Functional and Conceptual Design
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Lecture 9
Mission Statement - Examples

So in the last class we discussed how we prepare a mission statement for a new product, you want to develop a new product. You have some idea about designing a new product or developing a new product. So, you want to start the design process by preparing a mission statement for the new products. That is what we discussed in the last class. So, it conveys a vision for the new product and the project goes to the entire team. So, that is the purpose of preparing a mission statement and as a first step, what do you do for preparing a mission statement? What is the first step?

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Yeah, you have some idea about developing a product but then you need to get some information or you need to answer some questions to clarify your own vision or your own mission. So, we will start with a mission statement by asking technical questions. That is basically known as the technical questioning.

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We will go for the technical questioning, and then try to get the answers for these questions and use these answers for making the mission statements. That is what we found in the last or we discussed in the last class. We asked many questions, as you can see here, we will try to find out what is the real problem and then what are the expectations, implicit expectation involved, that means, there will be some basic expectation which may not be really told by a customer, but you need to understand what are the implicit expectations and then where about the customer needs, they are appropriates. And then what avenues are open for creative design.

Is there a way to address the design problem in a creative way or can we do some kinds of innovation or innovative concepts for making the new products? Similarly, what are the avenues limited or not open for creative design, some of the things you cannot really change, though you want to change them, because of some reason, it is not open for creative design, and you may not be able to change it. Similarly, what characteristics the product should have and then what product characteristic it should not have. And what are the things which can be quantified. At this stage, some of the things can be quantified like its weight or the size or the cost. Some of the things can be quantified.

Is there any bias existing within the task and task statement, are you seeing that there is something towards a particular direction or you are actually biasing your design goals in a particular way, is there any bias existing? If so, what are the biases and what are the conflicts existing in the design task? Suppose you want to design an iron box what are the requirements of an iron box? All of you know about iron boxes, right? Yeah. What is the requirement that normally people will have in an iron box, pardon, heating?

Basic things like you want a large force applied on the clothes, right? That is one requirement because you want to remove the ringers, you have to apply some force or pressure on the clothes. And how do you increase that pressure either you press it or you have a heavy iron box, any one of these you can have a heavy iron box so that you do not need to apply a force, if the iron box is light you have to apply force.

If you do not want to exert force, then you will make it very heavy and when you make it very heavy, it is difficult to use, because you have to put more force on moving it. So, there is a conflict, you want to have very high pressure on the clothes, but you do not want this to be heavy.

So, you want it to be light, but at the same time you want to apply a large force on the clothes. So, there is a conflict, you cannot do both. That is why there is a technical conflict in the design. For example, in the case of aircraft design, all the aircraft, they want it to be very light right. The reason is that if it is heavy, you need to have large fuel and you need to have a large force to be generated for going forward. So, you want it to be very light, light weight, but when you try to make it light weight, the strength will come down, if you want to make the wing very light, the wing strength will also go down.

So, there is a conflict. You want to make the aircraft lightweight, but at the same time you want it to be strong also, these are known as the technological conflicts. So, in your design is there any technical conflict or technological conflict, when identified at this stage is the answer for this question. These questions force the design team to think critically, restate the design task in a more precise way for the project or subset currently under consideration.

Before you start the design process, ask these questions and try to get some answers. Not everything you will get in the first stage itself because this will go in an alternative way, but initially you try to answer these questions and then prepare a mission statement based on your understanding. That is basically the process by which you generate the mission statements. We took some examples.

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The mission statement will be something like this. You have that mission statement for a product. So, whatever be the products means iron box, bicycle or whatever it is, and see what the

product description is. What actually you want the product to do, what actually the product is trying to address or what actually your design task is trying to address in this particular product.

And then the business goals, what is the schedule? What is the approximate profit we are expecting or what the market share is and what kind of social needs it is trying to address all these are basically coming under the business or humanitarian goals. Then you try to identify your primary market, who is going to be the primary customers for your products. And then not only primary there may be some secondary customers also.

We will take an example and show this and then what are the basic assumption basically the assumption these are coming from your technical questioning, what are the implicit expectations, what are the things that should have, should not have etc., these are coming under the assumptions and then the stakeholders are those who are the primary people who will be involved in the whole process of design as well as the use of the product also. That is basically the stakeholders and then avenues for creative design, what are the things you can actually creatively design in this particular product?

What are the things that can have some kind of an innovative design? And what are the scope limitations, what is limited or you cannot change really touch that one that is basically known as the scope limitation. You write all these things in there in a concise form, and that becomes your mission statement for the product. Whatever may be the product that you are trying to develop, this becomes the mission statement. And as you progress, you may modify the mission statement because you may get more and more insight, you try to add more data. But before you start, you need to have some kind of an idea. What you are trying to develop and that is basically known as the mission statement for a new product.

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Then we took an example in the last class and tried to answer these questions to see how we can develop a mission statement for a new product or a redesign of a product. So, we took this example of a nail clipper, which you have used. You have seen that this product has not changed over a long period of time, it is still almost the same shape, size and features, maybe some additional features have come. Suppose you want to redesign this product, or you are trying to develop a new product, either modifying this or you are trying to come up with a completely new product, which may do the same kind of job as what the current product is doing.

So that is basically the redesign project. So, we ask these questions. These are the technical questions that we discussed. And of course, you can have additional questions depending on the product also. What is the problem really about and we found that this product has bought a lot of

issues. Basically, the shape is straight, our nails are not really straight. It is a curved one, but this one is not curved as our nails shape.

And then the cutting force needed may be difficult, you cannot do it with the left hand, left hand uses are not that comfortable, and the nails will fly away. All those are the issues, the sharpness goes out, then you will not be able to use it for a long time. There are a lot of issues out there. So, we can actually put all those things into one sentence or you can actually physically write everything together. I am simply writing it as the clumsy operation of a typical clipper.

So, you are having a clumsy operation that is the main problem with the clipper. You want to redesign it. And then what is the, what are the implicit expectations in this product development. Implicit expectations are the ones which actually people will be always expecting even though they do not directly tell you, but there are some expectations.

It remains as a manual clipper, you are not looking for an electronically activated or mechatronic products, where there be force sensors, vision sensors and all those things, you want to have a manually operated nail clipper, which can be operated by oneself you do not want someone else to use it and then cut your finger. You can use it yourself because it becomes a very clear expectation of a customer that is basically known as the implicit expectation.

They are expecting a normal nail clipper which can be used by a person without any other person's help, this is the implicit expectation, just to be a manual one, just to be used by a single person. And then the question is, are the stated customer needs functional requirement, content constraints truly appropriate? You have started with some kind of an assumption of the customers and then you are questioning again, are they really appropriate, so you need to answer

this by if you had done some kind of a survey or studies, then you have to say many reports or studies have mentioned about the clumsy operation.

It seems to be a reasonable assumption and detailed assessment will be made in post customer interviews. You will do a detailed analysis at a later stage and then what avenues are open for creative design and inventive problem solving? Is there any avenue for you to be very creative? That is something which you can think of as a completely different one from the existing. Is there a venue for creative problem solving, then you can say that, okay, I think there are many avenues.

You can actually modify it in all parts. So, all of this can be modified. You can get a completely new design or you can have function sharing can be achieved and similarly, to store and thumbnails, these are the other areas or the avenues, where you can have a creative design. You can think creatively to add these things into the products, so that it becomes a completely new product.

So, that is the avenue for creative design and what avenues are limited or not open for creative design that is the limitation on scope. Is there anything which you cannot really change or which is not in the scope of your product development, so in this particular case, it is that you are not interested in electrical power. It has to be a manual one. So, do not think of innovation using electrical power, electronics or anything. So, that is not open in this case.

And what properties must the product have, this is something which people will be expecting some basic things like safety of operation, light weight, they are not very costly, these are the basic expectation products people will be having, easy to use, durable, safe. These are the basic expectations people will be having, it should not be very complex, it should be long lasting, and

it should be safe. These are the product properties, the product must have and what product properties should not have, it should not be bulky, it should not be very big, it should be very easy to handle.

The product should not have bulky size. One aspect of the recent tasks can be quantified now, what are things you can quantify at this stage because you are still in the very beginning of the design. Many things are not known, but is there something which you can quantify now, for example, what should be the approximate weight can you quantify, what should be the approximate size can you quantify, what should be the force that should be applied to cut the nail can you quantify, can you quantify the size of the nails, average size of the human nail? These are the things which we need can quantify at this stage.

So, statistical sample size and important ratings and fingernail characteristics, human hand finger sizes, the strength of the human finger or how much force is needed. So, all these things can be quantified now, because these things can be directly obtained from the public domain. These things can be quantified. And the ninth question is basically, a question which you may find a bit difficult; do any biases exist with the chosen task statement? Is there any bias in the design task?

So, what do you mean by bias? Bias is towards one side. I mean it is not really balancing with all things, it is towards some kind of inclination towards a particular thing that is basically known as bias. When a mechanical person is here trying to do something he will always need bias towards mechanical components mechanical design, a person will try to make it more electrical or electrically oriented, and that is known as bias. In this case, you can see that one particular bias here is that it has to be a single person manual.

I have bias towards a manual operation. I am not interested in any other things, this is a manually operated one, so no electrical or anything that is considered to be a bias, and you are actually talking about cutting the tip of the nail not really removing the nail. So, that is basically not a bias, per se, but you are making it more clear that when you say a nail clipper, you are just trying to cut the tip of the nail, so that is the bias. And are there any technical or technological conflicts inherent in the design task? As I told you, the conflict is basically, you want to improve then something else goes wrong or that goes against it that is known as technical conflict.

What kind of conflict will be there in this design, because now you have mentioned many things in this? What will be the kind of conflict you can think of, any technical conflict you can identify. If you make it sharper then it may injure, but from looking at this now it should not be bulky, added functionality may make it bigger. If you try to add more functions like you want to have a store and dump nails, then it may become bulky, the size may go up but you do not want this to be bulky. Added functionalities may make it slightly bulky, these are basically the conflicts that you can identify.

Yeah, but then you are telling that you do not want this to be electrical. I mean, that is the starting point. Manual clipper is the implicit expectation. You do not want to touch that part saying that, okay, see we can actually design with the electrical battery or a 230 volt and adapter or a solar there are many ways you can do it. But if you do all those things, then your implicit expectation will not be met. So, you say that okay, no, no, I do not want to touch that, but let me do only the other part of the design. I am limiting my scope to manual operation only. That is why we are saying that electrical power is not.

You can also be saying that if this is not the design, remain as a manual clipper is not there, then you are opening the avenue also. So, compact sizes versus large surface area for grasping a large mechanical advantage, because you want to have easy to operate. You want a large mechanical

advantage, but then the size may go up. Similarly, other functionalities may increase or decrease the size of it. These are all technical questions and based on these technical questions and some other understanding of your design goals, you will prepare the mission statement.

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The mission statement will be here fingernail clipper product, so the mission statement is basically for this product and the product description is basically remove and file access fingernail length. That is the purpose of this product. You want to remove excess nail length using these products. And the key business goals again depending on the team's understanding, you will say okay, you can take six months to develop the products and you are expecting around

30 percent profit margin and 5 percent market share supplements fingernail polish business. These are the key goals that you are planning to achieve in this design process.

They actually come from the design teams on understanding okay how much profit margin you would like to how long it will take things like that and the primary market who are going to be the primary target. Adults of all ages are primary targets and focusing on fingernail polish users, these are can be used for polishing and giving beauty for the nails and the secondary market would be the knife collectors, business executives who wants to travel and they want to keep one for hourly basis travel and somebody with some collectors who want to have different kinds of products. These are basically secondary markets so the primary market is always the adults of all ages and what are the key assumptions you have, it should be small.

This actually comes from your perceiving and complex stowage volume, long life. These are all basically the assumptions that you have and what are the avenues for creative design, economic shape, store capture nails, compact stowage, ease of cutting. All these places you can actually have innovative ideas. Innovative concepts can be used. In order to improve all these features, you can think of a very nice shape or economic shape which is not existing or you can think of adding nails door or capture mechanism so that the nails do not fly away and compact storage that when you are operating it, it will be having a large volume, but you can actually stowage it, fold it in a proper way and then make it very small.

So, that can be stored very easily, that is known as compact stowage. And ease of cutting; it should be easy to cut the nails. These are the things where you can actually have very creative design concepts yeah, pardon okay. So, this is, this is basically coming from your own as a business or a starting business, you will be having an idea okay what do you want to achieve.

So, this is not from coming from technical question these are the team that will be having some an idea of how long it will take to develop this, six month and then what is the approximate profit you are actually expecting in this one this is not from technical person but more from a business perspective of the design team. And finally, the scope limitations. So, you are saying that it can be only the materials or the steel and moldable plastics you want to use, you do not want to go for any other material.

These are basically the scope limitation and similarly manual to remain it as manual, no electricity these all come are scope limitations. So, this becomes the initial mission statement for the products basically to tell someone, oh wait, this is what we are trying to do. And these are the goals, these are the scope limitations, these are the avenues where we want to contribute in the design of the products. So, that is the mission statement for the new product development. Got it? Any questions?

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So what we will do, we will do a simple exercise. I hope all of you got the sheets. So we will try to see how we do a technical questioning and prepare a mission statement for a new product. All of you are using backpacks. Suppose you had to redesign this backpack or try to come up with an

alternative product, whatever it is, either you redesign the product for some particular flaws in the design or to meet the same purpose you want to design a product. How do we actually develop the mission statements for this product? That is the question here.

So, you have to do the technical questioning and prepare a mission statement for the backpack. So please take the sheet and then write your name and roll number and then answer these questions. And then you have to prepare the mission statement. So, the first one side of the page you use for the questioning; Question and Answers. The second page, you write the mission statements.

You do not need to write the question here. So, the first question is, what is the problem really about whether you can write the answer for that, what is the problem with the existing backpacks or what is the reason for you to redesign the bag? Because you want to redesign this backpack and you are redesigning because of some reason. Either you do not like the design, or you would like to have a different way of using this.

Student: What if we have additional questions?

Professor: No. Okay, you can write this question, then you can have additional questions. No problem. Okay. We have already done it. You already did it. You can have these questions answered and you can have additional questions. No problem. So, you can have any additional questions if you want to have additional questions. You can always do that, but please try to answer all these questions, yeah?

Student: How do we know the exact values?

Professor: Oh! that you can actually make some assumptions for the time being okay 20 percent 30 percent profit and all other things you can write, what is the humanitarian goal or what is the development time you may require those things you can make an assumption for the time being. See normally it will be done as a team. So, the team will be having some kind of an understanding of how much profit you should get and how long it will take to complete.

So, the first question, what is the problem really about? So, please answer this. What is the problem with the current design of the backpack? Can anyone tell me if there are any problems with the backpack? Yes, what is it? Zip?

Student: One side carrying is difficult.

Professor: If you put on one side it will try to fall down to the side, right?

Student: Similar look of bag leading to mistakenly taking others' bags.

Professor: Yeah, yeah. Sometimes you may lose this because everything looks there and somebody will take you there definitely is an issue, carrying and sometimes taking objects on the bag also may become difficult depending on the type of objects. If you put the books, a lot of books, then a water bottle and then put some food stuff also inside, it gets squeezed inside and then you may find it difficult to use or what.

So, this way there are a lot of issues that you can actually identify with their backpack. So, you can identify each one of these or you can say, oh, this is a particular issue I am trying to find. So, that is a core issue in the problem, which is a core problem in the design of this backpack. So, please answer that question and then go to the next one what implicit expectations and desires are involved. What are the implicit expectations of this bag?

Student: Carrying things.

Professor: So, basically you should be able to carry with you right you do not want someone else to come with carrying your bag. So, the implicit expectation is that you should be able to use and you should be able to carry the basic stuff that you want to take with you. These are some of the implicit expectations, you are not expecting this to be a trolley with somebody will be pulling along with you. So, you just want to carry with you wherever you go, there is an implicit expectation. So, implicit expectation is something which you need to I mean, depending on the product it may vary. Each product will be having some implicit actions.

So, if you are designing a trolley bag that can be pulled for travel then the implicit expectations are different from a backpack. So, that is what actually you need to understand: what is the difference between these implicit expectations and the next one are the customer needs, functional requirements and constraints are truly appropriate? So, this is something which again you should be able to answer based on your understanding you are talking, your discussion with your friends or others.

So, almost everyone agrees that there are issues, so your discussion with your peers or your friends. Most of them confirm that there is a problem with that bag and the exact details will be worked out later. That way you can write. So, they are basically telling you that you did some

kind of an analysis and found that these needs are really important needs. So that is the fourth, that question and the fourth one and this depends on how creative you are, what avenues are open for creative design and inventive problem solving?

What are the avenues that you can think have where you can be creative? So, actually the strap can be designed in a different way or you can have a different way of arranging the, the what you call the compartments itching in the back, so that the packing of things will be much more easy that can be another avenue or you can have some other kind of holding because always the load comes on the shoulder, you can think of some other way of shifting the load to some other body part instead of having at the shoulder, can you have some load coming onto that hip, I mean something like that.

So, it can be creative in sharing the load or distributing the loads the human body or the shoulder that can be another avenue where you can think of, you can have some kind of safety mechanism can be creative in coming up with the kind of safety mechanism where you can prevent the theft of bag or losing your bag, not always theft, but sometimes by mistake people will take the bag assuming that it is their bags. So how can we actually avoid that? That can be creative, you can have creative thinking in that direction.

So, you can actually write whatever the things you feel that it is possible. You have to submit it back to me after the completion of it. So, please write it and then and what avenues are limited or not open for creative design? Yeah, so you are not looking for a hard I mean, you have to increase the load, I mean you have to make it safe and it should not break, it should not damage but that does not mean that you can actually change all these to plastic or something. So, you want it to be a flexible one which can be easily carried.

You are not making it into a trolley bag. Is that the limitation that you are trying to tell? So, I do not want this to be a trolley bag with the wheels and other things. But it has to remain as a backpack or a bag which can carry things and there should be enough flexibility for you to add to carry with you. Use appropriate sentences to write down that part. What avenues are limited or not open for creative design. Next one, what characteristics properties must the product have?

Student: Compartments

Professor: Yes, it should have enough compartments for holding objects or holding things. It should be durable, it should have a good life, it should not get damaged within two three weeks. It should be durable and it should not be very bulky, it should be lightweight, the bag itself should not be very heavy, because if you try to put more things it becomes very heavy, I mean more features, then it will become very heavy so you do not want it to be heavy it should be lightweight, it should have enough compartments, it should be durable, cost should be low cost, whatever depending on the type that should be affordable cost. What characteristics properties must the product not have?

Student: Simpler design for use.

Professor: You are telling me that you do not want to make a very complex design. It should not be complex for use. The product should not be complex to use. And it should not be dangerous for the user. I mean, you designed in such a way that it actually hurts something else I mean your body in some other way injures.

It should be safe to use or it should not create injury to the user. These are the things you do not want the product to have. What aspects of the design tasks can be or should be quantified now? What can be quantified now? What will be the average or the maximum load that you should carry? What would be the approximate size of the bag and how many compartments you would like to have preferably?

These things can be quantified, maybe not always that you will follow. How much weight you should carry, what should be the approximate size and what should be the self-weight or the bag also that also can be quantified, saying that, it should not be the total weight of the bag should not be more than a particular value. These things can be quantified.

Does any biases exist with the chosen task statement or terminology has the design task been posted at the appropriate level of abstraction? Is there any bias in the design or design we talked about? Do you think there is a bias? We are always talking about somebody carrying it in the back. So, you are actually saying that okay, I am talking about the bag which can be carried by a person.

So, we are not talking about anything else, we are not talking about something where you can have a cycle and then put on your bag, put stuff in that one and then come into the take it with you. We are not talking about that kind of stuff. I am talking about something which can be carried by the person to go wherever he wants. That is basically the bias, you are not trying to design something which can actually carry load and then reduce your efforts. The bias here is, you are actually looking for something which can be carried by an individual. Where he can have all the stuff put into that bag. So, that is the bias in this case.

Of course, you may find this difficult to answer all this question now, because once you start thinking in these lines you will know. How do we actually answer these questions? There can be multiple ways in which you can approach the problem. That multiple ways will actually reduce by having these kinds of assumptions. So, like for example, you can think of a very sophisticated safety mechanism for your back, I am not talking about all those things, I am looking for a simple single person use bag which can actually carry stuff and solve all the problems that are actually mentioned here.

So, that is the way how you limit your scope there or it will actually narrow down your design task to a particular direction that is the objective here. And are there any technical or technological conflicts inherent in the design? Is there any technical conflict you can identify? When you are trying to increase the compartment the size will go up and the size goes up, your weight will go up. These are likely conflicts. So, you cannot increase the number of compartments as you wish, because then the size will go up and when the size goes up the weight also will go up.

So, these are technical technological conflicts and you try to add a feature to improve the safety that also may lead to an increase in size and weight. You need to see that there is a conflict here. The job of the designer is to see how to address this conflict in an innovative way so that you will get a good design.

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All right, once you are done this, the next task is to prepare the mission statements. The mission statement will be like this. You have to write the mission statements, the products then, what is the description of the products, what are the humanitarian goals, primary markets, secondary market, Assumptions Avenue for creative design and scope limitations.