(Refer Slide Time: 0:17)

I mentioned earlier that we spoke about Ideation and Prototyping, but then you can expand this, you can stretch this a bit. This stretch is like this, first you empathise with the customer. Second is you define what is his problem? And therefore, you define what is the solution, then you ideate how to make the solution possible. Then you come to the prototype and you come to the testing phase. So, these another way of looking at it, so it stretches what we called as 2 stages into 5 stages.

Basically, the whole emphasis here is focusing on the customer, observation, collecting and recording the needs and developing solutions based on that and moving into the prototype. Why is this different? From let us say, what you call market research. So, when you look at market research, you try to understand how is the product is functioning and ask certain questions as to what the customer wants out of the product, but, when we look at this kind of phase, you are actually seating with the customer, you are observing the customer and you are trying to find out what else could make his life easy and different.

(Refer Slide Time: 1:30)
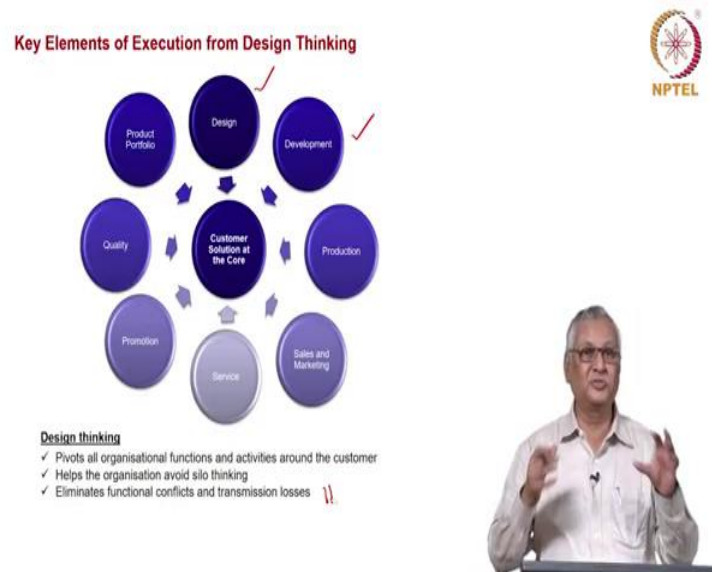
So, when you look at this, the entire gamut, we created earlier is an idea phase and a prototype phase, but, once you do that, it is almost like a manufacturing phase also because you have to do the design, you have to do the development, come to the production, sales and marketing, service, promotion, quality, product portfolio. So, this entire idea of ideation and prototype is the foundation of setting up a new company, because at the end of it you are going to market it and to market it, you have to go through the established product portfolio.

But, the only difference between design thinking and the way of doing things in an organisation functionally is that, all the organisational functions and activities are around the customer. They help the organisation avoids silo thinking; they eliminate functional conflicts and transmission losses. Now, many of you would have heard the word "concurrent engineering", you may ask how design thinking is different from because concurrent engineering came into being particularly in the automobile industry because people found that when you design and developed a product, probably it is either over engineered for the plant or under engineered the plant, the quality was not fit for the purpose nor the service was not really ready to take on the product.

So, there were gaps, the value chain was in a way broken, it was impacted by the silo thinking. So, people said that, all the people should work together and concurrently engineer a product, so that it is done in the right manner for the market. So, how is this different from what we call we here as a design thinking?

The difference is that in concurrent engineering eases a process flow, it is a project management approach, you have a clear plan of what you want to do? And get all the functions to execute in such a manner that there are no breaks, there are no disconnects and it is delivered in a very efficient manner to the customer, but on the other hand the design thinking approach is not looking at these aspects.

(Refer Slide Time: 3:44)

Design thinking sits with the customer and tries to find out, what the customer requirements are and then looks at how do I really get this customer need defined as a product. Now, we have got 4-5 examples here, this is a very famous example of design thinking. People use to have shopping baskets and the result of that was that it was difficult for people to carry little more than what the shopping basket would carry and they also had the limitation that each time they would only buy this much.

Whereas the shop had got so many goods to offer, which means that either the customer had to make repeat rounds of visits or he would just be happy with whatever he or she bought and the business is sub-optimists. So, the first idea is that, why not we give a shopping cart just simply put some wheels.

So, the first ever model was a skeletal model where in a kind of box was made and wheels were provided, but then that was not very efficient, so a more elegant shopping cart which is fully balanced which can be stocked in the mall as well as in the outside parking area

and which also could accommodate a child in terms of sitting which was graded for different types of products was developed. So, sitting with the customer, observing the customer, observing the customers buying practices enabled the store owner to develop a shopping cart.

So, it is because of the customer orientation that was there and, in the process, got the business up scaling done. Same is with the suitcase, how much weight can you carry? Can you carry 7 kilos? Maximum 10 kilos beyond that is not possible, but use of the introduction of strolley was the revolution, very simple idea of putting wheels on to the suitcase, but it is design thinking how does the customer benefit.

Similarly, from processed food to ready to eat food and having a bottle which comprises medicine to making these bottle child proof, that is unless you open it with a little type of discreet pressure which only an adult can do, a child cannot access. So, this is where the design thinking works and comes up with some creative solutions not always with very sophisticated technologies.

So, what is design thinking do? When you are doing the ideation or when you are doing the prototype, how does the design thinking helping you? First, design is a pure technical process, I want to set what my materials are? What my specifications are? I define the manufacturing tolerances, I assure the overall finishes, I think of the colour schemes etc. etc.

Whereas, in design thinking, design is a consumer fulfilment process that is how does this design make consumer feel more fulfilled? Therefore, all the things which we have must be there but we also must have certain other categories. First, it should be fit for purpose quality, second, it should be targeted for ease of use because consumer is happy when it is ease for use.

When you compare certain sachets with certain other sachets, you will find that this is very easy to tear, so that is called ease of use. So, you are observing the difficulties faced by the consumer in trying to open a pouch and you have provided some kind of benefit to this. Then the unboxing experience, how difficult is to unbox a particular product and what are all the various components which are available for you to start off the use immediately. Then the ease of service, so the technical components of the design process, coupled with the customer-oriented bells and whistles are supports which come from the design thinking.

They make this whole product a more fulfilling process, and when we look at the design process the triggers are usually in terms of market research, as I said earlier and then the base is the current product. Suppose I have this pen, it has got a stylistic option, I can put the finger in this manner, could there be a different way of doing this, could it also be used for projecting somewhere else or could it be used for different colours to come at the same time.

So, these are all the improvement so the current product is the basis for the design process and it improves.

Then obviously performance, new technology, compatibility with my manufacturing infrastructure, these are all part of the design process. Whereas, the triggers for design thinking process are different. I keep this product with the consumer, how is he going to use? One of the important aspects which even in very big companies miss they put the physical buttons next to the phone, they forget to see how a typical consumer uses the fingers and that could cause lots of issues for the product itself.

So, living through consumer experience with empathy, developing insides on issues and so developing the solutions in an inspired manner and do not rest until you get the most fulfilling solution. So, to summarise this, developing a technical solution or an engineering solution is a relatively simple and normal construct. If you have knowledge, if you have got good trained engineers you can develop a good technically viable and satisfying product, but, developing the right features that help the users feel happy when the product is actually working is a bigger challenge. And that is where the design thinking tries to apply itself.

(Refer Slide Time: 9:23)
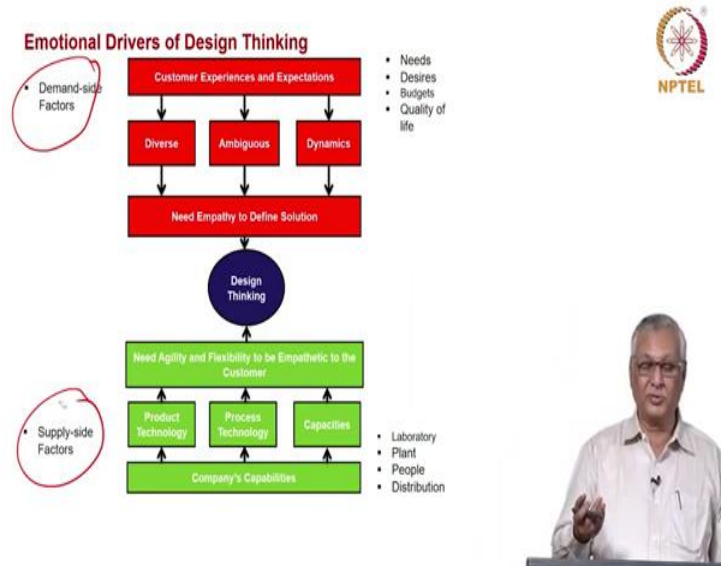
Now, design thinking is not again as I said simply an organisational process is more an emotional process. The emotional process which combines the emotions of the customer when he uses a product with the supply-side capabilities of the firm. What are the supply-side capabilities? I have laboratory, I have a plant, I have people, I have distribution chain. Whereas, the customer he has got needs, he has got desires, the budgets, quality of life.

So, how do a combine these demand set factors with the supply-set factors? I have product technology, process technology capacities, whereas customer has got expectations which he is not able to define in any good manner, they are diverse, they are ambiguous, they are dynamic and nobody can assure by the time the product is developed, he is still remains committed to the idea, the same way as he was during the empathetic design stage. So, you have to defined a solution that will last the developmental life cycle.

(Refer Slide Time: 10:22)

And when you come to think of it again getting back to that, some simple ideas have developed huge revolutions. So, at one level we have got automobile, the tramways, the cycles, the rail tracks where just a wheel has driven mobility, without wheel there would not have been mobility.

But the same wheel has been applied in the consumer facing activities, we talked about shopping cart and this suitcase, but we have this electric scooter or this scooter wherein school boys can go to school very easily, they can play. Then you have got skiing shoes, so wheel a simple object has led to several revolutions.

So, if you jog your mind and look at various other parameters, you will find that simple innovations have led to application of those innovations to other kinds of products.

(Refer Slide Time: 11:21)

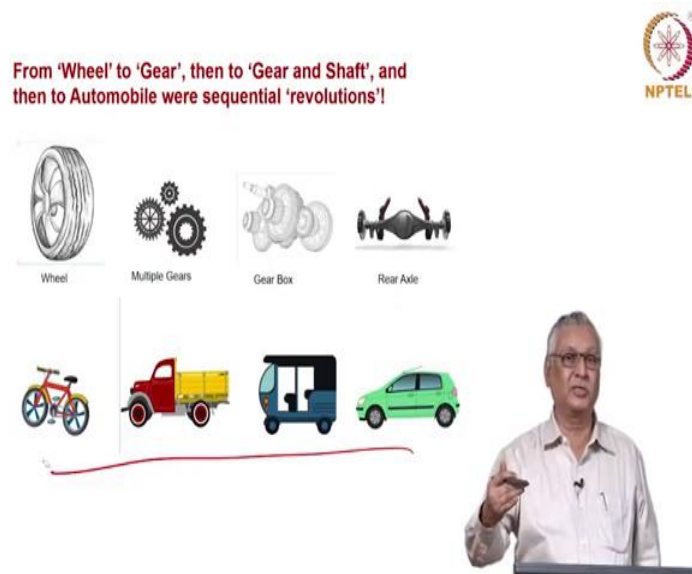So, why is design thinking important in entrepreneurship and why are we spending so much time? Primarily because unlike the big firms which are focussed on the market, they are benefitting from the scale and size they have got, this sheer velocity and momentum of their actions, they have got their own field set-up.

But entrepreneurial start-up firms have to get into the market, create their markets, therefore they have to be consistently customer focussed and design thinking makes you customer focussed. Second and third, the digitisation is helping the customer being more efficient so what was the design thinking? Bluetooth speaker was converted into an Alexa or a Google speaker. Similarly, an affordable water purifier was made for millions using simple technology, a watch was converted into a health application. Telemedicine has been brought up. So, trying to look at customer requirements you have come up with a new challenges.

(Refer Slide Time: 12:22)

From 'Wheel' to 'Gear', then to 'Gear and Shaft', and then to Automobile were sequential 'revolutions'!

Wheel   Multiple Gears   Gear Box   Rear Axle

And this is evolutionary which said that there is a wheel, wheel became a gear, gear needed to transmit. Therefore, gear and shaft were combined but it cannot be only linear transmission it has to be from one direction the thing has to go to another direction, so axles came. So, all these things when this got developed sequentially with thinking, then all the kinds of automobiles came. So, you look at various other products like whether it is a submersible firm or whether it is a turbine?

You will find that one development let to the another, and not always they were incremental developments, they were all breakthrough developments completely altering the product shape.
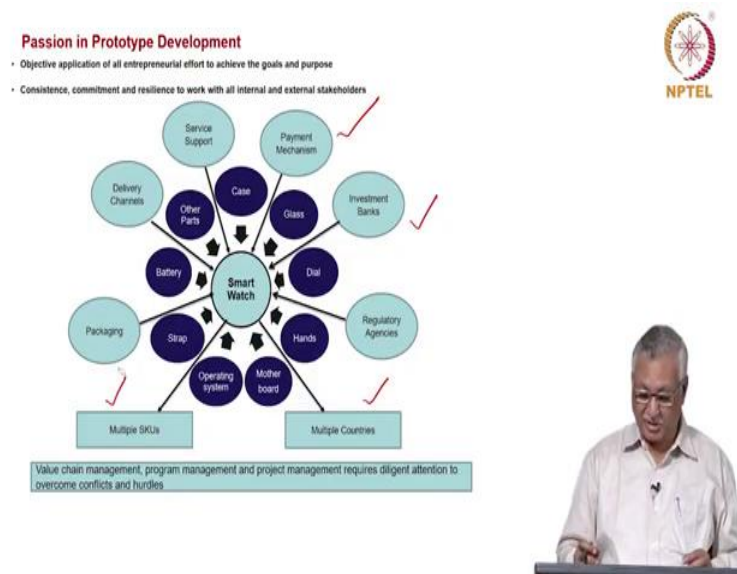
Now, let us look at Passion in Prototype Development, why is passion important? Because you may have passion for prototype development, but you really require a total ecosystem for you to make it happen, I am taking the example of a smart watch. A watch whether it is smart watch or a normal watch has got a few things which are essential, the blue circles a case is important, a glass is important, a dial is important, hands are required, a motherboard is required, an operating system, a strap, battery these are essentials.

But, if you want to make it really smart, you should have something which is added, which is let us say, you may say that it will be a payment mechanism, you can use this watch to pay your bills, quite possible. Then you can get these things done with the help of investment banks, when you go into the payment mechanism, you have to have approvals from the regulatory agencies, to be able to make cross border payments.

Therefore, you should have the ability to deal with multiple countries. You should have the ability to provide multiple SKU's because if somebody is interested in a watch without payments, you should be able to provide a watch, and if it is a payment thing you need a special strap which can do the payments, then the packaging delivery channels.

So, when you look at prototype development, it is not just dealing with yourself but it is dealing with a whole lot of stakeholders who must be brought into the same level of alignment so that the whole value chain is delivered in a perfect manner.

(Refer Slide Time: 14:44)

So, what is empathy do? And why does empathy work? And how does it work? Generally, we know that there are two types of 'W' constructs actually. One is keep asking why-why-why-why-why 5 times theoretically. People say that if you ask a question why for 5 times, you are bound to get a solution like a student comes late.

So, you ask a question, why did you come late? Then he will say that, I did not get up in time, you ask him, why did not get up in time? You say that, first he will say that alarm did not function, then you ask him, why? Then he says actually alarm functioned but I over slept, why did you over sleep? Because I slept late. So, it's a very-very common place example of drilling down to the lowest possible solution, you will get the real reason.

The other way other construct is that that who, what, when, where, why, why are we doing this product? When you do a product like electric scooter, that is the two-wheeler where boys use it, who will use? And what is the operation about? Is it to be used in mass roads? Or it is to be used only in the play fields? And what are the timings when it can be used? And why somebody going to use it? Is it for the fun or it is for the speed etc. So, when you ask these kinds of basic questions, you will get your needs elaborated, and then on the field solution development happens. So, this empathy exercise finally makes you understand, is this product idea desirable? Is it feasible? And is it viable? So that is the whole idea.

Differences Between Market Research and Empathetic Analysis

Market Research	Empathetic Analysis
Product performance oriented	Customer experience oriented
Usually research is based on multiple-choice questions for easy analysis	Usually empathetic study is free-wheeling supported by co-experiencing with the customer
Reliance on Big Data Analytics and high volume-high throughput processing	Emphasis on deep dive and deep learning for true customer experiences
Usually outsourced to external vendors	Usually conducted by in-house staff
Improvement remains as a key goal in market research	Disruption emerges as a key takeaway in empathetic analysis

So, earlier I eluded to the differences between market research and empathetic analysis. Market research as I said is product performance oriented, I ask him how do you feel about this particular packaged food? Does it have the appropriate package? Does it get cooked properly? What is the taste? etc. Whereas, empathetic analysis ask, what else you are looking for in a particular product? What else I can do for you? So, it is customer experience oriented. Then market research is usually done on a huge number of people and it is based on multiple choice questions.

Whereas, empathetic study is based on very carefully selected customer base, it is done through observations and it is actually as a very important concept co-experiencing with the customer. It is not just asking him a set of answers but is just living through the product example with the customer. Market research looks at big data analytics, makes lots of trend analysis and it is a high volume, high throughput processing. Whereas, this one is based on emphasis on deep dive and deep learning for true customer experiences.

Market research is usually outsourced to specialised agencies because of the volume involved and because of the efficiency that is there, when you outsource it to external vendors. Whereas, design thinking directly leads you to product ideation, it leads you to develop new products, therefore, the knowledge which comes out of design thinking the empathetic phase has to be internalised and institutionalized. Therefore, it is usually conducted by in-house staff.

In market research improvement is the key goal. How do I improve my product? Make it more cost efficient, more consumer efficient, so that I can improve my business. Whereas, in

empathetic analysis Disruption emerges as a key, how can my product may be completely obviate the need for existing product may be combine one or two products make it better. So, disruption or transformation is a key takeaway in empathetic analysis. So, these are the significant differences between market research and empathetic analysis.

(Refer Slide Time: 18:41)
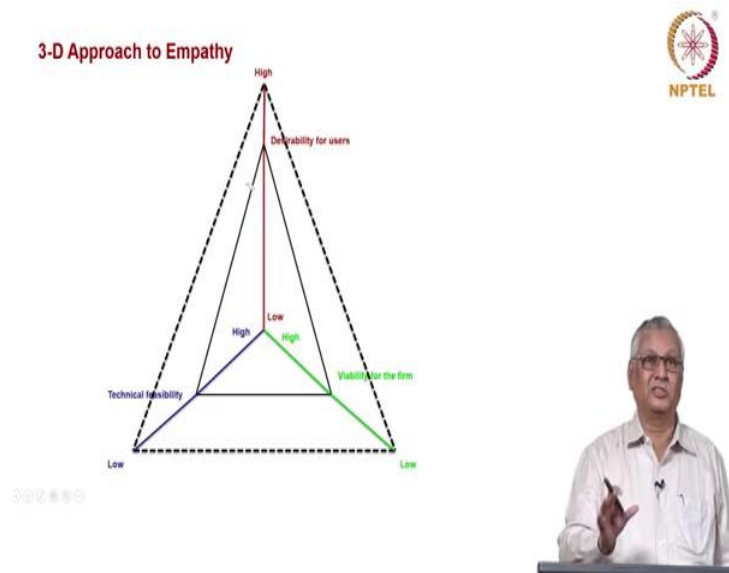
Now, we talked about feasibility, viability, desirability. Here, I am presenting a 3-D approach. Let us imagine these three to be 3 dimensions of a particular scale. So, on vertical scale you have got the desirability for users, that is I want an electric car which can go from 0 to 500 kilometres on a single charge. It should not require any other charge time, so the desirability is 0 kilometre to 500 kilometres.

So that is the vertical axis. The higher the desirability the greater is the consumer acceptance probably. The second is the technical feasibility, it is fine for you to have that desire but is it technically feasible. So, when you look at the highest desirability, you will get this marry to the lowest technical feasibility.

Yes, thousand kilometres is also possible on a charge, but it is technically infeasible, at least based on the current technology because the battery pack that will be required will be so huge, that the whole advantage of electric vehicle will be negated. So, the technical phase is the reverse, when the desirability is low, it can be made very easily technically and when the desirability is very high, the technical feasibility tends to be low. Then you have got the viability for the firm, when technical feasibility is high when the desirability is low, then there is viability which is easy.

That is the firm is already experienced in doing that, therefore they are unable to do it fast. Whereas, if you have the highest desirability, lowest technical feasibility that means highest technical challenge then you have got the viability for the firm low. So, when you use this design thinking, you want to arrive at a particular triangle or a vector where you are able to manage the combination in such a way manner, that you are reasonably successful.

(Refer Slide Time: 20:51)

So, you look at it you can say that, there is a scaling approach, there is a User desire which is the vertical dimension, there is a technical feasibility desire which is the left dimension, then there is a Business viability which is the right dimension. So, as I said when you have the easiest way of doing the user desire is low, what is easily made, he does not want, he wants the most challenging thing, technical feasibility is very high, business viability is also very high but will you select that? Because everybody can do that, so what is so great about it so you wouldn't select it.

Then you can look at lower-middle, middle, higher-middle where these are different kinds of combinations of the desirability, feasibility and viability and depending on your company's capabilities, the customer requirements you will choose a particular combination. Ideally, if you are able to get the highest level of user desire, you combat the technical infeasibility, combat technical un-viability and make it better, you can select but would you be able to do it? What kind of resources it takes? This is therefore there is a question mark.

So, the objective of ideation as part of design thinking, is to combine the highest level of user desire with the easiest paths to technical feasibility and business viability. So, it is easier said than done, but that is the goal. Management of paradoxes is the essence of management

actually, what you think is usually done is not easily sold, what you think is difficult to make may be easily sold. So, like somebody said on the stock market, what looks cheap as a stock is not safe, and what look safe is not always cheap.

So, there is a paradox so in lives we have paradoxes, and similarly in design thinking in product development we have got a several paradoxes.

(Refer Slide Time: 22:43)

So, now we are coming to empathetic phase is over we are coming to identification. So, what do we do in ideation? We have studied the customer needs, we will convert into measurable specifications. We look at idealistic desires, we come into realistic benchmarks. There are rigid definitions we come into dynamic prescriptions because, we should be able to make sure this endures over a period of time.

Then we have got pure creativity which is required by the customer, we use it for applied creativity. Then there is segmented thinking, we get into system thinking and architecture. Ease of development and manufacture is there in an ideation but when you come to design thinking, you get to ease of use and service, and most importantly, you design it for the product when you do normal design development but when you do ideation through design thinking you have to design it for the environment. So, it requires significant brain storming within the team as well as with the customers and vendors.

(Refer Slide Time: 23:53)
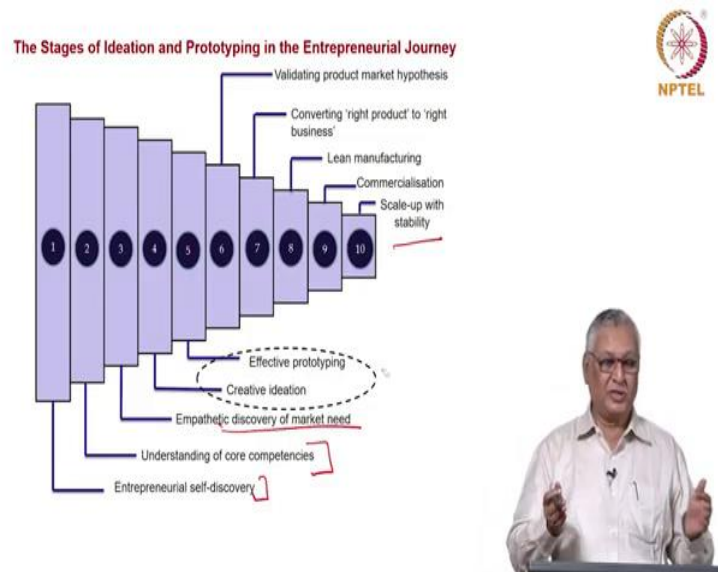
So again, let us look at the whole entrepreneurial journey, we have this entrepreneurial discovery, we discussed about it in the previous sessions. We also talked about the core competencies, in this session we talked about the consumer need can be done in an empathetic manner and we are focussing on creative ideation and the effective prototyping.

Thereafter in the future sessions we will go into scale-up with stability, we will look at commercialisation, how do we do the lean manufacturing? How do we convert the right product into a right business idea? How do we validate the product market hypothesis? These are all the other things but, let us focus in the rest of the session on effective prototyping and creative ideation.

So, we really looked at several stages about ten stages of entrepreneurial journey from self-discovery to putting into the market and our focus in this session is on prototyping and ideation.

Now, let us go into little bit of philosophy of ideation. Ideation combines the conscious and the unconscious mind, converts abstract to reality. There is a conscious mind which says that, "I want this", but there is also an unconscious mind which is really not telling the designer or even the customer himself what he or she wants.

So, ideation is a really a challenge of combining the conscious and unconscious inputs which we have got through the empathetic phase. This ideation can be individualistic or a group endeavour, obviously, the later will be more impactful and there are many approaches to ideation. First, basic approach is to observe, record, analyse, re-invent. That is the fundamental requirement for ideation.

The second stage is exchange, challenge, improve, synergise. This observe, record, analyse, re-invent typically happens in the individual level. If there are five people who are participating in this ideation and empathising phase, they will observe it in the same issue, same product in different formats and they will record. And then they will exchange, they will challenge themselves, they will improve and synergies and once they do that, they will present it to their hierarchy or to the rest of the team saying that, yes this is what we have discovered.

And advocate a particular solution and when you advocate a particular solution and somebody says that, yes, it is valid or invalid. Finally, you come to the synthesise phase. So, ideation is effective when it is a cross functional, when it is customer centric and it is willing to be experimental. If ideation is on bitten lines then it is not likely to be effective. Therefore, creative ideation is the heart and soul of entrepreneurship.
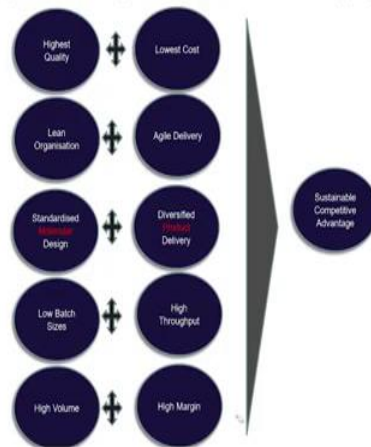
Now, through ideation prototyping, what are the goals which we should have? Obviously, as I said managing paradoxes is the most important thing. You may be a start-up with very meagre resources, but still you can aim for the highest quality and the lowest cost. You can aim for lean organisation but you should have agile delivery capabilities, you should have standard design and diversified delivery, then you should have low batch sizes high throughput and high-volume high margin. So, when you are able to combine these paradoxes into a way of doing business, then you will get into sustainable competitive advantage.