Product Engineering and Design Thinking
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Module - 04
Concept Generation and Testing
Lecture - 18
Concept evaluation methods

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Today we will be learning about idea evaluation and selection. So, initially what we learnt we have first identified a problem or multiple problems and then we selected one problem for understanding and solution generation. And when we have a problem with us which is we have selected we have generated product design specification.
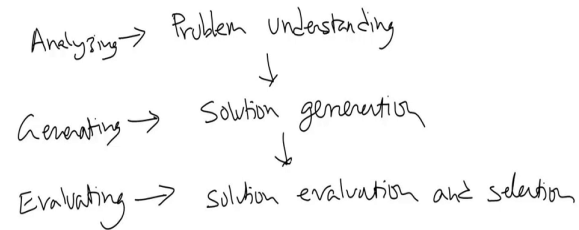
So, once product design specification is done then we have generated lots of ideas, methods we have used brainstorming, switchboard diagram, other methods we have used to analyze the problem. And then we have actually find out lot of solution for this and this solutions once we have it, this solution solutions we need to evaluate.

So for evaluation of the solutions, we need to have evaluating criteria. So, this criteria is going to come from the beginning of the exercise what are the major criteria for used for assessment of the solution. So, once we have this criteria, we are going to use this criteria for selection of the right kind of solution and once the evaluation is done we are going to select the best one or the top two one for further testing where we make a prototype.

So, this is the way we are going to learn this and in today's lecture we are going to learn how exactly we are going to have this evaluation done, there are lot of methods some methods we are going to discuss.

Concept evaluation and selection

Analyzing → Problem understanding
↓
Generating → Solution generation
↓
Evaluating → Solution evaluation and selection

Now, concept evaluation and selection is having a few steps. So, when we have when you are talking about problem concept evaluation selection first thing actually whatever we have learnt is problem understanding, then solution generation and then we have used solution, evaluation and selection.

So, basically here we are analyzing the problem, here we are generating solution and here we are evaluating.

Concept evaluation and selection
  Step 1 : Find the evaluating criteria
  Step 2: Rank the solutions and compare
  Step 3: Select the best one
      more than 1 solution possible

So, for concept evaluation and selection there are certain steps. So, what are the steps we can write as step 1 is find the evaluating criteria. Step 2 is rank the solution and compare, step3 is select the best one and there can be more than one solution and there is always a way to improve it.

Techniques of concept evaluation and selection
* External decision: Customers, experts outside the organisation
2. Product champion: Expert with the company
3. Intuition: Feeling about the products
4. Multi voting: Votes of the members
5. Cloud sourcing/online survey: Online tools
6. List Pros and Cons: Each idea
7. Prototype: Best among all
8. Decision matrix: Weights, without weights

Now, there are techniques are there for concept evolution selection. So, one is the external decision. So, here is we can request customers experts outside the organization to evaluate the product. The next possibility is we can use a product champion that in a expert within the company and here she can evaluate the concept select the best possible concept among the possible among the concept which has been generated by the group of designers or managers or engineers.

The next thing is intuition. This actually we do this evaluation is a use this technique a lot. This is about feeling. Sometime this evaluation is actually is very good this kind of technique; however, not always sometime you may get biased. However, this is very important method. Next is multi-voting. 1 2 3.

Here, we can use votes, votes of the members and then they are going to tell which method is the most which product or designs they like and maximum voting whichever ideas they will get that one will be selected. We can also use cloud sourcing, online survey, there are certain online tools. Even Google is having a tool which is free can be used and many people can be asked to give responses to this.

We can list pros and cons of each idea and the best thing is among all these things you see basically decision making based on the prototype. This is the best one. Now, apart from that we also have certain kind of decision matrix. These are weighted and without weights also. So this we are going to learn today how we can use this technique.

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Concept evaluation and selection
1. Selection based on experience
2. Voting
3. Formal selection methods — with or without weights

Before we go to this technique, there are certain things which we know understand that we are trying to use this technique to that. So, that we reduce the biasness towards the idea which

we have generated personally. So, the most commonly used one is this selection based on experience.

One is the selection based on experience. The second commonly method common method which is used in many organization is selection based on voting and third one which we are going to learn here is formal selection methods with or without weights.

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So, formal method among the formal method this one of the thing which is very simple is the simple concept selection method. We are going to learn about simple concept selection method. So, here take for example, pen 1, pen 2, pen 3, and there are some evaluating criteria which we can use.

Take example, the first evaluating criteria is that duration. How long you can use it? Second is you can use the aesthetics, ergonomic and there may be cost. And then whichever method whichever like you know deviation this may be may be pen number 3, you can write really long so, you can plus plus. Pen number 2 is little less, pen number 1 is one is not much. Ok

So, we do not have given anything. Aesthetics in terms of aesthetics, if pen number 2 is far better very good looking and pen number 3 is not that great. And then for ergonomics, if we pen number 1 is good, pen number 2 is very good, pen number 3 is really good. That also is good. So, cost may be actually it should be higher and it should lower. So, that way pen number 1 is good low cost, pen number 2 is again it is lower cost and pen number 2 3 is very good low cost.

So, now depending upon how many plus and how many minus you can see that you can see here that this is the pen number 3 is the design of this pen number 3 is may be concept 3 actually. Concept 3 is far better than the others.

Weighted method

Concept 1   Concept 2   Concept 3
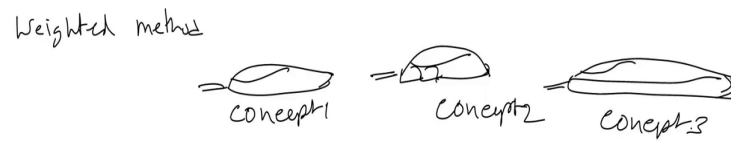
The next method which we can use is weighted method. So, weighted method we are going to weight, we are going to give weights. So, take for example, we have designed mouse. Concept 1, concept 2, concept 3.

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Weighted method

	Concept 1			Concept 2		Concept 3	
	Weight	Rating	Value	R	V	R	V
Accurate	0.3	5	1.5	4	1.2	5	1.5
Cost ↓	0.4	3	1.2	3	1.2	4	1.6
Ergonomic	0.3	2	0.6	3	0.9	5	1.5
	1.0		3.3		3.3		4.6

So, we do not need this drawing now. So, here we can say that criteria for this and the criteria's are that accurate. Second is cost, third one ergonomics. So, here we are going to use weights. So, weights, criteria may be weight which is more important. Among all this it has to be accurate, but how much important this this one is. So, 0.3 may be and cost you can say 0.4 may be, cost is important and this is 3 may be. So, here you see that it should be total should be 1.

So, now we are going to give ratings and then value. The ratings value ratings value. So, take for example, for first concept we have the ratings as may be may be out of 5. So, it is quite accurate. So, we give 5 out of 5 for concept 2. It is also accurate, but not that concept 3 is also very accurate.

Cost is in terms of cost actually should be less. So, concept 1 is 3. Concept 2 is also 3 and concept 4 for 3 is high. So, it is 2 basically 4. So, ergonomics we can say as rating as again 2 and concept 2 is 3 and concept 5. So, now if you want to have the value take for example. So, here it will be 1.5, 1.2, 0.6 and then and then we are going to add this these all of them together.

So, here you see 1.2, 1.2, 0.9, and 1.5, 1.6 and then 1.5. So, the when we are going to add, we can find out how much it is and whichever is the highest one we can select this. Right. So, here 3.3, 3.3And this is 3.6, 4.6 this is. So, here you see that this one is the best one among all these and slowly is going to go like this.

So, the concept 3 will be selected for this one. Ok apart from this we also need to understand that whether the evaluation is done correctly or not which means that did the final solution meet the customer expectation.

Did the final solution met the customer expectations
Wow factor
Sustainable
Good for the society ?
Did it met the Design specification document?
Customers are happy
price match

And does it have the wow factor and is it sustainable or not? These are all additional information which we require for selecting the best one. This is good for society and did it met the design specification document. Are the customers happy and does it match with the price that is competitive also. So, all these things we have to see.

Thank you.
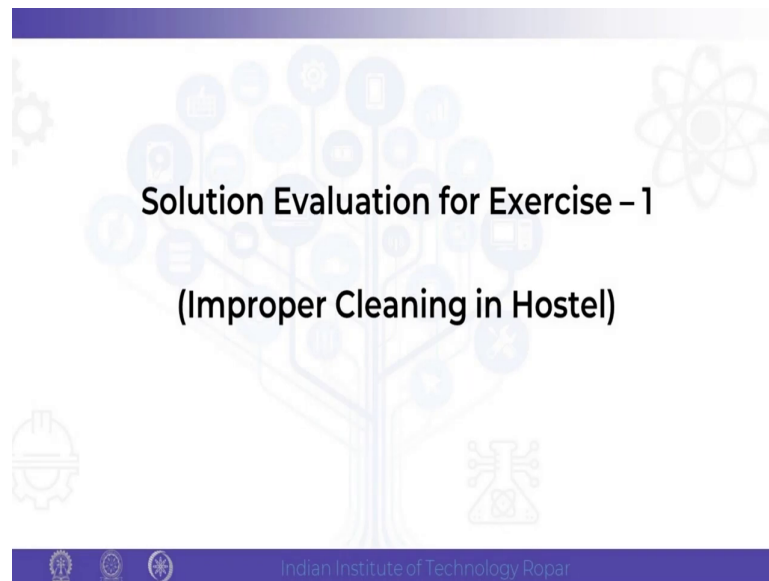
Fine so, now we have 12 ideas and now the next step is to select the best idea and that little difficult process. So, one possibility there are multiple methods to do that. One is that we can use criteria and then varied criteria multiply with the factor and then do it. Second is we can use expert also. So, right now we do not we do not use we use the voting system.

Voting system means he is going to read each of this idea 12 ideas and how many of you agree with it, just raise your hands and then he is going to mark the number of how many of you agree. And then depending upon how many of you agree a maximum number of these one voting we will take that as the best or most suitable solution among all of us.

Ok. So, we will start with the first solution that has been provided. The first one is that maintaining the feedback of the cleaning staff. So, how many of you agree that this should be the proper solution for that?

Yes.

Ok, the second one is the proper authority should be assigned. The authority should be properly assigned all the cleaning staffs regarding their particular duties, ok. So, I will to agree with this solution. So, I will write 4. The third solution is that the checking of the cleaning places should be done on the random basis.

Ok, so, 2 are there ok.

The third one is that the fourth one is that regarding that the sleeping cycles of the students. So, flexibility should be there and the timings. So, how many of you think?

The one student ok.

So, the fifth one is that the authority should some amount of power or authority should be assigned to the students also regarding this. So, how many of you agree with this? Ok, including I also include. I am completely agree with this solution, ok.

The another one is that the active participation of authorities, students and the cleaning staff together for this combined solution, ok. So, 2 are there, ok.

The 7th problem is that the quality of equipments used by the cleaning staff should be should be of a good quality. So, only 3 are there, ok. The third one is that the cleaning should be done on the weekends also.

1, 2.

2 ok. So, one more solution that we discuss is that is that the access of equipments to the students should be provided. So, how many of you agree with that? O. So, I and Rishab agree with that 2, ok.

So, then last one is that the shift basis system of the cleaning staff. So, how many of you agree? Ok, only 1.

Yeah.

So, now we are going to see which one which one has received the highest number of voting and possibly the multiple of them so and all this we will going to collect and this is how the recommendation from the group, ok.

Ok. So, depending about the voting system, I think we got a maximum number of votes for the solution of proper authority should be assigned through the management, through the cleaning staff and having the participation of students itself. So, this solution has got the highest voting. We all 4, I have agreed with that.

Another one is that one floor should, particular floor should be provided with each and every staff members should be given. So, proper assigning of the duties at a particular position should be given. So, this one has also got the highest number of votings that is 4. So, these two are the total number of solutions that we have got.

Ok, thank you and I would like to thank everyone of you for your participation. Thanks.

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Solutions and Votes

S. No.	Solutions	Votes
1	Maintaining feedback	03
2	Proper authority should be assigned	04
3	Random inspection	02
4	Flexibility in cleaning timings	01
5	One staff for one floor	04
6	Students should have authority	04
7	Active participation of students, authority and staff	02
8	Providing good quality cleaning equipment	03
9	Major cleaning on weekends	02
10	Access of equipment to students	02
11	Shift basis system	01

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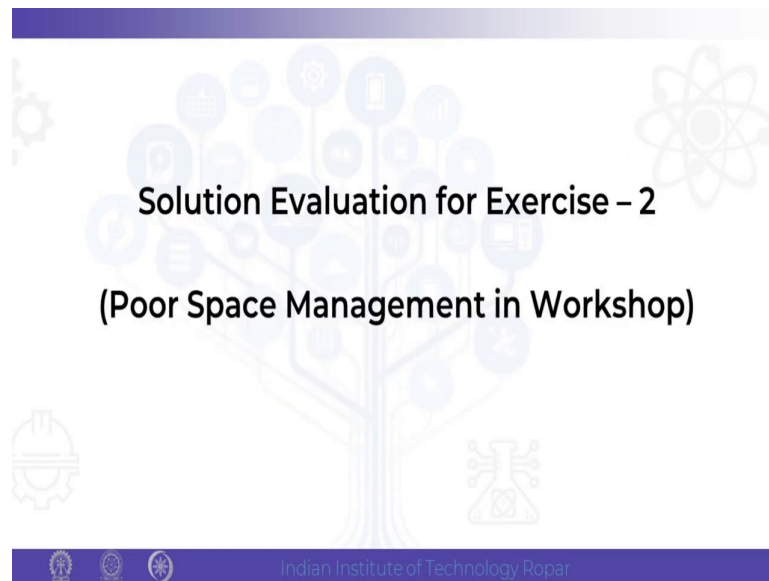
So, I will state the solutions one by one and whoever agrees can raise the hand simply. So, the first solution is that standards, proper standards of international or Indian standards should be followed while planning a machine workshop. So, we all agree. So, we can have the vote of 4.

The second one is that ventilation, proper ventilation should be done for every machine. Proper ventilation system should be there.

No (Refer Time: 27:34) cost

Not possible (Refer Time: 27:37)

It can be it can be categorized.

Ok.

So, no one is agreeing.

No one is agreeing. So, I can give a 0 on that, ok.

So, next one is that categorization of similar kind of machine and different and other kind of machine should be done.

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Kind of a chamber.

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Ok so, on another.

We can collectively make a chamber for a selective network.

Similar kind of machines ok. The fourth solution is that a proper scrap management should be there, so that it can indirectly or indirectly will help in a good space management. So, everyone issue agrees with that proper space management. Ok.

So, the next one is that more rooms storage room should be there. And it should be kept in such a way that even the expansion of the machine workshop occurs; the storage room should be there or not, more storage room.

Storage room will again take the space only.

Ok.

If there outside the workshop, if you are expanding in creating storage rooms, (Refer Time: 28:48)

So, at I think I agree with this. If anyone else agree with this storage room, more storage room should be there. It may directly affect.

Like storage room should be there. So, that the waste lying around in the entire workshop.

So, I can say 2, 2 votes are there from our sides, ok.

Another solution is that there should be more number of doors for entry and exit with a good escape plan.

Yeah.

In case of emergency.

Yeah.

So, I think you 3 are agree with it.

So, another one is that the 7 solution is that recycling, reusing of the waste material which can reach to a sustainable help in to achieve the sustainability for the workshop. So, will that. So, I ok. So, one vote is for this solution.

The 8th is that proper setting arrangement at a particular place only.

Yes, that should be in place.

Ok. So, this will give a fourth solution. And more number of windows be to be placed at those machines and those machining operations where air circulation requirement is must have much more air. So, will that.

So, if we are going with the previous solution. If you are making any compartments, it will solve the problem.

So, I think that is only my vote will be there in this, ok.

Another solution is we provided is that big doors to be installed in case new machines enters.

Yes.

So, big doors should be there, ok. So, it will cover 4 votes. And the last solution is that we should always have a space, additional space for new workshops, new shops in case of expansion of our workshop.

That is not there number. (Refer Time: 30:46)

So, anyone is agree with that or not. Should I count and how many votes.

So, Rakesh one vote one vote ok. So, from here on we have concluded the voting system for every solutions.

Which is the highest? Which is the highest?

So, regarding the highest one, we have 1, 2, 3, 4 and 5. Out of the 11 solutions, 5 solutions are there. So, there are multiple solutions which are getting the highest votes. That is all of we agree for 5 best solutions.

Which are the solutions?

So, the solutions are first one is that the planning and of the workshop and placing of the machine should be done according to the standards. The second solution is that categorization of similar kind of machines to be done at a one place and different machines categorization at a different place. The another solution, the third solution is that this scrap management proper scrap management should be there, which can directly leads to a good space management.

The fourth solution is that proper sitting should be there at a particular designated place for the staff workers. And the final solution is that big doors should be installed in case there are new big machines to be installed in the workshop or not. So, these are the 1, 2, 3, 5 major solutions of the problem that we got.

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Solutions and Votes

S. No.	Solutions	Votes
1	Placement of machines as per standards	04
2	Installation of ventilation system for each machine	00
3	Categorization of similar/dissimilar machines	04
4	Proper scrap management system	04
5	More store rooms in case of expansion	02
6	More number of doors for emergency exit	03
7	Reuse/recycle of waste material	01
8	Proper seating place	04
9	Sufficient windows for good air circulation	01
10	Big doors for entrance of new machines	04
11	Additional space for workshop expansion	01

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Thank you.