Entrepreneurship
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Lecture 8
Ideation and Prototyping Part – 1

Hi friends, welcome to the course on Entrepreneurship. We are into the third module and this module covers two important topics, Ideation and Prototyping. Before we delve into this, two aspects little deeper, let us once again look at Entrepreneurship and start-ups. The reason is when we are talking about ideation and prototype, we are thinking of an abstract thing called an idea, we are also thinking of a reality a physical reality called prototype.

Now, what is bridging these two? Obviously, technology, engineering, engineering is bridging Ideation and Prototyping, but the way technology and engineering works is little different in entrepreneurial firms completely entrepreneurial firms and completely start-up firms.

Therefore, let us look at the subtle differences between entrepreneurship and start-up before we go to prototyping before that ideation.

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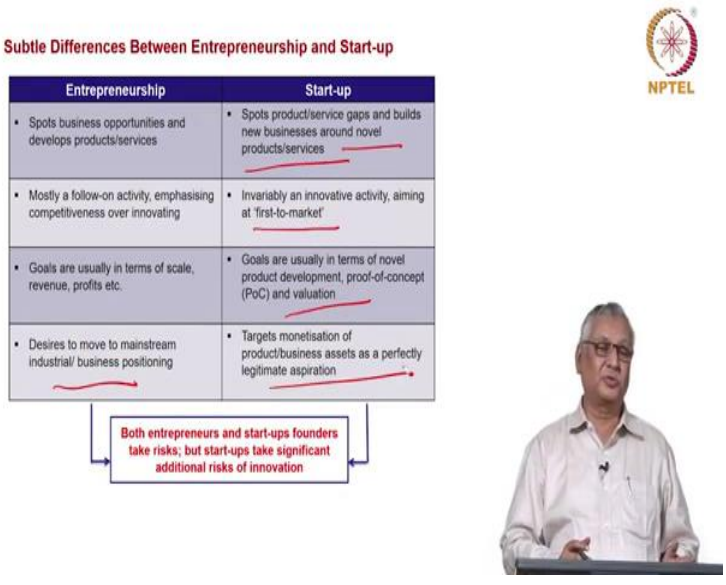

See, entrepreneurship is something of a movement, which looks at continuing business opportunities and takes them up as a new projects. So, in a way it is kind of follow on activity with little creativity, in the way you conduct your business. And the goals of an entrepreneurial firm are usually in terms of scale, revenue, profits etc. and the goal of a

typical entrepreneur is, how fast I can get into the mainstream industrial business? That is the goal.

On the other hand, the start-up looks at certain unserved needs or certain needs which could be served by new technologies. Therefore, it is a question of gap identification around novel products and services and invariably and a start-up is an innovative activity. It looks at product innovation or process innovation and looks at being first to market.

As I said in my earlier class also, an entrepreneurial firm can flourish without being "first-to-market", they can be more cost efficient, they can have a more creative business model, they can deploy their resources more productively and therefore achieve market share or they can simply catch it to the expanding market of an emerging country like India and then become entrepreneurial in whichever field they are working.

On the other hand, the start-up firm is definitely an innovative activity doing something for the first time, and the goals as oppose to mainstream entrepreneurial activity are in terms of proving the concept, converting an idea from abstract concept to a real physical activity, and another goal is not merely revenue, how do I get my firm valued? So, the market valuation or valuation by the equity investors of the firm, is a very important goal for the start-up firm. Whereas, for an entrepreneurial firm the valuation comes as a result of these scale, scope, the revenue performance, the profit performance etc.

And as far as the entrepreneurial firm is concerned, the intent is to stay in the business as long as one can and grow the business and become as large as one can. On the other hand, a start-up firm looks at even monetisation, that is once you developed a prototype successfully, you see the first commercialisation, you might like to do it as a perfectly legitimate operation, there is nothing wrong about that in start-up. Obviously, both entrepreneurial firm and start-up firm take risks because they start with lower level of resources.

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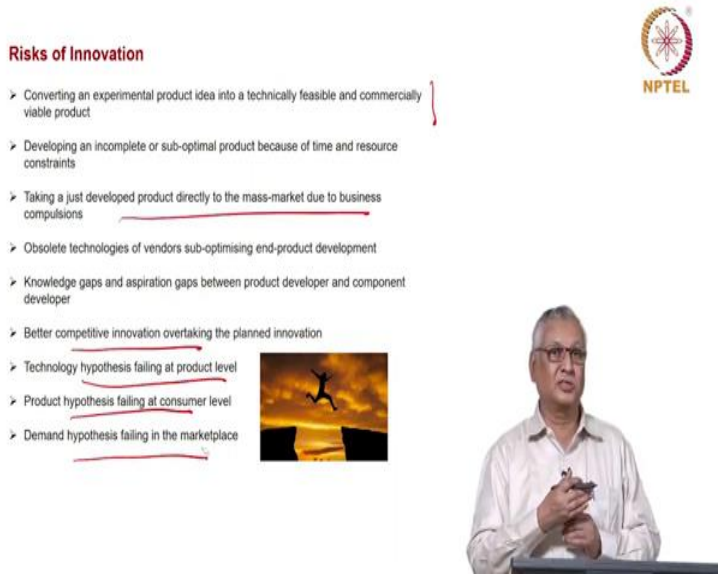

But the start-up firm take significant additional risks of innovation. Now, what are those risk of innovation? Innovation is something doing for the first time in world. So, we are converting an experimental thought into an experimental product idea and then converting again into an experimental commercialisation idea. Obviously, there is a risk involved whether this idea is technically feasible? Is this idea commercially viable? Secondly, the risk is that innovation typically takes long time and a start-up does not have that much time or resource to conduct the experimentation the way one would like to have.

Therefore, there is a likelihood always a risk that the product development could be sub-optimal; it could not be what somebody would like that to be. Then there is also another risk, that the innovator tends to like the product so much or simply the innovator does not have enough time to go through different types of testing which will come into later, that he would straight away put the product into the mass market.

Therefore, it could be rejected while the product is expected to be tested in phases and therefore improved upon once you reach a product directly to the mass market, there is a great risk of failure. The other issue is that the start-up founders usually deal in sunrise technology, they do it for the first time, technically compatible stakeholders are there in the ecosystem.

Therefore, the vendors who support the start-up with new technology are likely to be lagging behind. Therefore, there is a technological mismatch between the core technology of the start-up and the technical components supplied by various other vendors. Therefore, the ultimate product is instead of being a high-tech hybrid, it could end up being a compromised.

Then obviously, there are some knowledge gaps between the founders, between the product developers, the component makers. On the other hand, there is also this threat or the risk that, there are other people who are working on these kinds of projects and they are coming up with improved innovation, so this is competitive innovation. Again, looking at this, the entire start-up activity or the entrepreneurial activity is based on three hypotheses. First is the, technology hypothesis that if you do this kind of development, this is going to work well.

Like for example, you may say that I can get an analogue watch with 20 year battery life as a theoretical possibility, is it possible? Yes, it is possible if you are able to combine the kinetic movement along with the battery movement, but, typically the optimisations of these two cycles could fail in the product.

Therefore, the technology hypothesis could fail at the product level. The second, when you take the product to the consumer, at the consumer level if the product hypothesis could fail and thirdly, the demand hypothesis that if you do a product of this nature and prototype it and prove it, it will find its niche in the market place that could fail.

Therefore, there are enough number of risk in innovation that one should be very careful how we deploy innovation for taking these start-up firms and entrepreneurial firms going in forward.

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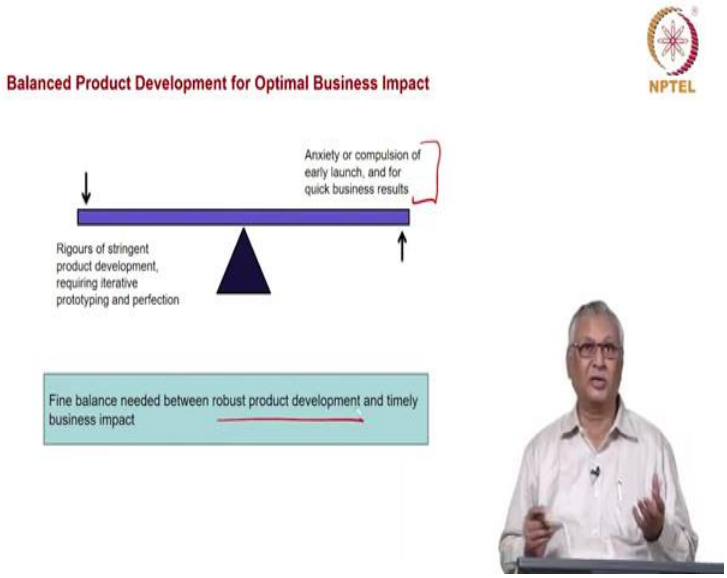

So, that is where this entire issue of ideation and prototyping comes. So, to summarize everything in a nutshell we need balance product development, we also need optimal business impact. How do these occur? You can have a very perfect product development by working

on it for several years and making sure that this product is the best one can produce, but, likely more people will come into the market likely the demand for that kind of technology itself may change.

Therefore, there is an issue in doing things for long time. Therefore, there is an anxiety or compulsion of early launch and for quick business is also, when we say quick business is reasonable 1 year, 2 year etc. On the other hand, there are these rigours of various stringent product development requiring iterative prototyping and perfection. So, the challenge is to establish the fine balance between robust product development and timely business impact.

Now, again these aspects are done when we go through a very structured phase of ideation and prototyping.

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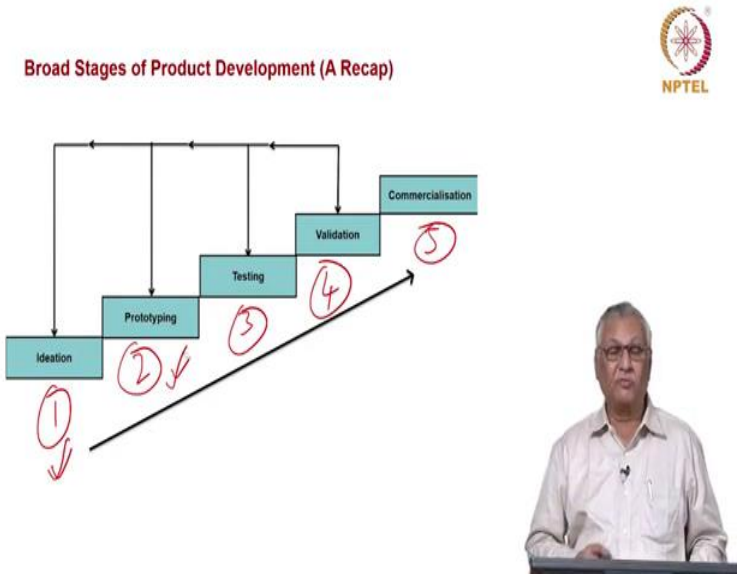

So, let us recall what we talked about as the broad stages of product development in entrepreneurial firms. First, we have ideation that is, understanding what the customer needs which he could not express but which we have discovered, which is the ideation phase. Second is Prototyping, third is testing, fourth is validation of this entire concept that if you get this product as we have defined, we are going to get some good demand hypothesis or good market hypothesis.

So, that is the validation phase and finally the fifth phase is, commercialisation. Now, in this module we are looking at item number 1, which is ideation and item number 2, prototyping. I would also like to say that as part of ideation, we also have one precursor phase which is

called empathization. Empathization is a way of getting the ideas to fruition by understanding the customer needs.

I have not shown it as a separate phase but there is a body of a knowledge called design thinking which is pioneered by Stanford which says that, empathising is a precursor to ideation and should be treated as one of its own in this whole development recycle.

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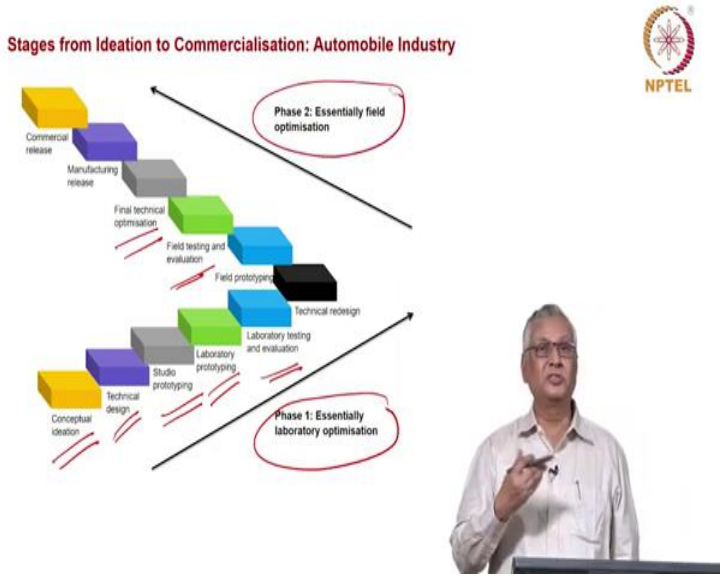

So, how does this ideation to commercialisation, how does it work? How does the process flow work? I am going to give you 3-4 examples, let us look at automobile industry. First, we will have a conceptual ideation, the conceptual ideation could be that, yes you should have completely dominant front grill, you should have a fog lamps and tail lamps with LED systems, you should have GPS, you should have a fluidic design, various other kinds of conceptual designs will be there and you must may also be thinking that you must enlarge the boot space, you should minimise the bonnet space things like that.

So, once you have you will get conceptual ideation. Then you try to fit in the wheel base over hang where over hang parameters, the height etc. this is the technical design phase. Once you get these two done, typically an automobile manufacturer or the design department of the automobile manufacture does some clay modelling, which is called studio prototyping, with hands even in this time people would like to feel the contours, feel the shape, feel the aerodynamic drag etc. and they develop a model of the car or the automobile you do. Once you do that you get into the laboratory prototyping.

At the laboratory prototype stage, you also do the testing and evaluation. For example, you can subject it to the noise test, how does the engine rev and what kind of noise it produces. You can perform a crash test; you can perform an acceleration test. So, these are all possible in a laboratory testing and evaluation. Once you do that, you have got enough inputs to do a technical redesign which is a kind of optimisation of the design, once you do that you will go into the field.

Now, this field could be your own field, where you have a huge test track including a torture track, which simulates the road conditions in a very extreme compressed cycle. Once you do that, you have this testing and evaluation results and you get into the final technical optimisation. At that point of time, the product is ready for commercial manufacturing release which is then followed by commercial release. Why are we distinguishing between manufacturing release and commercial release? Because even though the product has been developed in the laboratory, optimised in the field and redeveloped.

There is always a possibility that the components may not be turned out the way you want because the manufacturing infrastructure is set. It is already there manufacturing a different type of product and you are kind of leveraging it to develop this new genre of products. So, these are the steps, so if you look at it, you have phase 1 which is essentially laboratory optimisation, you have phase 2 which is essentially field optimisation. So, this is as far as the automobile industry is concerned.

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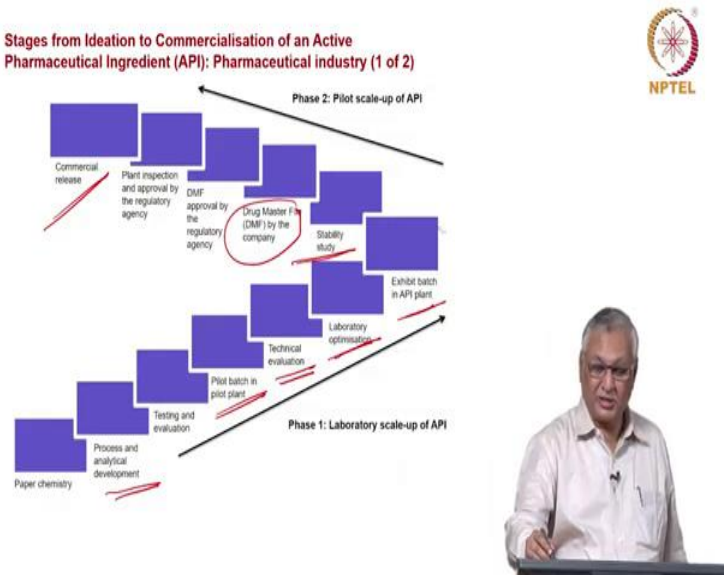

Let us look at another example, this example is one of the bulk drug or the active pharmaceutical ingredient. When you look at a formulation, that is the medicine which we

take, a pill, the capsule it has got inside the basic drug that is called the active pharmaceutical ingredient and then it is packaged or it is filled in or it is compressed into a tablet, capsule or even a liquid dosage form, that is called formulation. The development cycle for both these kinds of things are similar but are also different.

But, let us look at this. When you look at an active pharmaceutical ingredient, you do a paper chemistry saying that, this molecule has got this synthetic process and why do we do that? Because we want to do it in a way, it does not infringe on any of the patents which are available. So, for the same molecule with the same end structure, there are several roots which are possible, such roots should be patent non-infringing, such roots should be cost competitive, such roots should be compatible with the manufacturing infrastructure one you have.

And the most important thing in the pharmaceutical industry is to ensure that whatever you have developed is proven by analytical methods like HPLC's and mass spectra and several other sophisticated equipment. So, that the product which you are taking which is chemical is characterized to the fullest extent and its safety and purity are well established. So, this is called, process and analytical development. Once you do that, you do the testing and the revaluation and you do it in pilot batch in pilot plant. Why we are doing pilot batch in pilot plant?

This is very unique to the pharmaceutical industry because you cannot manufacture on a full scale a drug, unless it is approved. And you cannot take the risk of manufacturing the product on let us say 100 ton basis unless you know that it is getting to be approved, but at the same time the regulators that is the food and drug administration cannot approve it a drug unless they are sure that it meets the requirement.

So, there is this concept of pilot plant, that is you have a pilot plant which is let us say 1 by 100 of the full scale manufacturing plant, which means that as long as the experimental parameters are maintained, what you produced in the pilot plant is likely to be fulfilled in the final destination manufacturing plant.

So, once you do the pilot plant, then you do the technical evaluation much like what you do in automobile, then you do the laboratory optimisation? Then comes what we call exhibit batch, exhibit batch is something where you do it just as though it is a manufacture product, record everything batch manufacturing got how much solvent is going inside? How much

solvent is coming out? What are the nitrogen blanketing you are doing? And various other things.

Once you do this, you will get the product out and the product has to withstand this stability. A product can be stable in the normal room conditions for five years but product can be unstable also and it may require even cold chain or being in very protected conditions like a vaccine, like a biological molecule or like a probiotic, they require 2 to 8 degrees or some below 0 degrees.

So, stability study is very important, once this chemical entity is proved by this stability study, you prepare what you call a Drug Master File and that Drug Master File gets approved by the regulatory authority, then the plant gets inspected by the regulatory authority.

And you are ready for the commercial release. There the manufacture release and commercial release are combined because the regulatory has actually inspected the plant and has cleared based on the Drug Master File, which you have submitted. So, if you see the automobile example, and you see this Active Pharmaceutical Ingredient example, you find that the process is more or less similar, but there is lot of emphasis here on traceability.

In automobile industry, as long as the final product meets the requirement, you are not really concerned as to how the component has been produced, what was the parameters at which the component has been produced. Whereas here, you would like to characterize all the deviations, therefore the traceability the computer system validation, the data integrity they become very important.

Now, a start-up can do these kinds of products very well because they are of pilot scale, and once you do at the exhibit batch level you have already established the product. And probably you can market that concept to global big pharma.

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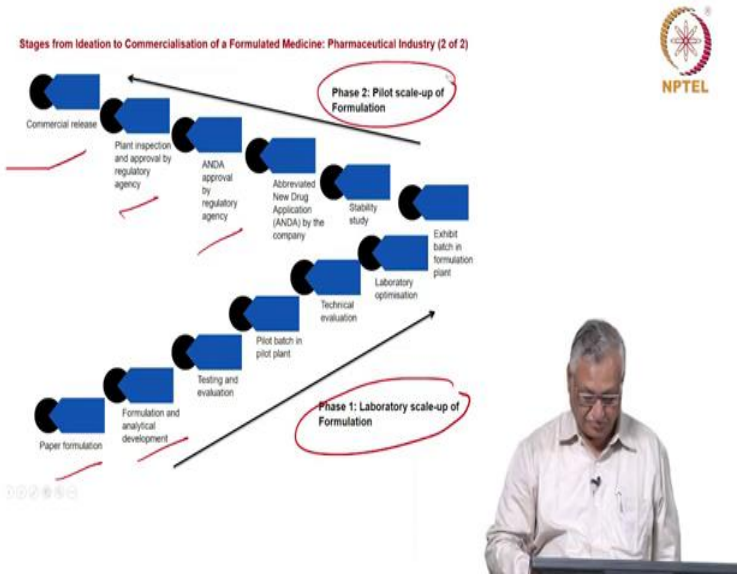

Now, when you look at the finished dosage form, what does happen? Similar to the paper chemistry we have paper formulation here. Similar to the process and analytical research we have a formulation analytical development, then you do the testing and evaluation pilot batch, technical evaluation.

The only difference here is that, instead of calling it Drug Master File, we call it abbreviated New Drug Application, we call it Abbreviated New Drug Application because a new drug is always approved as a new drug application with lot of clinical data. Whereas, when you are introducing a generic product, we just do a bioequivalence study to prove that in blood stream, it goes in the same way as the original medicine, and that is why it is called Abbreviated New Drug and you go through the same kind of process and get a commercial release. Again, if you look at it, there are 2 phases, laboratory scale-up of formulation and pilot scale-up of formulation.

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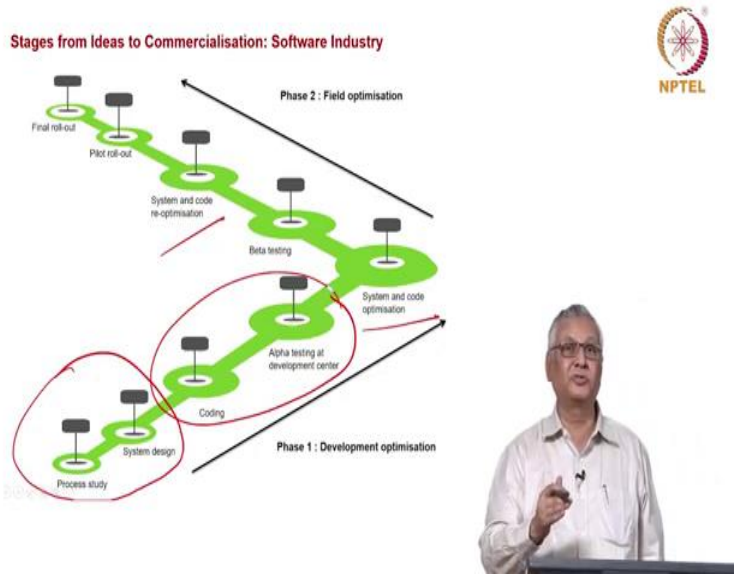

Now, let us look at the software industry, again there are 2 phases, one is Development optimisation, the second is the Field optimisation. In the development optimisation, you are looking at the overall business processes adopted by the company then you develop the system architecture, then you get into the coding, then you do the alpha testing at the development centre. Once you do that, you are near the System and code optimisation, after that you give it to the users they do it in their field, they do the beta testing.

Again, there will be feedback look and you do the system and code re-optimisation you pilot roll-out. So, when you look at it, what is very evident here? There is an early phase where you do this process study and system design, the ideation phase. Then there is also a prototyping phase, the product would be physical like an automobile or bulk drug or a formulation. It could be a kind of a service-oriented system like software but still there is an ideation phase, there is a prototyping phase. And as we can see the prototyping phase itself goes through successive iterations.

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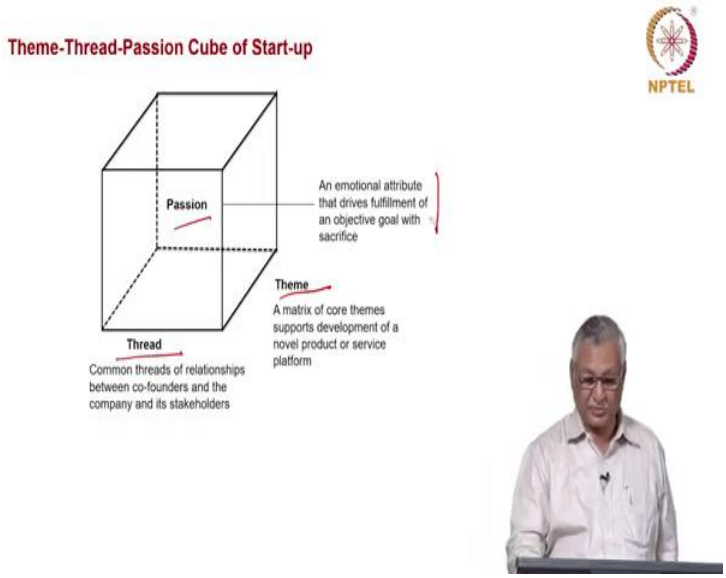

Now, how does this whole thing happen? How do people develop new products? There you can look at it in a 3-way grid. The first dimension of the grid is the theme which is this. What is the theme of this product? On under what preposition are we making this product and under what conditions we believe the customer will approve this.

Second is the, strength of our company, the strength of the team to make it. So, what are the common threads, which we have to make this theme work, and thirdly the passion what is our emotional attribute by which we can contribute to the development?

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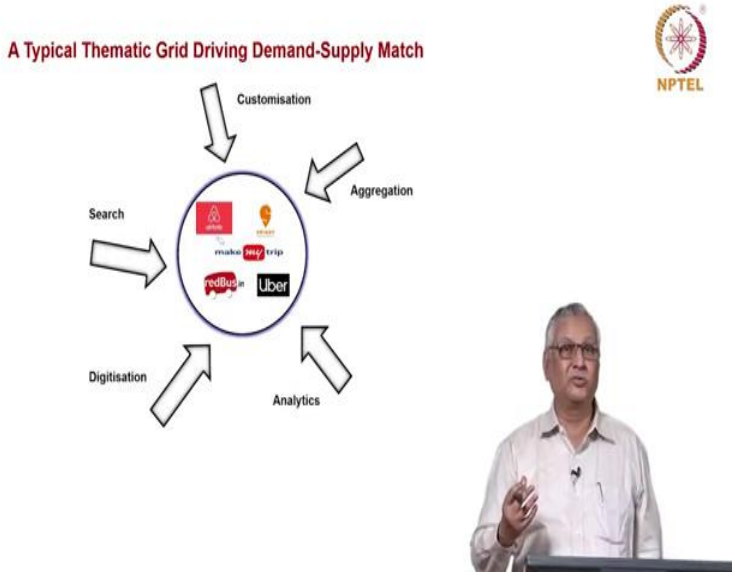

So, to give little more thing you look at thematic grid. The thematic grid could be anything, you can say that it is Customisation, it could be Aggregation, it could be Analytics, it could

be Digitisation, it could be Search. So, when you look at a company like a redbus.in what did they do? Like Uber they aggregated, when you look at make-my-trip they are doing customisation, the customisation of the cheapest possible fare. When you look at Airbnb, they are releasing the rooms which are lying idle and then they are providing to the guest who want have a different hotels space.

And how does it happen? It happens through a combination of search and analytics. So, there is a thematic grid which drives the demand supply match in several start-ups.

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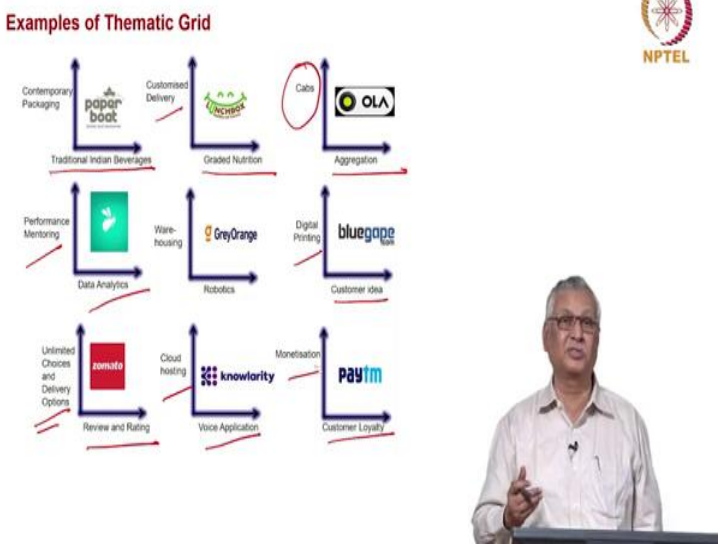

I have given you here 9 start-ups which have that thematic grid, everybody would have seen paper boat, it is the new kind of flexible beverage format that has been introduced and you can see it quite popularly in the airplanes. So, what it does it has two ways of making it differentiated, one it does the traditional Indian beverage and it does contemporary packaging which is different.

So, they have been able to get thematic grid which is quite different from juice given in that tetra pack container. You look at lunch box, they have decided at first, to give school children the best possible nutritious food. So, Graded Nutrition for different kinds of school going children with customised delivery, so there is a thematic matrix here. Then we look at Ola or Uber, we have got aggregation of demand and supply and we have got the delivery vehicle which is called the Cab. Then we look at Bee, report Bee then you have Data Analytics you got performance mentoring.

GreyOrange, it applies robotics to ware housing operation. Bluegape whatever customer has got in terms of developing an idea into a theme, it does digital printing. So, from combining the customer idea with digital printing capabilities, the company has been set up. Zomato, it started with a review of hotel business, food business, rating business, therefore they have developed a huge analytical base, huge restaurant contacts and then they added on that choices and delivery options. Therefore, a new food delivery business has been established.

Similarly, voice application and cloud hosting, customer loyalty and monetisation they have supported two other companies. So, you look at any company which has coming to being in a new fashion, you will find that there are two dimensions of thematic grid. So, when you say that, I want to introduce a new smart watch, obviously you can follow a Fitbit versa or Apple watch, but on the other hand you say that I will have this style of an analogue watch as the x-axis and the digital capability of an Apple watch as the y-axis.

Then you are doing a smart analogue watch, you are not doing a digital watch you are doing a smart analogue watch. So, like that you can always come up with a number of modifications to the product dimensions and come up with your own theme.

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Then we also spoke about common thread, to be able to do this thematic matrix, to do the thematic grid, the organisation or the founding team, they should have some competencies. These competencies if you look at only one competency it is like a thread, but if you intertwine those competencies and make them into three or four competencies rolled into one.

Like you see the threads getting into rope which is strong, you will find this same analogy working in this start-up also. So therefore, common threads which are there in many good start-ups, one is Innovation, the ability to think in an innovative way and create a new product. Second is, Acumen, acumen is the ability to spot something which others are not able to spot and also deliver that product in a more competitive way that is the acumen. The third one is the Experience or the landing curve, the more you do something the better you are at it.

So, you have been able to focus on, let us say highly optimised battery development as part of your course work or as part of research work, you have gained lot of core competence in that area, so that is the experience part. And fourth of course is education continuous learning and ability to continuously innovate. For example, when a digital watch is developed, the health care sector was not capable of analysing the blood sugar parameters based on this fact, but today that kind of technology is getting available, so this is possible through continuous education of whatever is happening.

So, we can say that one is the thread of knowledge and skill. Second is the thread of functionality and application end-use. The third is the thread of product, service, business and the fourth one or the first one actually is the thread of idea, innovation, experimentation and convergence. Now, when you add all these four threads, the company gets a very strong rope the strength of the common thread. So, we have this thematic matrix on one side we have got this common thread on the other side.

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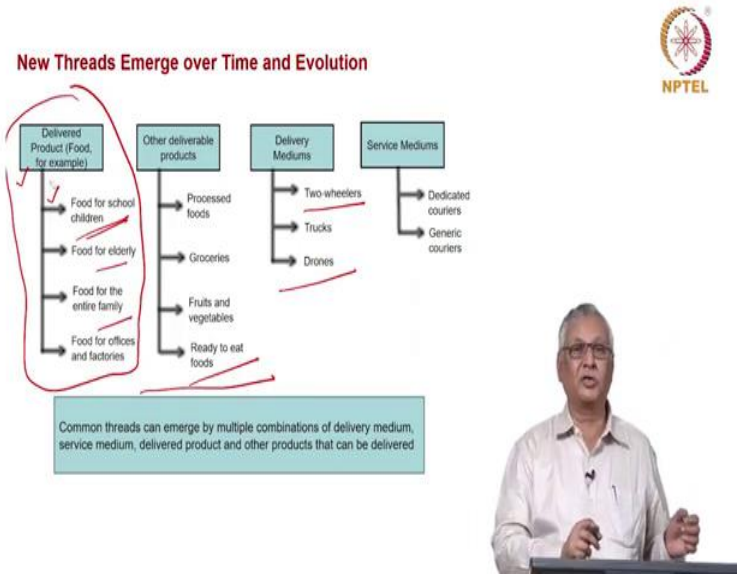

Now, these threads emerge over time and evolution. Let us take this lunch box itself, so what was the first iteration? It had got delivered food and it started with food for school children. Then, it can be expanded further you can provide food for elderly, then you can follow it food for entire family, then you can get into food for offices and factories. So, this is one vertical which you have been able to develop based on thematic matrix, initially started, upgraded nutrition versus customised delivery and then you have expanded your market segments.

Now, that you have done one item called food, you can have other deliverable products, it could be processed food, it could be groceries, it could be fruits and vegetables, it could be ready to eat foods. So, what happened, the thematic matrix have been expanded, the common threads have been strengthened and you have been using certain delivery mediums originally probably you had used the two-wheelers, but when you go into these kinds of complete bouquet of products and services then you get into the trucks, you may get into drones.

So, how do you, once you do that, what is the service medium? I can do it through courier services, I can have my own dedicated counters. So, when you see from this combination which the start-up had initially, it is moving over a period of time through evolution of the thematic matrix, it is moving through the evolution and the strengthening of the common threads to get into a completely new business conglomerate kind of situation.

So, you have to keep in mind therefore that by combining this specific component of your activity be it the product, be it the process, be it the delivery mechanism, you are able to create new businesses of thematic matrix, new businesses of common threads. So, the journey is iterative it is continuously evolving situation.