STD Session 10

**Karthik C:** [00:00:00] And what else? Sir, network connectivity is not. Network connectivity. Processor. These are the different components of your mobile phone. Yes or no? For example, I am designing a battery. Alone. Battery alone I am designing. See, it is performing as expected. For 5 hours, I will be checking, testing and everything.

Battery is performing. If it is not fitting into your mobile phone, is there any use?

If I'm designing a screen, it's too sensitive and that that is not fitting into your mobile phone? It is actually, when I'm testing the screen, it meets the requirements individually. Individual [00:01:00] components are meeting the requirements individually. When I'm asing it, if it's not meeting that requirement, whether it's going to perform as you expected?

No. So you have captured the requirements. You have previous one snack analysis, you have captured the requirements, right, and you know what are components make your product. And each product has got a, each component of your product has got a function, yes or no? Each product, each component has got a function, its own function.

It is performing individually, it is meeting the requirements. So there is a behavior of that component. B is expected behavior. I am expecting something, but I actually perform something. [00:02:00] That is a piece. Okay? The structurally is meeting the requirements. It's not meeting your expected performance, so you're going back and forth to fine tune the requirements to put it together as a product.

There is a cycle which you are following. Finally, we'll be deploying the product. So this is the basic understanding we have, and. So, this is the standard model which worldwide followed to understand the relationship between the product requirements and the function of, functions of each components, okay.

So, this is the basic thing you should understand before going further designing something. Excellent.

This is an example, typical example, [00:03:00] okay. For example, instead of going to that one, let us take a car. So car is a system or a product. Car has got multiple attitudes. Car has got the body structure, powertrain, and all put together is a car. So it's running, okay, but it has to meet certain standards.

So, we will be doing the crash testing and checking whether it is meeting the requirements of the standard, 3 star, 4 star. So, you all, you have a fancy car, right? So, do you know which car has got 5 star rating crash in India? Let [00:04:00] Tata

Indica. Tata India has got a 5 star rating for the first time in India. That is why that car was sold, uh, as much as possible. Okay. Still many people uses a taxi. The Tata Indica 5 star rating. You should have the glass testing results and that should meet that requirement. not just one and it has to meet the NVH noise, vibration, harshness, there is another requirement.

The same car has to perform as expected with the vibrations and the harshness and the same car it has to meet the durability. It just run for a second period of time. There [00:05:00] are different tributes, so individually when you test it, it are meeting the requirements. But when you put together as a car, it's not meeting the requirements.

Where will you compromise which requirements you are going to, uh, reduce or increase, improve? So. So, there will be common platform that put it together. The same example, which I have shown, told us about mobile phone. So, that

we need to understand now. So, what makes a great design? [00:06:00] Okay. So, for the same example of a car, it meets the crash performance. It meets the NVH performance. It gives the long life. This is the requirements, it meets that. Whichever the product is meeting the maximum requirements, that is a great design. Why Apple products are very successful?

It meets all the customer requirements. My Android phones are meeting the requirements. It's also meeting the requirements. Many people are using Android phones also, right? Not just Apple phone. Why? There are two different products, so some meets requirements that it cost. The cost and phones are cheaper than the iPhone.

And some compromising parameters, right? [00:07:00] So likewise, you need to compare, identify products. So that is product.

So this, uh, the first class we started with this behavior, right? We identified what is the business opportunities. So when we started the mobile phone, what was the business opportunity? Everyone would like to use it. We had a cordless phone, white phone, and why they moved from that to a mobile phone, right?

There is a business opportunity. There is a business opportunity for learn one product, whatever you are selected, we should see what are the business opportunities when we develop that product. That is the first stage. And then the second stage we'll be looking at the product functionality.

So, I [00:08:00] am going to sell so many mobile phones in the market or so many customers, some millions of millions of mobile phones I can sell, that is business opportunity. The product is mobile phone, okay. The mobile phone can contain so many components or features, that is the technology, right. The same mobile phone has got multiple sub solutions.

And what are those solutions? That is where we'll be attacking or technical problem, solution, disciplinary, thermal, et. And finally, how do your components of that product is work. That's a physics or your science. That is where your science lower so. Whatever you have done so far at, [00:09:00] at the higher level now we are breaking down, going down and down to look at how the product is going to function or work.

Okay. Next. Next there. How many techniques available to understand that requirements? So, out of which we are teaching only one technique, it's called i a. So. So functional means it can lead to several solutions, but other methods can lead to a single solution or generic solutions, or some we can pinpoint and find out multiple solutions, uh, through applying.

This is, that is called technique. Okay, so what is ISM, interpretive Sensor modeling. Okay. It is similar to a discovery matrix, it is a semi mathematical approach, [00:10:00] okay, and this method will lead to identifying multiple solutions, okay, and this was developed by Professor Warfield, and it is a semi mathematical approach, and there are many approaches available.

So, this method we can extensively use in the industries. Especially on the software side. Okay, next, so your first step should identify the key elements. For example, the same mobile phone. My objective is to reduce the weight or to reduce the weight of the product. That is my

my second object. To reduce the cost of the product. [00:11:00] Okay, the third one, to increase the performance or improve the performance of for third objective. Fourth one, to reduce the sensitivity of this screen or to increase the size of the product

or to increase the.

So, that is the first step in this ISM method, interpretive structural model. Now I will give you some five minutes to list it down, these key elements required for your understanding.[00:12:00]

Okay. Then we will go to the next step. So just take five minutes. Discuss with your group whatever the problem which you have already identified. List down these requirements or these key elements. As I said, for an example, like a mobile phone, you have also got some problem. What is your problem? Sleeping.

Okay. Okay,

that is the top level, uh, key element. You have to break it, break it down, at least 20 key elements you need to break it down now. Okay? Clear? So that

is the first step. You need to follow. So you sit with your group, discuss between your team members and list down all those. Okay. [00:13:00] I'm feeling sleepy. Same. I'm going somewhere. I went on top of them. You tell the key elements.

Now for problem What?

This is the second step. I have to tell you [00:14:00] the remaining steps. That will be totally different from this one. What else do we have to do? What else do we have to do? Understood? Make it in multiples of 10.

Tickets multiple.

Okay. Where, where am I required? In bus? What do you require in a bus? Like, when you're traveling [00:15:00] in a bus? Breathing space. Space. Space. It's too crowded.

Space. Space is not allowed on the other side. You understood what the, what we are going to do with this step? Yes, sir. We are listing out more problems, sir. Okay. More requirements. For the classroom purpose, whatever you got, you do the next step. Okay? See, in the classroom purpose, whatever you already have listed out, you can pick up the first step.

This pose. Ventilation. Okay. Better ventilation. What? Better ventilation? Better arrangements of seats.

Then you do the full scale. That's why [00:16:00] I can't do it one by one. Everything else is a requirement. So, now, you have to get this particular matrix, ok, so all of you, this step you have to follow, you got four matrix, so the same for example, to reduce the weight is the first requirement, to reduce the mass is the second requirement, to increase the processing time is the third requirement.

And it will improve the sensitivity of the screen. So like that, four different requirements. Same four requirements. Okay. Reduce the, uh, cost. Is there any difference? So same. And zero. Number. So you have to, [00:17:00] I have to pitch in phrases. To the other. I have to pitch in phrases. Okay? They don't know how to do it.

There's an option to draw. Really? Yeah. Do it.

That adjacency matrix only. Exactly, even I thought Even I thought the same. Sir. [00:18:00] Sir, what is the difference between the adjacency matrix and discovery matrix? Discovery is to discover the problem. Discovery at the top level to identify your problem. Now you identified your problem. Now in this adjacency matrix you are going to understand the Is there any influence of your first objective with the second objective?

So it is like discovery matrix. Similar to discovery matrix. This is the second one, one critical step of discovery matrix. We have multiple other steps. 5 by 5,

right? We have only five things. Five. How would you put here? And one, we put it outside for now aside. 1, 2, 3, 4, 5.[00:19:00]

So basically one is,

does not reading the location affect seat comfortability? No one does not affect two. Does one affect three? One effect three. One effect three. If you can't read the [00:20:00] location, that means you can't understand what the conductor is saying as well. But, but can't read, unable to read the location doesn't affect, see you not knowing the language only affects, you not able to read doesn't affect.

Probably I don't know how to read, but I know how to listen also. Some people don't know how to read Tamil, but they know how to listen. I'm telling it just now, completely. See, if you're telling one, then it should agree with you unanimously, unambiguously.

One, uh, Yeah,

the seating comfortability affect,

that's, that's what influence for.[00:21:00]

Rough than nine. This is rough, so it's fine.

Five 18.

Actually two effects. Four. What is two orders? Four audio effects. Reading comfortability affects, give denominations or change.

What as the [00:22:00] denominations that, not how you give the denominations. Okay. Problem. The denominations.

So, have you all completed this step? Second step? 4, 3, 4 of x3, right? 5 of x3. 4 of x3. I mean, sorry, 5 of x2. 4 also of x3, right? 4 of x3, ah? How does 4 of x3, ah? Denominations and conductors conductor is 10 rupees, you get 10 rupees. But 3 of x4, right? 3 of x2? 3 also of x4. 3 also of x2. 5 of x2. No, 4 does not affect 3.

3 affects 2. But I put 2. Unable to hear what the conductor is saying, will affect you, how you give the denominations, how you give the change. I'm not 10, I'm not 10, I'm [00:23:00] 8. Yes, yes, yes. Dude, dude. In the whole matrix, there are only two 1s. Is it? Only two 1s. Yes. Non. See, this is our problem. We are actually non,

oh,

that is problem. We need to look at the requirement theme. We are looking at problems here. We must look at this. They did. Hey, we're looking at the problems. We're looking at the requirements. That's it? Yeah, these are the requirements. Does language neutral display system affect UPI transactions? 1, 2, 3, 4, 5, 6, 7, 8, 9 Hey, that's not all.

You've been given multiple answers. [00:24:00] You won't need multiple answers for one, right? But all of them are solutions, right? See,

does language neutral display system affect UPI? It's supposed to give a break, no? Sir, the word is, uh, please don't give What's the point of living now?

Do you want me to talk about solutions? You have to. Just keep it like this. Nothing new. That's it. Those [00:25:00] flies.

If all the flies would appear from the, disappear from the world, would the world be a better place or a worse place? Yeah, I think it's both sides. Depends on the person. Frogs and all that. Yeah. So if frogs die, then the species eating frogs will die. The species eating frogs, the higher species will keep dying.

So ultimately we die. It's bad. Flies are not supposed to go extinct. It's a food pyramid. Bro, he sounds exactly the same. No, the accent is a bit different. [00:26:00] The vector space. The vector space. This is a scalar. So you want to expand to be a scalar. The vector space. The vector space.

What are we doing? What is this?

You already got the A matrix, right? A matrix. What is A matrix? This will be your A [00:27:00] matrix. A matrix. What's the finite matrix? One, one, one. What's the in the in the So, you have to take the um, uh, the um, uh, the, the, the, the, the, the, the, the, the, Write A matrix, adjacency matrix, which is similar to your discovery matrix.

That is the second step. Okay, second step. You have to write a discovery matrix, which is similar to your discovery matrix. [00:28:00] And third step, you have to add the identity matrix. With your adjacency matrix. Yeah. You don't have enough space. Yeah. Yeah. Adjacency. Now you do the third one. What space are you talking about?

Vascular space. Then comfortability is also For example Comfortability also affects the normal motion, no? The previous slide I have shown, A matrix. Comfortability And I have added the, I have added the matrix. Dear Anu Yeah, seat comfortability, right? You took that. Okay, now you pull the card. Why are we still here?

He sounds like Natsi, no? Accent is a bit different. Natsi

has the cockiness in her [00:29:00] voice. Lexus has the cockiness in her voice. This guy is funny. Hey, you're showing too much cock, da, Sudip. That is my mix. But what is your right hand? Yeah, they're right. They're right. That's what all my friends are. Siri Kiriye. My Kiriye.

Round is done. Three 40 back. That's Ram. Ram. You want be Ram.[00:30:00]

Uh, yes, number.

The accidents were defensive.[00:31:00]

Uh, bird speech. Are you sure? Are you sure you're a rapist? Would you be a Would you

be a rapist?

How

the third step, I got our metrics, the. Yes.

The UPA influences UPA. Yeah.[00:32:00]

The UPA, which you are using not, might not always work for me. Okay. So technically UK doesn't influence uk. I. I think, I don't think we're supposed to have any one. Multiply with the, multiply with the, yeah. What is he doing now? So this is right. 18 cross 18 into 18 cross 18. So EFSI, you've got some matrix.

R. UPI influences UPI, so put that. Are you sure? Yeah, no, see. You're using, let's say, SBI Bank, and you're using PhonePay. Okay? Or whatever. Okay. I'm using ICIC, I'm using giving denominations affect giving denominations, sir. Okay. We are not taking this right? Yeah. We are not taking.[00:33:00]

Requirement, right? Right now, just do whatever this is. We have to make this matrix again anyways. We have to multiply this, right?

Sir, so A plus 2A.

What the fuck? What is the point of that? What is he even doing? A plus I whole square or A plus I square? Bro, I

don't understand. What are the steps? What are the steps? What are the steps? [00:34:00] What we should do now? Now, multiply, What we should do now? Multiply the original matrix with this matrix. With A into B or B into A? Which into what? This into this. This into this. R into A. No, you are saying, Multiply this to this, you are saying A plus I to a.

Yeah.

Zero. If you.

Zero. Zero[00:35:00]

a one minute. One minute down. The water outside you know people? There's no change in the water. Coming to night candy and white onions. Sandwiches. Cider. Cider oh. And there's no change in the water.

Come on. What is happening? Calculating the ship. 0 1 1. Oh, [00:36:00] so only one? These both columns. You get one. One. 0 into 0, 1 into 0, 1 into 0, 1 into 1, 1 into 1, 1. So we get in this matrix, this is A only. We are getting A? Yeah. I think. We compare. Yeah, we are getting A only. Okay, now add diagonal matrix again, multiply with A again.

If it's the same thing. A only we are getting, da. Hey, Malini and I only got A. That's a fact. I think we only have to solve for A. And A is stable value. Oh yeah. And it's stable value, right? The table is stable. Just do it again. What? No, A plus I. Oh yeah. A plus I. That's why we got A. After doing that, we got A.

But it's still the same. That's right. After that it's into I. [00:37:00] So listen here, at the last page, Okay, at the range of length is set to, okay, The particular objective one, objective one, Is influenced by, what, three, and four. A to the, A plus?

A plus A. A plus a. Item

two. Then why is he multiplying A plus A with a

four, third by one, three and four. One, three and four. The fourth. Second one, three, and four. That is your reachability [00:38:00] sector. Okay. And then seven set is like, so this particular tick one is influenced by 1, 2, 3, 4. This is influenced by one, only two. This is in bay 1, 2, 3, 4.

So, you see this is, you see this is a, this is arely, this is the intersection. So, 1, 3, 4, 1, 3, 4, that is intersection. And here. 1, 2, 3, 4 Here, 2, 3, 2, 6 is two like that. 50 into section seven. Now what is the level? [00:39:00] So here there is only one particular thing, section set. What's the level one? And here? 1, 3, 4, 1, 3, 4.

Same level.

So, this is the second level. So, that you need to identify. Okay. So, these two directly do not influence 1, 3, 4. This 1, 3, 4 are directly affects the other, each other. So, that you need to understand. You got my point? Any doubt? Any doubt, you can ask me now. Or we can spend some more time on this.

That's only one particular object is set from this. So there are other things are interconnected. [00:40:00] Okay, go to the next line. So level here, this is the interpretation. So this object to one are directly influencing each. If I change anything on. Two directly influence is the third and fourth. By changing anything after the two, it may not be directly in one or four or three.

To understand this behavior is the most important one. Two, you are to do this particular steps. Okay? It'll clearly tell you whether I'm going to maximize the, uh, means or maximize the performance is my first requirement. Or reducing the weight is my first require, which is my first priority requirement.

Modify. I keep that as a first priority. What kind of a change it's [00:41:00] going to make on second or third, whatever the remaining objectives to understand that this particular analysis helps you. Okay, so can you work on this now or sometimes. Yeah. And finally that's the same all batterie like discovery matrix.

You come out of degree in

next step sixes. Add this 1, 2, 3, 4, 1, 1, 2, 3, 4, 1, 2, 3, 4. And add this three. Okay? This is got degree, degree out and that plan degree. Degree out. Okay. This same as. And then you can see what is t plus r, what is t minus r, degree 1, total d plus r, d minus r [00:42:00] you calculate, and that you can see, your objective is 1, 2, 3, 4 are lying here, and this is here.

It is far away from your requirement, so this can, this objective 2 is not directly different 1, 3, 4, that you can see from this. Okay. So, that will be your last step. So, this will be like a clustering of your objectives and finally identifying which is the most influence objective of your product. So, you got only objectives.

In that you can see which are, what is the first primary function of the product or primary objectives and secondary objectives and primary objectives like that you can categorize the different levels. And then you can address on your concept design. Yeah, I actually had it. Okay? So these steps you follow.

Next. I don't think we should get AI again. [00:43:00] So these are some of the examples. So already you are applying to your own example. I don't want to give any other examples. So you apply these six steps now. See, first row will be zero only. I did. Because you need to have 1 over in this row, that's 1 into 1, then only you'll get 1, right?

So first row will be entirely 0. Second, if you want to multiply, here 1 should be there in any column, any row, any, any column, 1 should be there in the second row, right? So no 1, so 0. Here, third and fourth, right? Third and fourth, you have only 1, only in this, in this column only, so this into this, right?

That will only give you something, finite result. 0 into 0, 0 into 0, 1 into 1, 0, 0. So, 1. Which is what I have written over What are you doing? 0 into 0, [00:44:00] 0 into 0, 1 into 0. 1 into 1, right. This into this, da. Right.

For this row, only one element is in the fourth. So fourth row, all are zeros. So you get all zeroes only. It is coming A only. So it's um, it's not a linear matrix, it's a matrix multiplier. I'm going to pick up from this. I don't think it works.

Pick up this particular product. I'll pick up this screen from this I pick up display[00:45:00]

I a new product, the best. Some best to pick up. Uh, products and you can create a new variant for those type of applications. This particular is method will help you move. I pick up your different objectives, different functionalities. Okay? This is one of the examples I picked. So we pick up from this particular type product, you pick up a body and here you pick up something like a power uh, drive.

And some cases you pick up the razors.

So, this is for your re designing of product, so an example, so you can think in that way and you complete out that ISM matrix, okay. So, this assignment will be completed by today, so it will give some [00:46:00] time for you to complete this assignment maybe next week and I think this Saturday you got two assignments.

Sunday is okay. So, you complete that assignment and submit it without fail, you will not give any extension The deadline is next week. Because we are going to use this assignment today. If we, if we extend that assignment, means then this assignment will not have time because we are approaching the end of 6th hour.

Okay. So, I hope you all understood what I think you should have tried to add some god. I think you should have put some of the, some of the, um, the, the, the, the, the, the, What do [00:47:00] you mean class 4? Damn! Sexy! Not even 4! Sexy, but Abhiraman sir is the best. Whatever the steps are, you have to do it now. Again he's coming back.

Class is starting, Gopal. You have to do it now. I have an exercise.

He walking like an idiot.

He's finally announcing the attendance in the mic.

You have to ask you see how they did this.

Now

raise your hands.

[00:48:00] It's handy. CS23B1001 2 B2 B4 B7 B7 B8 It takes attendance like this. Tomorrow only it is. Tomorrow, yeah, exactly. 13[00:49:00] [00:50:00]

I think so. Better

only, da. It's just passing time. Why pass time, da? Passing time. I don't know. This [00:51:00] guy said it's not done, no? It's not done yet. Do it. Supposedly, he said it's all done. I don't know. Yeah, we should do A plus A power M. And find the least value such that it becomes constant. I don't know what idempotency is.

What is A plus?

Find the least n such that a plus i becomes a constant. Understood, understood. It's like a plus i power n plus 1 is equal to a plus i power n. Okay.

33

RI [00:52:00] 34 A plus A from multiplied by A A plus A 35 A plus A multiplied by A plus A multiplied by A plus I 36 do in the para two A plus A the whole par by find least N such that. A plus A to the whole power n is equal to A plus A to the whole power n plus 1. Hey, what? One minute is taking 30 seconds. 39. 40.

Harith, go tell him you will take attendance. He'll kick me out. Sorry about this. Huh? Go, go. You go tell him. 42. I remember in D, [00:53:00] in D, I finished our apprehension in two minutes. Two minutes. Overall class. I remember. Whole class said, you are it, then all of a sudden I knew. That's how long I lasted. Actually, two minutes is not a problem.

I don't think she's a proxy identifying machine. What a piece of shit.

But

it doesn't make sense why it's, how it's going. It won't count, you won't get it. 100 percent you won't. This will keep incrementing, 2, [00:54:00] 3, 4, 5, because you keep multiplying. You'll never get a constant value. Which means we made our matrix longer. No.

We're in theorem 3. I am in theorem 3. See, we'll get 2, 2, 2 here. Next time we'll get 3, 3, 3. Next time we'll get 4, 4, 4 here. Not, not there. So you're doing a plus a whole power n now. So part 3. So you're multiplying with this. So when you're multiplying again, this column with this here I assume. [00:55:00] So this 2 becomes 2 plus 1, so becomes 3, right?

59. 3, 4, 5, that is, it will never remain the same. 59. 59. Anvitha.

Yeah. C 15 and right.

60, 61.

Really 60. No, he started at 3. 58. 8, 3. 58, yeah. It's been like, [00:56:00] probably 8 minutes. 8 minutes, how the hell is it coming? That was a half. 64! 60 roll numbers. 8 minutes, 60 roll numbers. He's, uh, 1, 2, 3, 65! Yeah, he's beatboxing. He's rapping, you know.

66 can go eat snack and 60 and it'll not be done. 64 8. 68.

Laughing.

Yeah, exactly. Where is my operator? Where is your cock, Mahesh?[00:57:00]

The aura in this class is infinity. 74,

I dunno, probably a month or 2 75.

Want kill that guy? 76 77.

78 79.

80. 81.[00:58:00]

82. Nicer watering. You drink coffee? 83. 84. What is that? Cheeseburger. I'll drink cheese maggi, I'll eat cheese maggi. I'll also, I'll also drink cheese maggi. Six o'clock then I pull up, man. Money at the net. Yeah, I'll eat cheese maggi. Jackfruit, eh, parotta, eh. What parotta? He said, eh, parotta. Missed, eh, I'll have parotta.

91 to 3.

No, no. This is updated. I think they updated. No, no. Only in this it's on. [00:59:00] 95. Should we go ask sir why that works? He doesn't know, I think. He doesn't know. He doesn't know either. If he wanted to, he would have told us.

You keep multiplying a plus a, a plus a, a plus a. It's not working for us. Find the least n such that a plus a to the whole power n is equal to a plus a to the whole power n plus 1. I don't know. I don't know. It didn't work for us also. For us it's going 2, 3, 4, 1. One index is going 2, 3, 4, 1. That's even worse.

a plus i into a plus i, right? So you'll get, say, for example, say, 3 cross 4, right? One into one, plus one into one. Two, right? So here, two you'll get. Simply, I'll go. Two and don't Hey, we should not get two, da. Only one and zeros. No, we'll not get that. Only one and zeros. Okay, [01:00:00] listen, listen. For example, it's Wait, wait, wait.

Okay, yours is five, right? It'll take three more minutes for that. He's taking exams.

A seven. So see, same. Take this column. Only column. Okay. This column with this column. So one into one. 1, 2, 2. One, two. One plus two is three. So here we get three. I'm not sure what I'm trying to say. So this 2, 3, 4 keeps incrementing. He's asking how it looks. But first it doesn't work for you. I,

I 15 I,

I 17 i 18 [01:01:00] I I,

it's recording. Yeah. This class is done anyway, so it doesn't matter.