Entrepreneurship
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Lecture 23
Technological Innovation and Entrepreneurship Part 3

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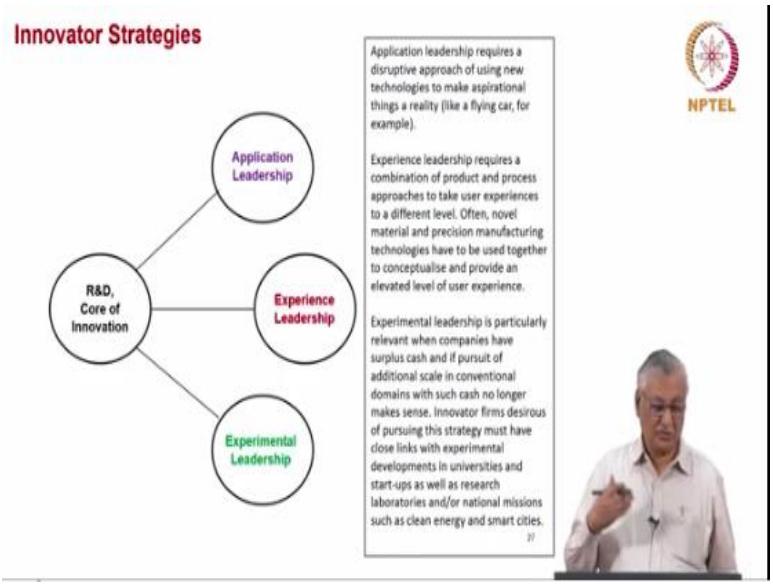

Now let us look at innovators can use their R and D competencies in 3 different ways. One, they can achieve leadership in the applications they are steeped in. Second, they can provide leadership in the experiences which customers are used to and third they can do a number of experiments to explore how things could be better if only a new way of doing things is done. So, innovation helps in dramatic improvements in applications.

Helps in dramatic improvements in experience, it could lead to dramatic disruptions and transformations through experimentation. Now application leadership requires a kind of approach which uses new technologies to make aspirational things reality. For example, car is a on road mobility vehicle, but if you were to get a flying car it could probably overcome the traffic logjams which we experience.

So, it is an aspiration, that aspiration can be brought into a normal mobility application by thinking of technologies which are borrowed or taken from aerospace technology, whereas, experience leadership requires a combination of different product and process approaches to take user experiences to a different level. For example, when you have a product with a camera which you are using and the camera is able to play back the sound recordings, the

nature responses when you are filming something you actually move into an immersive experience that happens. Similarly, augmented reality and virtual reality they take experience to a different level. Therefore, when you merge different technologies to develop a particular product or service that is experience leadership. The newer type of graphics where we use different graphics to recreate the human or natural living beings in terms of animation that is different types of experience leadership that is being provided to movie making.

Then the experimental leadership is kind of white space research, clean board you have no fixed agenda, but you keep on dreaming, you keep on experimenting and you come up with something which is really path breaking. For example, zero waste technology that no one should waste anything, it is a desire how do you do that.

You got experiment with several ways of achieving this or you think of a circular economy in a city, how do I achieve circular economy where there is no pollution of any kind, there is minimal wastage of products from manufacturing to customer usage, maximum reuse of products, maximum recycling of products how do I do so. So, you got experiments with different ways of doing things because there are multiple ways of doing this.

They are multiple industries which are interconnected in this activity. So, when you look at innovation as your prime startup vehicle the questions to ask, Am I trying to provide new technologies for achieving new aspirations? Am I trying to merge several technologies to take experience to a new level? Or I am going to dabble in the unknown and find out how newer technologies can bring forth something which was not considered possible until now.

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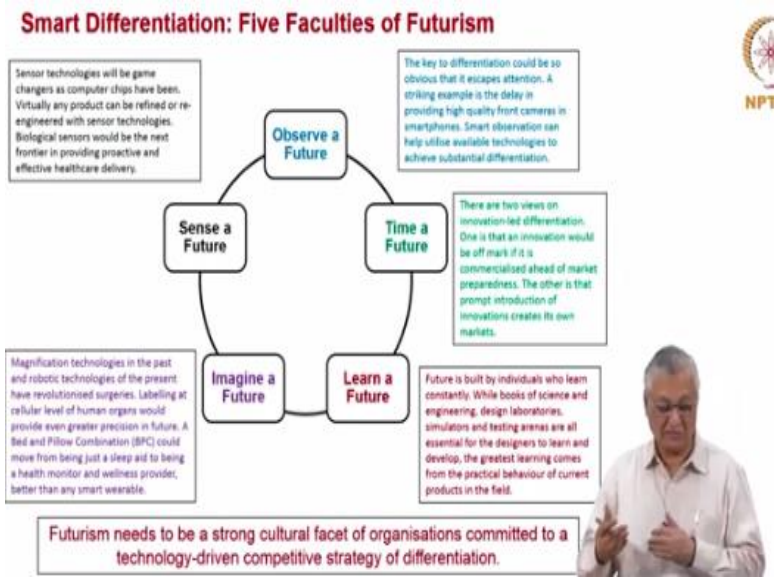

Then we have differentiation there are several faculties of futurism which comes with a keen sense of observation, timing, learning about the future, imagining the future, sensing a future. When you do these things, you are in a position to differentiate. For example, you can use sensor technologies to sense how you are going to walk or how you are going to sit. So that is going to be a kind of device which will have senior citizens to mend their life in a more safe, more productive way. So, sensor technologies will be a game changer.

Similarly, you can have differentiation by saying, how future trends are going to be in terms of customer usage. When the smart devices were made, they were made to record pictures like normal cameras, but then the whole idea of taking your own picture through your own phone came in that is how the selfie revolution came and therefore the question of putting equally powerful front camera came into being.

Now we may have situation where the front cameras are more powerful than the rear camera in not too distant future. This has so far not come into the high quality DSLR professional service cameras which are still used for recording the outside panorama, but changes could come there as well. Then how do I time when I would put this market, should technology be ahead of the market or should we allow technology to reach up to the market. How does it function most effectively?

Then how do we learn about the future? We learn about the future when we constantly look at things which are happening. You may say that counting steps and putting into a smart watches one step of developing a product, but what else is happening in the human healthcare

diagnosis wellness space and how do I incorporate all of those development in my smart wearable that is learning about the future.

And finally imagining a future, that is imagining how an eye functions and therefore develop an artificial eye. Imagining how a hand and the brain work together to conduct a medical operation and therefore create a robot which does robotic surgery that is another way of imagining the future. So, we talked about the flying cars. So, when we look at the future from 4, 5 different ways basically 5 ways of looking at our sensory aspects. Observation, timing, learning, imagining and sensing then you will find that futurism has a strong play in how startup start their activity and how they mould their technologies.

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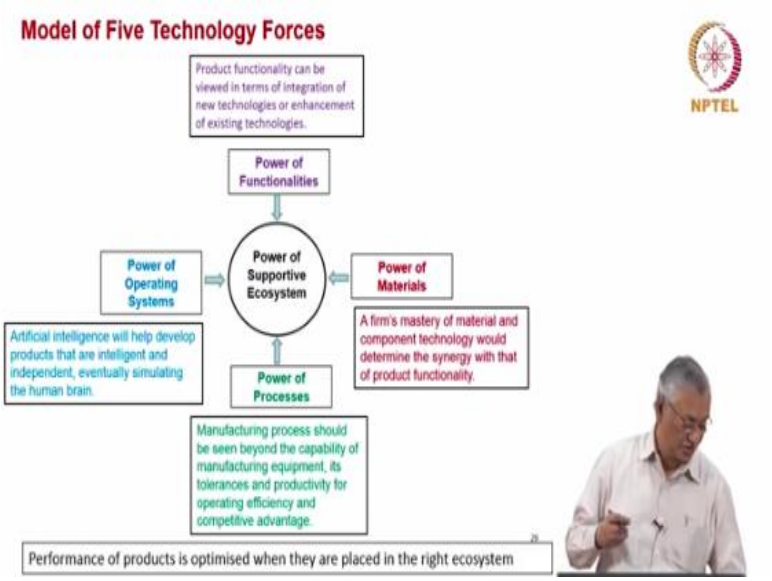

Now when we look at technology, we can use a Porters model for theory of competitive strategy to mimic a power of technological ecosystem. Every technology has got a functional power. Every product is designed to develop a particular functionality that is the functionality of the product. Then there is a power of material, if you use a LED battery there is a particular level of power in the battery.

If you use a lithium-ion battery there is a particular level of power in the battery, if you use rare metals like cobalt and nickel there is a particular level of power in that lithium-ion battery that is the power of materials. Then you have got the technologies power of processes we talked about how the recovery of rare materials can improve the manufacturing process, the cost competitiveness or product or the tolerances you get in manufacturing a chip, how it could pack more power.

Or how you could get durability and wearability built into the materials that could be the power of process then the operating system itself, how the component, the assembly, the original equipment how they are all merged to meet customer demand, the operating system whether you do it through programming, through artificial intelligence, machine learning that is the technological force.

When we do all these four forces and combine with the power of the supportive ecosystem you have a complete 5 technology forces situation and each of these forces is a potent area for a startup to start it project.

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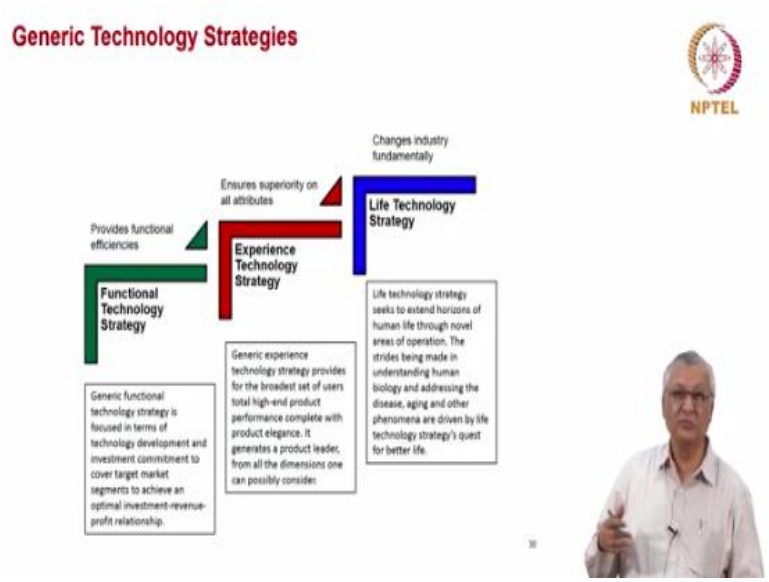

Now we are looking at the way you do innovation, looking at the way you do differentiation, looking at the way the technological powers operate in a particular ecosystem. We have 3 types of strategies. One is a functional technology strategy which says that you will improve the product functionality to much higher levels which is an optimum investment revenue and profit relationship.

Second you take the experience of using the product to a different level that is a experience technology strategy and third is completely game changing the way you conduct your life a completely circular economy for example is the life technology strategy that is your home is completely self-reliant, self-sufficient in terms of your energy needs in terms of its pollution damage, in terms of usage patterns of various inputs like water or energy. And outputs like waste is there anything is a self-reliant system it is the life technology strategy, how do you operate and where do you operate and what kind of technologies we adopt.

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Another way you can do it that you can do the customized product design. We discussed that the markets are so heterogeneous and so layered that we cannot use a traditional homogeneous market strategy or even a segmented market strategy you really need to customize for the masses. So how do you understand the personal needs, how do you measure and calibrate the individual diversities.

How do you do the business data analytics built into this and then how do you get flexible manufacturing and delivery systems and where does machine learning and artificial intelligence play a role. Now if you look at the readymade apparel industry which has grown substantially over the last few decades. Earlier if it has to be clocked, that is bought and tailored to individual needs this readymade apparel business has come in a big way.

Which provided the advantages of cost competitiveness, high quality, factory processes and also styling. So as a result of that industry took routes and led to many startups in the textile zones and also a big industrial houses in the organized area, but then all of these things suffer from the fact that you are fitting the person into the apparel rather then fitting the apparel on to the person.

So you have pre-specified sizes small, medium large, extra-large or double XL and we all have to adjust ourselves into apparel that is made available by the apparel ecosystem and if it does not suit you got to go back to your tailor and adjust a few things or just live with it. Now if you are able to design a system by which you move into a apparel shop and you are biometrically kind of sensed for all your body, shapes, contours and fitments.

And then that data is fed into the apparel making unit and then immediately it tailors the product for you and then shifts it back it is a great development that is a kind of centralized tailoring system, but it has its lead time, but what happens once you use the system is that while you are doing this here in Tamil Naidu, in Chennai quite possibly there could be hundreds of such people or thousands of such people having similar dimensions.

Having similar requirements coming from different parts of the nation. So if you have created a system by which all of this data is fed into a centralized data pool and then apparel is being made to match these requirements then obviously you are bringing the benefits of mass customization and as this data pool expands over a period of time the lead time to manufacture will be reduced, the perfection will be much more.

And then probably you will be in a position to send in advance products which meet a particular biometric system. So, when somebody comes in you do not have really decide whether it is XL or something else you do a kind of reality check, the person can be sized up and the apparel can be sized up and right apparel person fit can be made. So, this is a technological ecosystem which you are creating to ensure that there is best fit between the customer requirement and the product availability.

And these are the things which startups which innovators, which differentiators can do because they are not worried at this stage of development whether my product is leading to x amount of increase in my revenue. You are trying to solve a problem by creating a totally different technology, a totally different measurement system so that the customers are provided the best product possible.

And when the startup succeed in proving this customized apparel and diagnostic and manufacturing system then that becomes a viable product for a big apparel manufacturing company to acquire and that is how the value gets generated.

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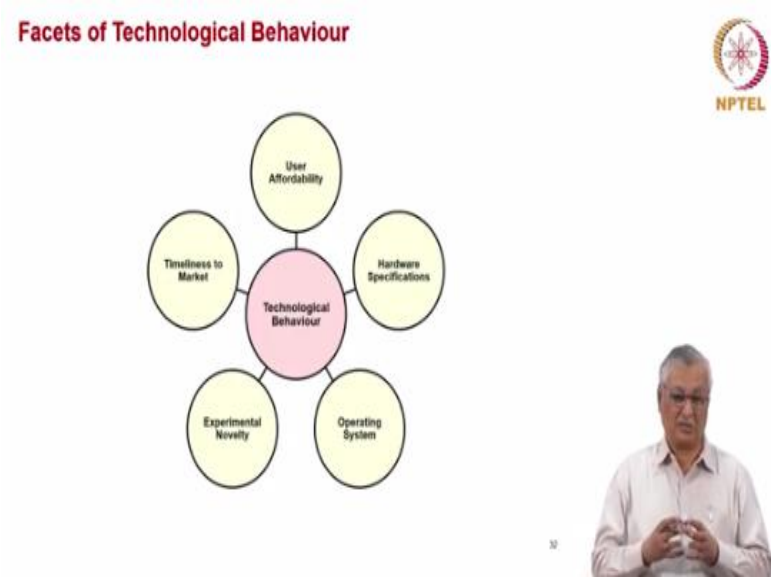

So, when we look at the technologies, we think that it is a kind of impersonal, a kind of technical matter, but there is also a behavioral pattern in the technological dimensioning. When we use technology, we have to see what does it require? How does the technology behave in the normal place? One, it should behave so nicely and softly that it provides user affordability.

It should be empathetic to the users of financial requirements, it should be understanding of the hardware requirements which does not require somebody else to invest huge sums of money to be able to develop your product, you should be able to have a operating system which is easy, which is by the same token very sophisticated, you should have novelty to attract people and you should be able to come to the market at the right time. So, all these 5 ingredients become a holistic technological behavior on the part of the startup which is extremely important for the startup to make its mark in the commercial space.

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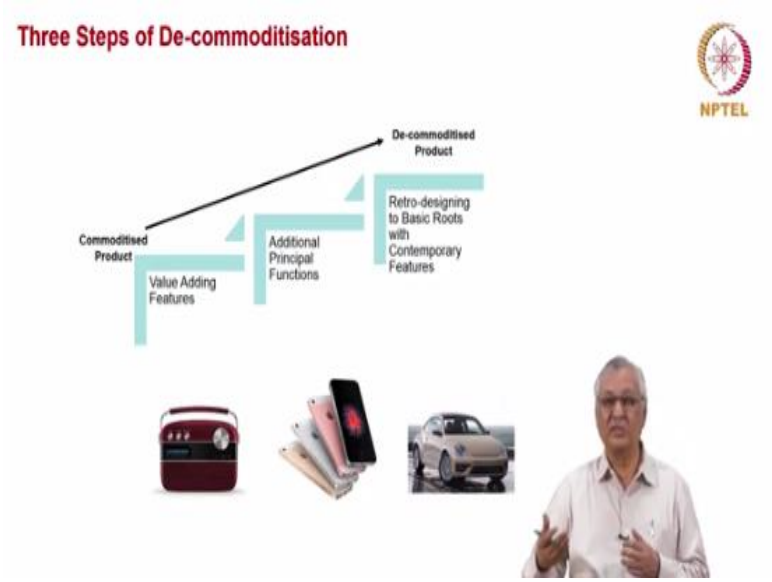

We talked about innovation, we talked about differentiation, but does followership has any role in startups? Yes, it has a role because all products gets commoditized at one point of time even if the technology of making steel is very sophisticated steel itself is a commoditized product, so how do you de-commoditize a product? You de-commoditize a product by adding more value to the product.

Like bronze steel you make it into steel which is more useful for automobile products that is one way of de-commoditizing or you create a steel furniture, steel doors so that you add value into the product and you do not see steel you see a readily usable product therefore you have de-commoditized product. That is possible in certain industries, in certain spaces, but what happens in product those configuration does not change.

The radio is a radio, it cannot change. So how do you de-commoditize? There are 3 ways you can do. One you add value adding features, second you bring in additional principle functions or you retro design with the basic roots remaining the same and bringing in contemporary features. So, I have given 3 examples here. One is the caravan radio which is a radio, but it brought in certain value added features like preloaded music.

It has retained the retro look, but it also has given certain selection processes for songs and systems so that is a kind of value adding system. The other is bring additional principle functions like bringing in better way of judging your maps navigating, your operating system, your search assistant, your camera functions more functions are added into the same kind of device.

So that what has been de-commoditize at one level again become more innovative at another level. The other is something like Beetle which retains its basic roots for over a century, but has got the highest power engine today, has got the more sophisticated GPS and navigation system, automatic transmission system so outside the same, but inside completely different.

So, you make a retro-looking product absolutely futuristic that is possible. So, when you do this a commoditized product goes into a de-commoditize zone and how de-commoditize it becomes depends upon the kind of strategies you have use for doing this. Why this de-commoditization is important because even when you are doing a modern product as a startup it is quite possibly that the technological changes are so eminent or so actually happening that the product is little obsolete by the time it enters the market.

So, you should have the ability to retain the basic roots of the product, but also bring in newer technological insights into how this product is finally offered in the market place.

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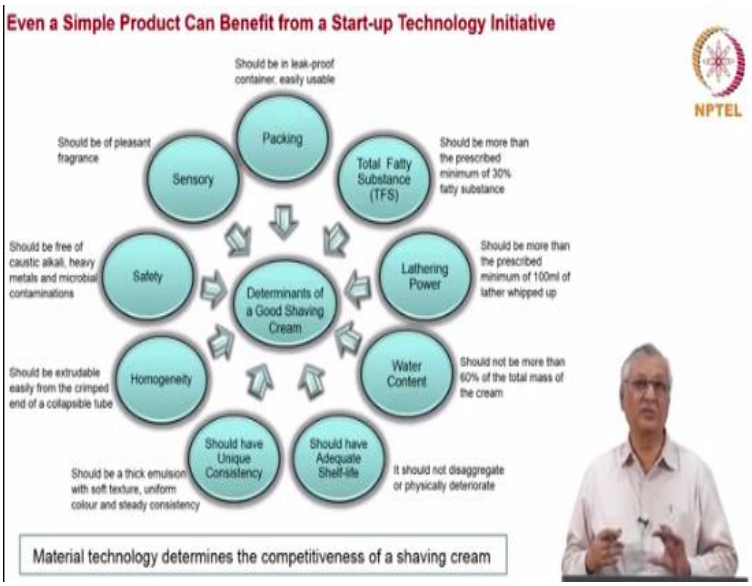

Now it is not that startups works only in a particular area, a startup can function in any area. So here I have got a very simple example of shaving a cream. Now a shaving cream looks one of the simplest products where you workup some lather with a brush and use it as a preparation for skin before the face before use the razor to your skin, but then if you really look at there could be several aspects.

Where a startup can contribute to the strength of the product. One it can balance the total fatty substance which is used in the shaving cream, it can improve the lathering power, it can make

do with lower water content or probably use the previous water content for the next round of shaving in water scare areas, it should have adequate shelf life. It should not dry or crack too readily.

It should have unique consistency whether it is at the top of the layer or the bottom of the layers it should have the unique consistency, homogeneity should be there, it should be safe, free of microbial contamination, it should resist microbes entering into the system, it should be pleasant, it should be sensorily very interesting and attractive and it should be in an easy to pack model.

So, all of these things are areas where technology can play a role. Now material technology determines therefore the competitiveness of a shaving cream, materials and the basic shaving stick to the way it is you know manufactured, the way it is packed, the kind of additional ingredients which are put in, material technologies determine how a shaving cream can be a better shaving cream.

Now startup can revitalize this product it could be an evolutionary innovation as we discussed earlier, but nevertheless is an innovation which can change the shape of the shaving cream industry. Similarly, when we talk about yoga-bar as a very nutrient bar as opposed to the other sugar laden creamy bars. You are trying to bring in technology to shakeup a market without disrupting the existing product market configuration.

You are creating a new segment or transferring a segment which is hooked on to a particular type of products into a new kind of products.

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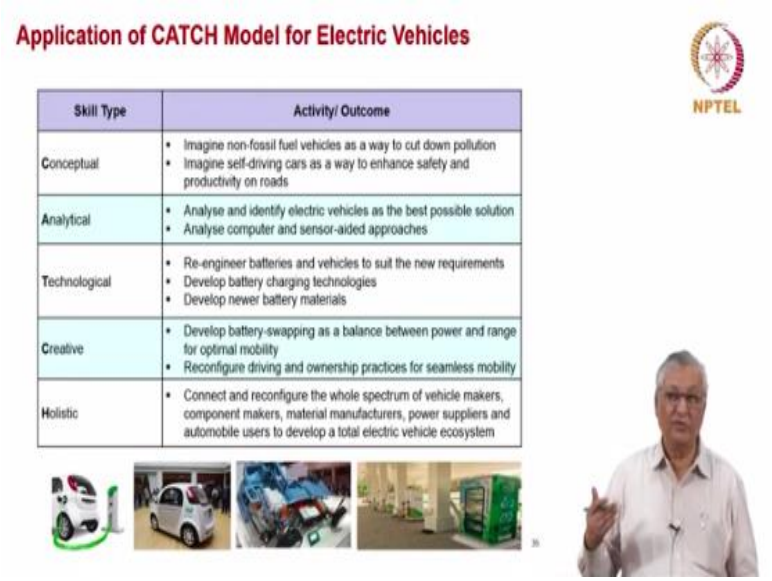

Now at present what is called a CATCH Model? For new products, you should be conceptually clear why I am doing this, you should be very analytical, how this can be done and you should be technologically focused on what kind of technology can deliver this, you should be very creative in delivering the product to the customer and finally you should be holistic on how this entire product is done.

So, if you look at electric vehicles if you are a startup which is doing the electric vehicles. The first is conceptual clarity saying that, yes I would like to solve the society's problem by eliminating the need for fossil fuels. I am also committed to the society by the determination to eliminate the accidents on the roads by having safe autonomous driving. So, these are your concepts which are clear.

Then you come to analysis, how do I really do it? Is hydrogen the best non-fossil fuel? Fuel cell is the best non fossil fuel, CNG, should I go for all electric or a combination of this, so you do lot of analysis and say that this is my product Similarly, when we talk about autonomous what is the level of autonomy, is it level 0 or level 5 which is more important. That is with maximal driver assistance to zero driver assistance.

What is the kind of autonomous driving which I must have in the Indian situation? Then technological, how do I have the range, how do I have the swapping, how do I ensure that the existing fuel outlets are converted into swapping stations then be creative, how do I reconfigure the mobility parameters in the new system and holistic. What is the point in developing a new electric vehicle battery without understanding how the whole vehicle has to

be developed in to a new native electric vehicle. So, how do I have a holistic strategy for that if I cannot do everything how do I work with others players to make sure that the ultimate benefit or the new technology is provided.

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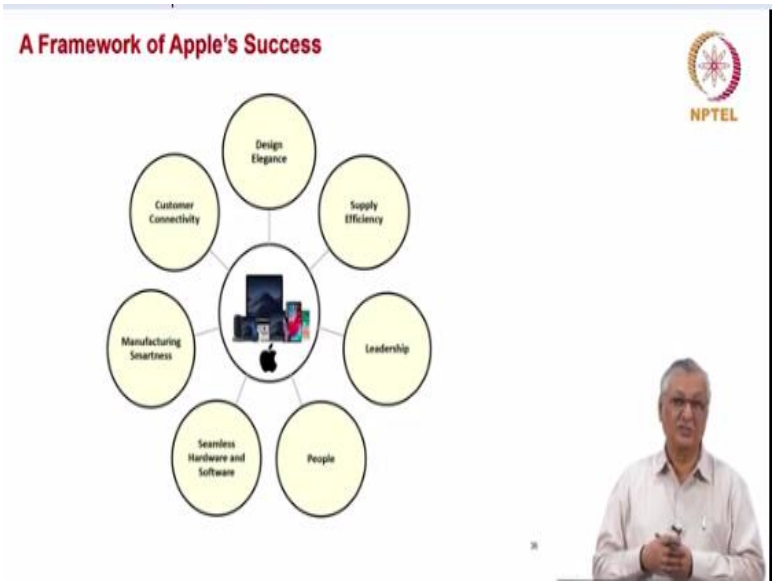

So, you look at Apple's success we are not saying that every startup is going to be Apple, but then do remember that companies which are giants today have been startups like Infosys has been startup of few founders led by Mr. Narayana Murthy. Apple has been a startup, Microsoft has been a startup, Facebook has been a startup. So, it is always important not to lose out the established companies in our fascination for doing something distinctive and differentiated as a startup.

Because there are certain lessons which come out the success of big companies which have had their entrepreneur roots. So the first element is design elegance whatever you do as a new product from a startup it should be elegant from the design aspects of it, it should be supplied in a very efficient manner which means that the entire supply chain from the materials to the final product delivery should be efficient.

Then there should be leadership which drives the entire ecosystem together then we should have top-class people who can contribute the best to the development of the product then the hardware and software must operate in a very seamless manner. Then the manufacturing smartness should be there and customer connectivity should be there. These ingredients will be there for a startup which is emulating Apple in terms of a new smart wearable.

It will be required for a startup which is converting or digitizing something which is as basic as let us say cleaning clothes through mass laundry activities. Now you should have design elegance in its stores, it should be able to attract people to come to its stores to deposit their clothes. You should also have design elegance in the sense that when it delivers the fully clean and pressed clothes they should be delivered in such a manner that they are not crimped, they are not spoiled so there is design elegance.

There should be supply efficiency how you collect your clothes, how you distribute it to your centralized or decentralized washing machine systems and how you get back, how do you really give it back and how do you have leadership across your value chain, what kind of people you have to represent the hygiene, the cleanliness factors you cannot have people who are unkempt or who are not really reflecting the credos of the organization to do this work.

Then you should have analytics software to understand your customer requirements, go through how you kind of stage gate your cleaning process and how you stick to your delivery timelines. Here manufacturing smartness is converted into cleaning smartness including how you minimize the use of water, how you minimize the use of detergents, yet have the highest possible cleaning efficiency and how do you connect with your customer.

So, whether it is a huge product technologically integrated product like Apple iPhones or clutch of products like that or a simple product like cleaning of utensils or cleaning of clothes in a corporate way, you have the same kind of requirements that determining the success.

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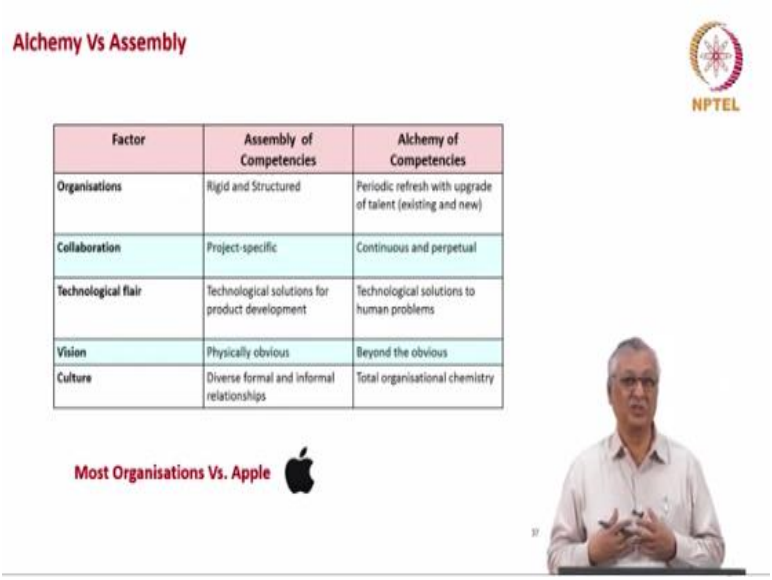

So which means that as a company you are successful when you are not an assembly of skills, you are successful when you are an alchemy of skills the same applies to startups and it actually it applies to a greater degree to startups because compared to larger organization which tend to be departmentalized, which tend to be very siloed. Startups are much more homogenous, they are multi-tasking one works for the other and together they work for the company.

And their goals therefore there is a greater alchemy which works in a startup, but assuming for a moment that we will just understand what is the difference between assembly of competencies and alchemy of competencies I would put five ways of looking at first the organization. In a assembly of competencies it tends to be rigid and structured and in an alchemy of competencies there is always a periodic refresh with upgrade of talent.

Second collaboration tends to be project specific whereas here it is a continuous and perpetual and it is also networked. Technological flair you tend to develop solutions for a particular product development requirement whereas here you develop technological solutions to solve a life problem or a human problem. The vision it is obviously physically measured in terms of let us say I do this kind of product.

How much more it will fetch in terms of revenues or I want to change the contours of this product can I have a new design, whereas in the case of startup it is beyond the obvious you feel that yes I am changing something, but it is very difficult to imagine how it would be like for example when Google developed its Google glass. It is beyond the obvious how a glass

would really do, several other functionalities rather than seeing the vision.

And the final one is culture. There are diverse formal and informal relationship in when you assemble competencies in an organization, but there is total organizational chemistry when you have alchemy of competencies. So again, to kind of compare ourselves with the real time check most organizations tend to be assembly of competencies whereas organization such as Apple would tend to be alchemy of competencies and obviously that is the way we need to move forward.

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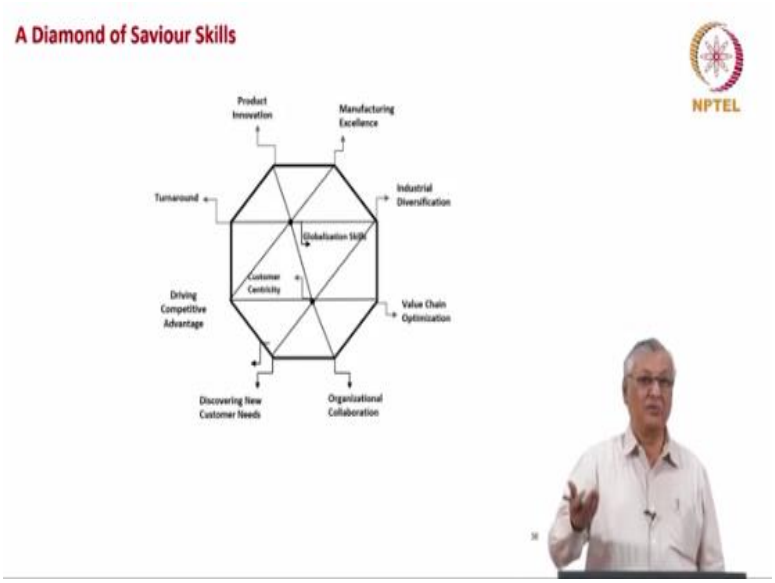

So, every organization require certain savior skills when I say savior skills there are also core competencies. If an organization has got that level of core competencies then the organization will be competitive. So, you can develop a startup which develops savior skills for an industry. How did small machine tool manufacturing companies come up? They came up mainly because they had the ability to judge that manufacturing excellence is going to be the future product competiveness or the business competitiveness.

Therefore, they created machine tools they design and create machine tools which could meet the flexible manufacturing norms of the emerging industrial milieu. So, manufacturing excellence was the savior skill for the industry which is based on manufacturing conversion and by developing machine tools several companies could come in entrepreneurially into the machine tool industry which was let us say was a monopoly of big company like HMT at one point of time.

Second savior skill is product innovation, so you need to always innovate. So, if you are able to let us say bring in better light sensing technology or better ability to photograph under low light areas or if you have a recording camera, but which adjust itself depending upon the movements of the person rather than stay in one place. So, it is a kind of automatic adjustment to the requirements of the person then you are innovating on the product that could be a savior skill for the recording company producers.

Then another savior skill how do I turn around the business and your business when a business model is defective obviously correcting that is a managerial competence or when the demand is going down then you really need to create new products. The third one obviously is when the product itself is commoditized. So how do I turnaround the commoditized product we discussed earlier, how you bring in the value adding products.

How you bring in the new functionalities or you keep the retro-look but bring in contemporary features, so how do you turn around. So, several of these savior skills which we have discussed here could be the savior skills for a startup. And there are companies which have originated in India, but have had international presence because the skill can save a market or restructure a market or create a market a market in new areas.

Companies which parking slot reservation systems they have globalized, all those startups, Oyo has globalized because of the room franchising or the room aggregating technology it has developed. So, the savior skills could be even globalization. So, when you combine the globalization skills of a startup with the globalization potential of the startup idea you have a worthy product or service which could be a successful startup in future.