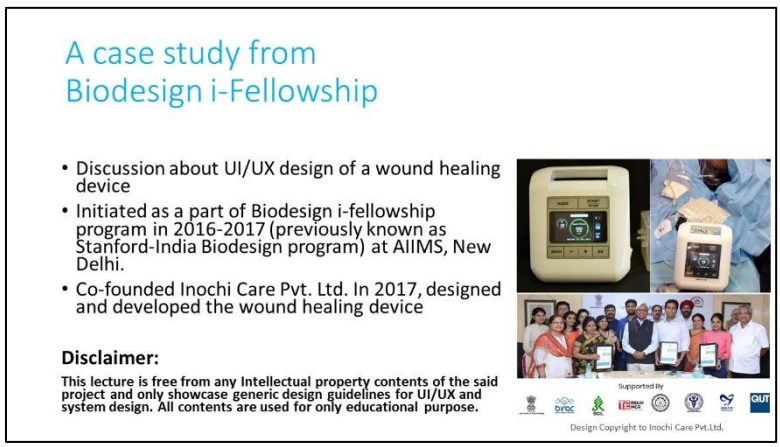

Here is a case study which I will use today to showcase you how this Garrett model can be have been used as a strategy in a past project. So, the project is a part of a biodesign fellowship program it is called Biodesign i-Fellowship in 2016 and 17. So, this program was a fellowship program initially known as Stanford Biodesign Process and it has been placed in AIIMS, New Delhi. It is founded by DBT.

And, I was fortunate enough to be part of this particular program where we are trained to devise medical products for India-centric clinical needs. And, also the program tries to teach how a product can be brings to the market with some sort of entrepreneurial objectives. So, later in

2017 we co-founded a company called Inochi Private Limited and designed and developed this product.

So, I was part of this design and development team. So, that is why today I am here to present you the actual road map of designing the interface of this particular product. So, here is the disclaimer. The lecture is free from any intellectual property contents of the said project and only showcase generic design guidelines for UI and UX and design systems. All contents are used for only educational purpose.

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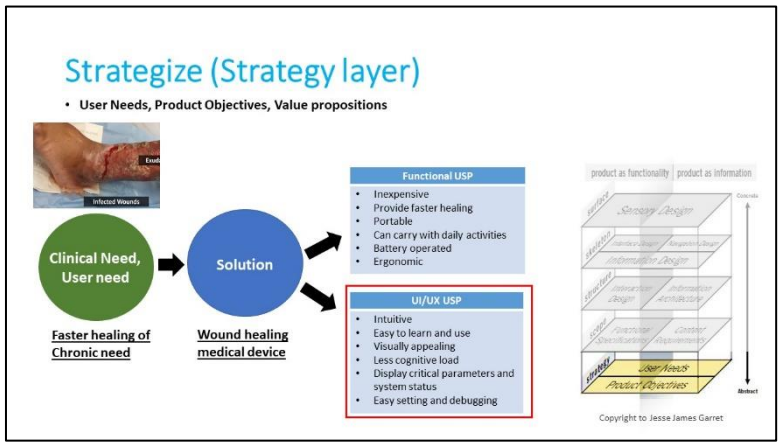

So, the first layer of the Garrett model was strategize and this is where we derived the product objectives, ok. So, since ours is a clinical problem. So, we have different kind of needs one set of needs are clinical and others are user and stakeholder needs. So, by clinical need what we mean is the requirement from the patient and from the clinician perspective that needs to be fulfilled maybe it can be a treatment or maybe a diagnostic solution.

And, when we talked about user needs it involve it comprise of lot of other requirements that needs to be part of the design solution. So, this user needs can be the requirements that the clinician need to fulfil in order to operate the device. So, those kinds of ancillary needs comes under user needs. So, the clinical need was faster healing of chronic needs, ok.

So, as a solution what we are trying to build was a wound healing medical device. Now, the journey to come up with this particular solution which is wound healing medical device is itself has a lot of activities in terms of design projects and development activities. I will not go through in detail here, but here what I am trying to show you that there are two objectives that

we need to fulfil as a part of this design solution.

If one is the functional USP that is the functional value proposition that we are trying to bring which means which comprise of things like we are looking for something inexpensive provide faster healing, something portable and the device can be carry with various daily activities, the device should be battery operated and also it has to be ergonomic.

The other aspects which is from the user experience part has to comprise with some of the requirements and objectives which are the system has to be intuitive, it should be easy to learn and use, it should be visually appealing, less cognitive load when the user interact with the system, display critical parameters and system status and easy setting and debugging.

So, to fulfil the functional USP we have to go through the product design activities product design pipeline of activities. But, that is not the goal of today's session what we are actually discussing here is this UX objectives. These UX objectives are part of the strategy layer that the Garrett model describe as the very bottom layer.

And, for a designer this is the first layer that we should consider in great detail so that we well captured user needs because here if we do not capture the user needs with great detail we may the system may suffer from experience point of view. The usability of the system may fail when actually the product goes to the market.
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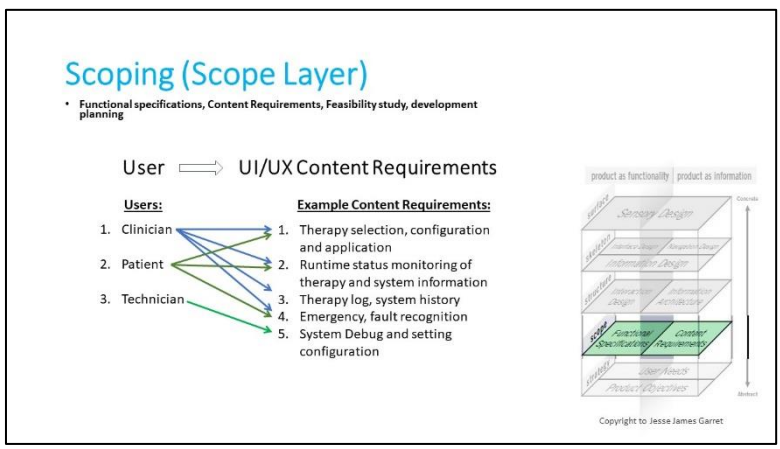

So, next was scoping. So, in the scoping what we do is we are trying to derive the UX content requirement from various users. Now, here I want to clarify one thing, by user I am not only describing the end user. So, user means the all stakeholders who are involved in the treatment process of a patient. So, the users we have considered whose inputs, whose requirements are essential for the design of this particular UX system are clinician, patient and the technician.

So, what are contained requirements to be a part of the UX design has been derived here? So, for a clinician you can see with the blue arrows that he should be able to select the therapy, he should be able to configure the applications. Now, these are system requirements that has to be implemented in our interface, then he should be able to the clinician should be able to monitor monitoring the therapy and the system information. This is very critical in terms of designing medical products.

Therapy log and system history, recording is also very important so that the doctor or the clinician can track the progress of the therapy. And, also it should record various patients therapy log to be viewed in future. Fourth is emergency and fault recognition. As a medical product it has to have all the safety critical facilities so that it is safe for patient and also the doctor can handle any such emerging situation. The system should also reflect such recognitions.

The next is patient. Now, as a patient requirement we have the same set of requirements which the clinician has, but we do not have something like the third point which is therapy log and system history. Because this is not what the individual patient is interested in. However, for the rest it is very important that patient also feel safe. He also should be aware of what is the status of the therapy and in what configuration in what mode the system is currently running.

The 3rd user is a technician. For a technician it is very important that he should be able to debug the system in case of anything happens ok. So, the system should be able to provide you sufficient control to do debugging and system configuration and this is part of the second layer of Garrett model.

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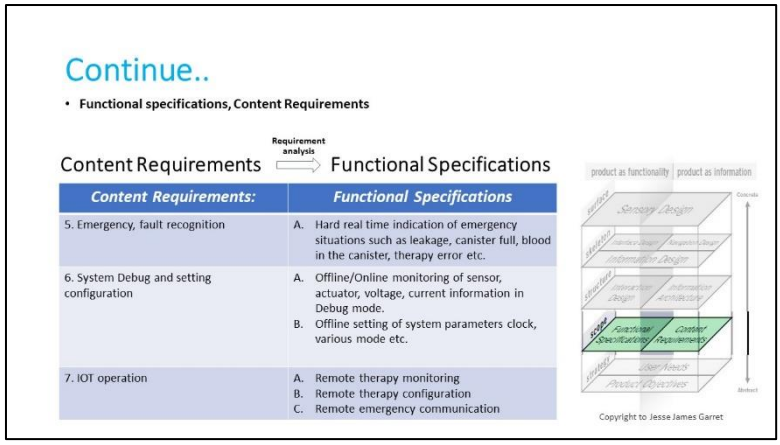

So, next what we did is we tried to derive functional specifications from these content requirements. Now, these content requirements have been derived from three users and we try to bring various functional specification that has to be part of the system. So, this is done through a process called requirement analysis.

So, these are some examples. So, first thing is like therapy selection configuration which was a requirement for both patient and the doctor. So, what functional specification we can give here? So, we ideate here like there should be some kind of therapy mode selection option. Now, I need to clarify one thing – this is not the interaction design. This is the aspiration the design aspiration that has to be part of as a functional specification ok.

The second is selecting and setting parameters. Therapy selection, why we need a therapy selection because this device is going to be a multi-therapeutic device. So, one should be able to select between various therapies and within each therapy the user, the clinician or the patient has to be control select or visualize the various parameters that has to be part of the therapy.

And, the third the C that it should have a option to start pause and stop the therapy ok. So, these are functional specification that we have generated for our first content requirement. Similarly, for runtime status monitoring of therapy information what we came across is a real time monitoring, high priority therapeutic information. So, this is very important, so that we know the system status in real time.

So, whatever software design or this embedded level hardware requirements should be there we need to accommodate all in terms of design and development activities. The second

functional specification is therapy duration and time the clinician or the patient should be able to visualize the therapy duration and the finish indication ok. So, that is that is are some kind of functional specification we have generated.

The 3rd content requirement was run time status monitoring of system information. So, the functional specification which we have arrived here are monitoring the low priority system status such as battery status, clock and time, the canister fulfillment status etcetera. Now, these are not very critical system information. So, these have less priority than what we required in number 2.

The 4th content requirement was therapy log and system history. So, this can be achieved via offline mode, system log and therapy history showing patient therapy information with date and time.

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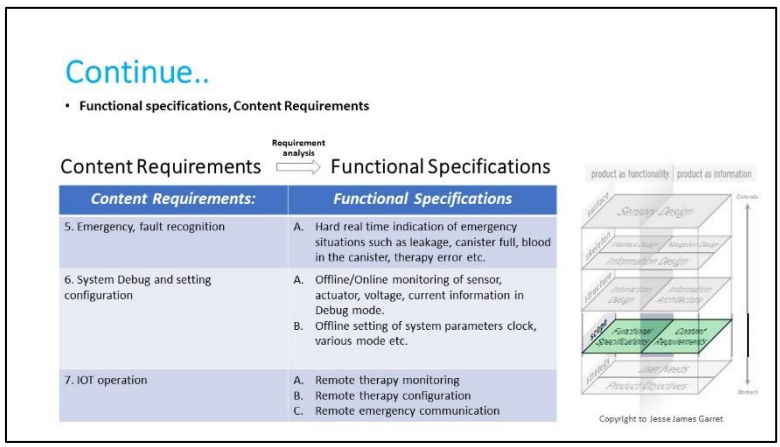

The next content requirement is emergency and fault recognition. So, here as a functional specification we need to provide hard real time indication of emergency situation such as leakage, canister full detection, blood in the canister, therapy errors etcetera and this is very critical for something that has been used for a medical purpose.

If the next content requirement is system debug and setting configuration and this is again some kind of specification that is of less priority, but that is very much important so that is the system can be debugged timely by a technician in case there are some faults occurs.

So, the functional specifications are offline and online monitoring of sensor actuator voltage information in Debug Mode. Offline setting of system parameters like clock, various mode etcetera. So, what we are trying to achieve here that despite of having the critical therapeutic requirements the system should also facilitate some kind of interface where a technician can actually debug the system. It can see what are various sensor values, what are various voltages, current information in the system and where such kind of fault may occur.

The last content requirement was IOT operation and this is more like a additional requirements we have generated later. This is to monitoring the therapy remotely to configure the therapy remotely, in case the patient want to carry the device at home. But this is not allowed in today's scenario in terms of clinical intervention, but in future if such products come to a class a product, then this may be possible. So, these are some kind of features we want to keep as a part of the system design.

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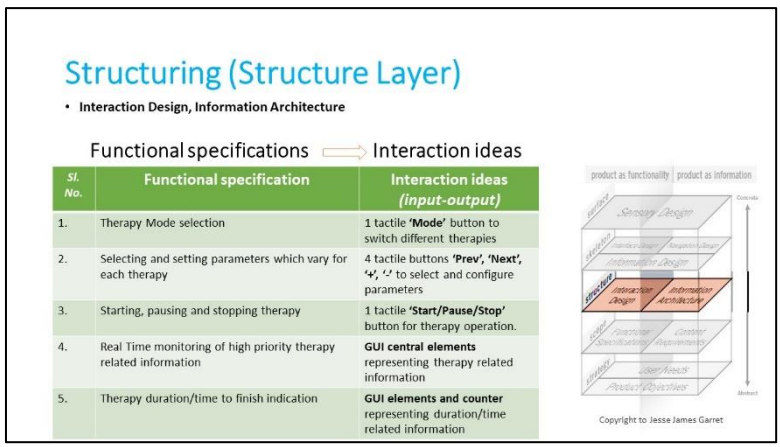

So, next phase the next phase of the Garrett model was structuring. So, as a part of structure layer, we generated various interaction ideas based on the functional specification we have generated in the previous section. So, what we did here that functional specifications are used and based on that we ideate various interaction solutions. And, we generated various ideas and out of them we selected few as our final input output ideas.

So, for therapy mode selection we have thought about using a tactile mode button, so to switch between various therapies. So, this mode button is a part of a physical switch, it is not part of

a graphical user interface, but it should be a part of a physical button because it is very important for a medical device of such class that accidentally something should not get placed. So, we want the idea of using a tactile button for therapy mode selection.

The next is selecting setting parameters which vary for each therapy. So, for that we used four tactile buttons Previous, Next, plus, minus to select and configure parameters, ok. So, these are also part of tactile buttons that we have thought should be part of physical buttons not part of the UI since it is a high-risk medical device.

Another tactile button we have thought of start pause stop one single button for generating three signals to control the therapy. Then for real time monitoring of high priority therapy related information we focused on creating certain UI central elements which represents the therapy related informations in great detail.

The therapy duration and time finish also has to be indicated as a part of GUI elements and it should showcase the duration and time related information to both patient and to the clinician.

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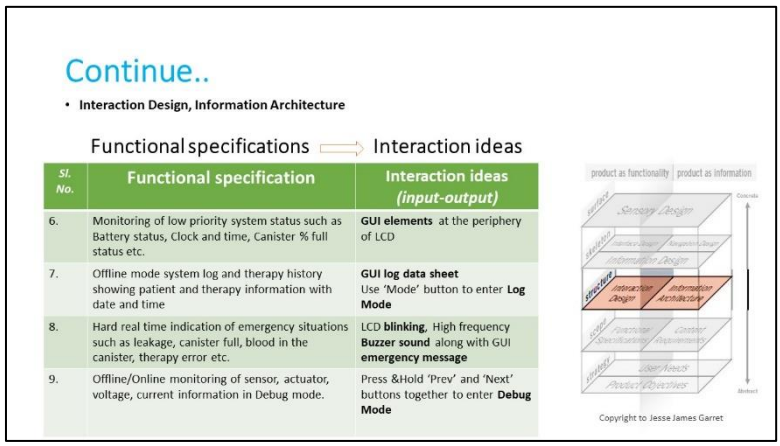

For monitoring low priority system status such as battery status, clock and time, we also thought of using some GUI elements that has to be placed at the peripheral of the LCD. So, since these are not very important parameters so, that should not be part of the central display. Next was offline mode system log and therapy history – to showcase what are the status of the therapy in various patients.

So, for that we created a separate Log mode, but we are using the same mode button to visualize that. The hard real time indication for emergency situations such as leakage, canister full, blood in the canister etcetera are thought to be implemented using some kind of light patterns like LED blinking, some kind of sound effects like buzzer sound with GUI emergency messages.
And, to for the technician to monitor the sensor actuator voltage current such information for Debug mode, we thought about some kind of combination press where the user will hold and press two buttons simultaneously to enter to the Debug mode. So, these are kind of interaction ideas we set we ideated for this particular device.

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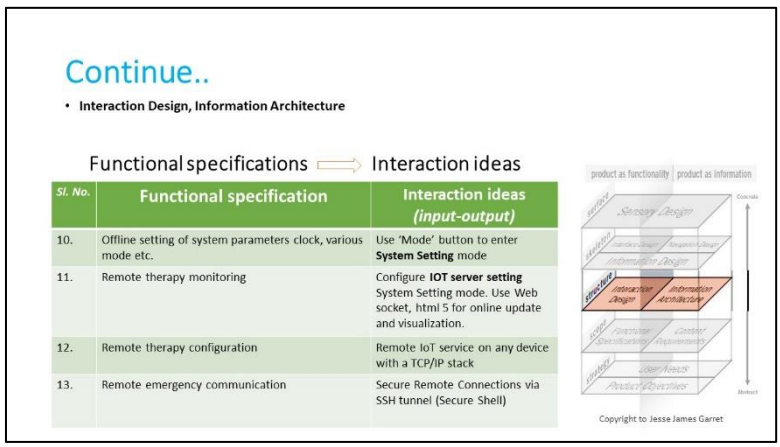

The next is how system parameters like clock and various modes will be set. So, for that we again include something called System Setting mode as a part of the mode selection button. And, the last three features the functional specifications which were remote monitoring of the therapy, remote configurations and remote emergency communications we thought of implementing this over a IOT server setting so that via a websocket we can visualize all those informations.
And, a clinician or a patient or his family members can visualize the system parameters over a smartphone or any such connected device. So, these are part of the structured layer of a Garrett model.

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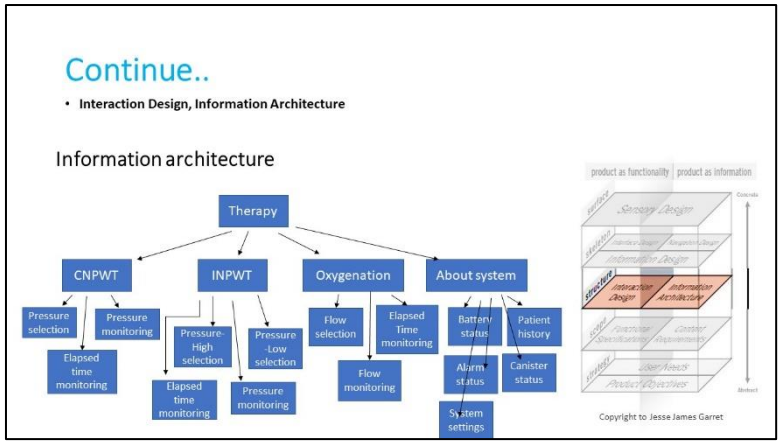

So, in this structured layer it is also important how these various interaction ideas and various therapies are structured as a part of the overall working of this device. So, if you see any websites the contents are distributed across various steps. Similarly, in our system also we try to bring various pages, various tabs for our therapies.

So, since the device was a multi-therapeutic device we have to break down this the UI part into various displays, various interfaces otherwise it will it would get very cluttered. So, we have to plan about the information structure of this device. So, here is a example of the information structure and this is a part of the structured layer in the Garrett model.

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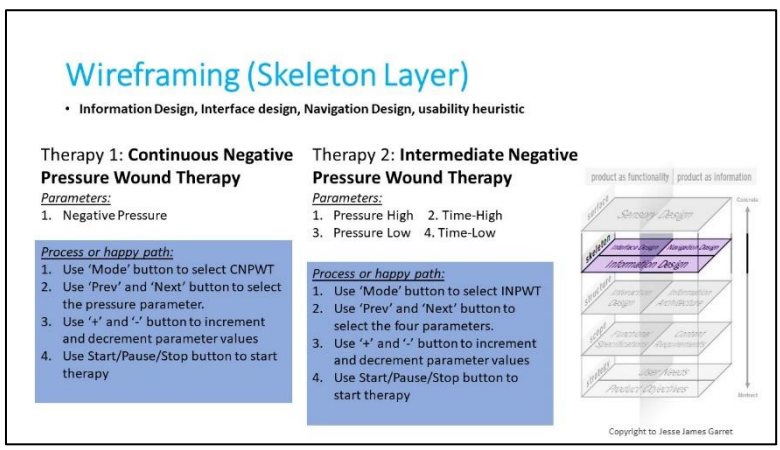

So, the final not the final the pre-final layer in the Garrett model was the wireframing. So, this is the layer where things come into reality. So, here the underlying information, structure and the interaction ideas get realized in terms of information design and interface design we try to generate happy path for various processes. So, this is important from navigation part of view point of view.

For example, for particular therapy which is called continuous negative pressure wound therapy, we have said particular process and happy path. For example, first the user will use the Mode button to select continuous NPWT, then he will use Previous and Next button to select the pressure parameter. Then he will use plus and minus button to increment or decrement the pressure values and he will start the therapy and if he has to stop he can use the same button.

Similarly, for intermediate negative pressure we have a happy path and the process flow which is that the user will first use the mode button to select the intermediate negative pressure therapy and he will use Previous and Next button to select the four parameters which are part of intermediate negative pressure therapy.

So, the plus and minus button will be used to increment and decrease each of these four parameters and finally, he will use the Start, Pause, Stop button to control the therapy. So, this kind of navigational design is planned in the skeleton layer of Garrett model.

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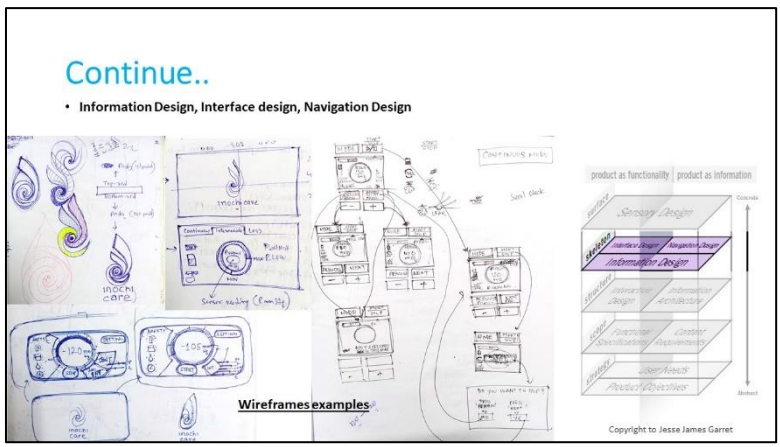

So, these are some examples of the wireframe where we planned how we can move between therapies, what will happen when we switch particular button and it will move to other interface. We have also planned here how the device will initiate, what kind of logo it will show at the very initial state of the device operation and what will be the first window. And

when he presses the Mode button, what will be the second window and how the overall navigation will happen.

So, all this planning and positioning of these various interaction elements has been planned in this particular layer which is known as skeleton layer.

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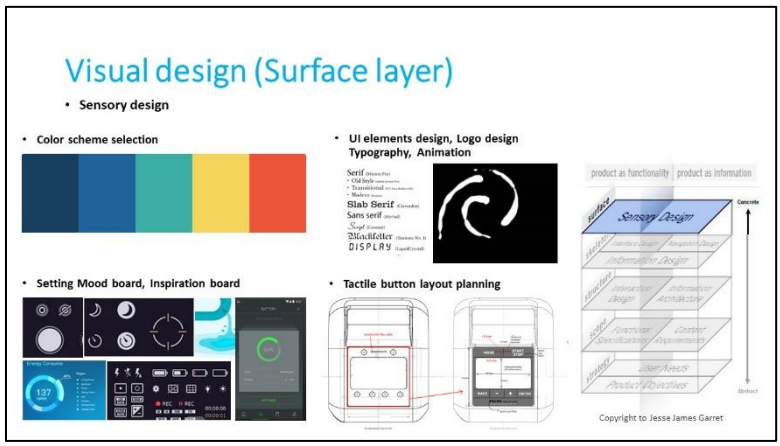

So, next is the final layer which is the surface layer which is the part of the user interface that the user interacts with. So, for that we have plan for color schemes, the various UI elements that has to be go we try to make something very simple elegant. So, we design each of these particular UI elements, we also designed how the logo should look, what kind of color scheme it should follow and how the animation will happen at the beginning of the display.

We also planned what will be the layout of the tactile button which will accommodate various push buttons behind. So, those things have to be part of visual design and it is has been accomplished as the final layer in this Garrett model.

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So, here is the final product where this overall UX design has been implemented as a part of tactile button feedback and a UI to achieve a good user experience for both clinician and patients. So, that is the end of today's session. I hope you have learned how Garrett model can be used as a strategy in designing good UX solutions.

Thank you.