Strategic Management for Competitive Advantage
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Lecture 51
Technology Management - II

Welcome to the course Strategic Management for Competitive Advantage. Continuing with the last lecture on technology management, today, we will be discussing part two of this technology management.

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The concepts that will be covered today are these - planning for technology, technology forecasting and identification of technology gaps. And most of these, these light things we have completed in the last session.

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So, to start with, we are planning for technology. So, for this planning for our technology, we will be going through very important questions like what routes for technology upgradation a company should undertake. So, there are two options that we have already discussed in the last class. One option is, the two routes are technology acquisition and the other is your in-house development.

Now, the questions come when are the acquisitions of technology preferred. When will you go for the technology acquisition, and when will you go for the in-house development? So, these are two crucial decisions you must make. So generally, when is the technology acquired? When there is a high gap in technology between your organisation and the technology, you are having now and the technology available in the market your competitors are having.

So, here is the high gap in technology. And when are a high gap in technology and you will also go for that when the in-house R&D is very costly because it requires your resource requirements, skill set requirement, and hiring experienced people and all, and R&D work is always time-consuming. So, when it is time-consuming and you do not have that much time or resources to wait for that time and resources to acquire those costly things, then you go for the in-house technology acquisitions.

Then if the technology is easily available on the market and has attractive terms, then why should you go for your in-house R&D? So, it is better to go for purchase from the market. Then sometimes it may be your customer's preference, customers want a particular

technology. So, to retain your market shares and all, you must prefer your customers' preference; you must go for technology acquisitions.

Then also the insistence on a backup guarantee from a collaborator. If your collaborator insists on this technology and all, you might have to go for the technology acquisition. These are some of the circumstances, but it is not limited; they may be beyond many other points, and reasons may be there. Now, can you answer this one?

Is in-house R&D essential for the acquisition of technology? In other words, if I say that you are going to acquire technology, do you need then in-house R&D? The answer is yes, you need it. Why? Because when you acquire or buy new technology, you have to absorb that technology in your system; you have to have it adept that technology and that can only be done with your R&D team's in-house R&D team.

And that technology may be, may have to be adopted in your circumstances. There may be some specific needs. You may have some specific needs. Those specific needs have to be accommodated; this has to be integrated. And also incremental improvement. After you take the technology, the technology should not be a static thing. It is the passage of time that you have to develop, incremental improve, you have to improve that technology.

So, that incremental improvement has to be done by your R&D team. So, they will resort to your specific needs, incremental improvement, continuous improvement, and upscaling. That technology requires upscaling. So, you must do the upscaling also. For these, you need in-house R&D. Furthermore; you must reduce your dependence on your that importer, and you must reduce them from your collaborators. Otherwise, what will happen?

You must pay them. That is a very costly thing. You must pay them to avail of their services. So, if you have your in-house R&D, they will reduce your dependence on imports, and they will reduce your dependence on the collaborators and all. So, that is why in-house R&D is essential, even if you go for technology acquisitions.

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The next question I will pour when is in is an in-house development of technology is preferred. We have seen when the buying or acquiring of technology is preferred under certain circumstances, but what are the circumstances that in-house development of technology is preferred? These are, when the technology gap is narrow, whatever you are having now in your organisation and the available technology in the market, the gap is narrow, it is better you do in-house development.

Then when the competition is not much, the market is also in the very nascent stage. So, you have that time to bridge that gap. So, if you prefer you should go for in-house development. So, because you have time, you do not have pressure to lose the market share, and you go for the in-house development. Then when the technology is not available in the market commercially, you do not have any other choice but to go for developing it.

For example, defence applications, space research, all sensitive things, that military application that I told you about is the defence application. Then nuclear, those items and all, those things are very sensitive, it is not available commercially on the market. So, you have to do that in-house. So, our DRDO, then BARC, Bhabha Atomic Research Center, then ISRO, they are doing it for India indigenously.

So, because of these, no country will part with these technologies and all. Then when the acquisition cost is very high, you better develop yourself. So, if you develop yourself and all something, you will see that the traders, the importers, the technology giants and all, they will

come to you for negotiations of giving that technology. You can see it in Oil and Field Services and all.

There, the big services companies, say Schlumberger, Halliburton, then your Weatherford, many are there. So, if a country does not have its own those services and they have developed, those countries, will offer those services at a much higher rate. Then if you have those in your country, you are partly meeting it from your country, but you still need it for your growth purposes, then you can see the cost they offer to you comes down.

So, when the acquisition cost is very high, you can go in-house. Then sufficient skill and expertise are available in-house in your company or the country. If you have those skills and all for development, you go for indigenous development. If you do not have one, then you have no choice; you have to go for acquiring the technology. Then in-house R&D cost is reasonable, and within the limit, then you go for this in-house development. These are some circumstances and factors that guide the company, whether they should go for in-house development or otherwise.

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Now, we will talk about technology forecasting. What is technology forecasting and how does it differ from economic forecasting? We all know economic forecasting. That is business forecasting and all – demand, supply forecasting, all those things, those are relatively simple than technology forecasting. Technology forecasting is much more complex and the uncertainty involved with it is much higher than the usual economic or business forecasting.

Business forecasting and all we have what? We have different techniques, different models, and different time series analyses and all are generally done. Still, here the technology forecasting first thing is you have to have an in-depth understanding in-depth knowledge of that particular technology. Then what are the components involved in it? The influential components, that development of that, the time is taken and all you have to look for it.

Then also, it isn't easy because there are… data required for these are not sufficiently available. So, these are the difficulties of that technological forecasting. And even say I will give you the example that there are many uncertainties and many factors you have to consider for technological forecasting. For example, it may be the technological obsolescence rate. Do you have to know that technology is the obsolescence rate?

Then upgradation trade for key features and how the upgrades are going, like power to weight ratio. This is supposing you are going for developing a power generation equipment, so, for that you will be requiring the what is the trend in power to weight ratio. Then processing speed-to-size ratio is for microprocessors, computers and all. For that development and that trend forecasting, you got to know this processing speed-to-size ratio.

Then you will be needing efficiency and reliability factors, rate of development, and venture capital financing to success rate ratio. These are some of the factors you may be requiring. Getting this data is very difficult. For any technology and you will not get all this data in a single place. You may have to scout it from different sources and all. And that is also not only time-consuming, it is costly also.

So that is why technological forecasting is much more difficult than economic forecasting. Now, what is the process of technological forecasting? There are two types of forecasting processes followed here exploratory forecasting other is normative forecasting. What is exploratory forecasting? Here, you take the technology capabilities, then technology features, and technology parameters; these you try to study, and you take a trend.

For these parameters, you find out the historical trend, that historical trend, then you project it, projections are for the future, you do that. But it is, uncertainty is very high. And further, normative forecasting is what? Normative forecasting is you fix the final date for developing the technology. You fixed a timeframe; then you work out that what are the main influencing components in that technology, and you try to develop those influential components within

that final deadline and all. You accordingly develop it. Say suppose say some mission, technology mission is Chandrayaan, going to the moon, Indian Mission for the moon.

So, in that now, the date has been fixed for certain years, now, you work out what are the requirements. What are the influential and the main important components for achieving that mission? Those things you then try to develop within that timeframe in a set manner. That is called normative forecasting.

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You are then forecasting techniques. How do you do this forecasting? The techniques are generally done - one is the intuitive method, which is the most straightforward method. This is what? You take experts' opinions; you survey, carry out conducting a survey and expert opinion, then you take polls, then you do the panel interview, then the panel discussion, panels whatever the consensus you come to that, and there is Delphi method that is more rigorous.

Delphi method you all know, several rounds it goes and the with the experts. First, you start with no one knowing each other, everyone is separated, they give their opinion, then consensus is built in successive rounds, then you come to some conclusion sort of common ground and all, that Delphi method.

These are the intuitive method. Then there are trend extrapolation and correlation methods. What is that? This is only a trend analysis of the same technology if you have the same technology. In this, what do you think? In this trend analysis, its accuracy level is rather poor;

it is not a high order for this forecasting. And usually, this technology forecasting follows an S-shaped curve.

We have seen it in the last module, the innovations curve and all we have seen it. That is an S-shaped curve, and sometime it may be the exponential curve or double exponential curve. For example, we have talked about power generation equipment. For that, you wanted to project technological forecasting. So, what will you be requiring? You will require many factors.

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Like one is that power to size, capacity to size, that ratio that we have talked about. The last time we talked about this, you related power to weight ratio, which may be one of the factors. Other factors may be efficiency and reliability factors, rate of development factors and maybe other factors, and maybe your loss of power, the efficiency of power, and all those factors, then your project is very uncertain is still high.

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Then another is maybe the substitution, trend extrapolation. Substitution, you must have seen that we have a mechanical typewriter. First, Remington, that typewriter many of you may remember, Remington that mechanical. Then it came to the electric typewriter, then the electronic typewriter, all of you know it, these are the substitution. Nowadays, with the invention of desktop computers, these typewriters are also getting extinct.

Then diode valve transistors to IC, integrated circuits and all. Diode valves to… the substitutions were transistors; from transistor, substitution from the integrated circuit. So, these are the substitution you can make a trend. Then DC 3 phase to AC, DC to 3 phase AC to HVDC of electric transmission, these are the substitution like this way you can also do it.

Then another way of forecasting technology is a simulation model. And this is what all of you know is a simulation model. Here you develop a mathematical relationship among the various variables parameters and especially in a dynamic environment because the environment is always changing, and the accuracy of your simulation model will depend on what?

It will depend on the accuracy of certain variables. So, those certain variables and all, those which are the key variables or the decision variables, you will have to be very careful with the accuracy of those parameters. You may have taken it after measuring or maybe assumed something, but one has to be very careful. Availability of sufficient data, the simulation model requires a sufficient degree of data. that for that, you can do a simulation model for technological forecasting. This is for technology forecasting.

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Now, we will discuss how to identify the technology gap in your organization's against what is available in the market or your competitors or the global world technology gap; how do you find it out? Usually, it is done from your internal reports regarding performance and failure analysis. Those reports are a good indicator for you to see what level of technology you are in and the scope of improvement.

Then also, you can find the technology gap and identify it through tendering, tendering in the domestic market, where MNCs-multinational corporations are participating. They generally give up-to-date whatever is available in the global market. So, one is tendering in the domestic market through which MNCs participate; another is in the international market. There what happens?

You can come to know their RFP requirements and all. So you can gauge your gap. Then also the joint quotation. Suppose you are partnering with foreign companies and all; if you take part in joint quotations and all, then you can know what is available latest in the global market and where you stand now. These are the tendering joint quotation. Then analyze, product and compare.

So, what is your product and all? You analyze it, your operation tears down, you do it, and you compare with your competitors what they are doing so that it can show what your technological gap is. Even if it may be your leading rivals and all, so, you can do that. Then another is continuously scanning for technology. There are many companies there are

departments that are only doing that technological scanning because this technological scanning they do it so that they can take advantage of that competitive advantage.

If the new technology is coming and your rivals take it, and if it is better than yours, they will get a competitive advantage. So, you continuously scan it. Then interactions with customers and consultants. These are also potential means to know your technology gap. Suppose your Indian company is doing a TV and customers. If you compare it with the global Samsung, LGs and all there, so, this company can compare the product, then they can also get the help from the consultant, from customers and all, different features and all, they can know what the technology gap is.

Then also visits trade fair, seminar, then the educational institute, universities, then the conferences. All these are also ways to know how far your technology is there compared to the latest technology available in the world. So, these are some ways you can identify your technological gap with your rivals or in the industry in general.

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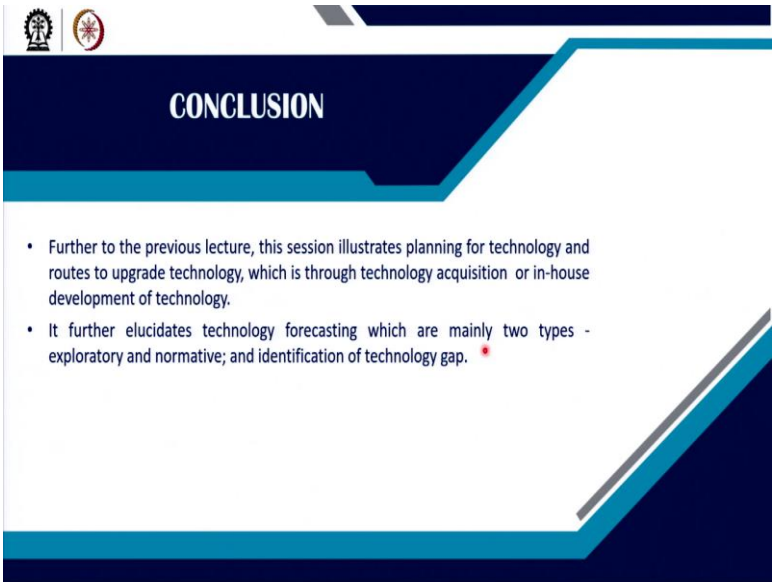

Now, to sum up, in this session, what we have learned, we can capture the way that this session illustrates planning for technology and routes to upgrade technology, which is through technology acquisition or in-house development of technology. Then, it further elucidates technology forecasting, which is mainly two types exploratory and normative. And it also identifies the technology gap. These we have covered in this session.

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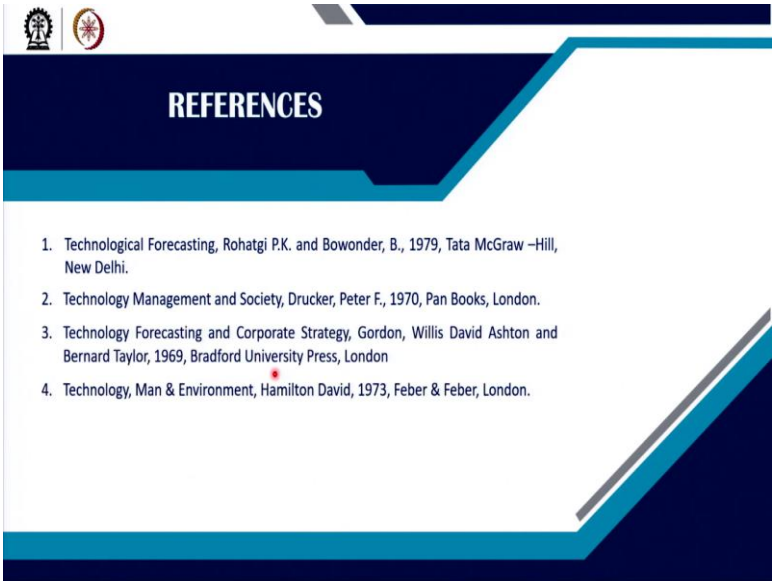

So, these are reference book books. You can go through and further enrich yourself on this topic. Thank you very much for attending this lecture.