Organisation of Engineering Systems and Human Resources Management
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Module - A
Basics of Organizations and Human Resources Management
Lecture - 5
Concerns of Organising Engineering Business and Systems (Contd.)

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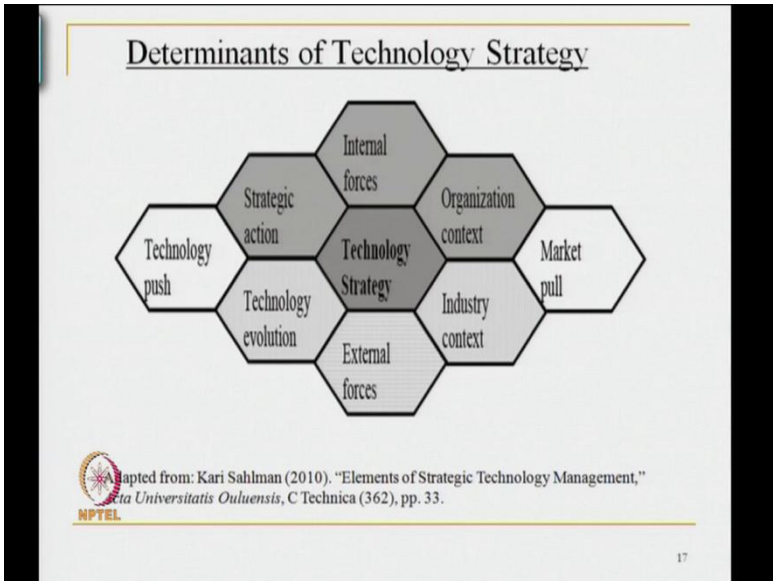

To understand the concerns of organising engineering business and systems, one needs to have a clear cut understanding of the determinants of technology strategy. You will obviously, understand that it is not possible to be exhaustive or comprehensive in such an elaboration, but a lot of work has been done by people on this by way of research and analysis; and I would like to reproduce to you a diagram from Kari Sahlman, when he is writing on elements of Strategic Technology Management at Acta Universities Ouluensis. He draws the following diagram for a clearer understanding of the issues. Let us work through this; in a manner, where you are able to comprehend the determinants of technologies strategy.

The first determinant is internal process; and we will move clockwise, so that you can manage to grasp the basic elements; the second is the organizational context where there is such a heavy interface amongst the concerns of engineering business and organization management. There is the market pull; there is the industry context, external forces and

technology evolution; this is very important, because technology is never ever frozen, and if technology is never ever frozen, then one has to recognize that the basic assumptions being the same in the manifestation of technological forms. The upscale ability is critical, which brings us to technology push; from technology push, we move on to strategic action, and that all converges on what is called technology strategy. These are the determinants of technology strategy as it well; to take the discussion further there are 3 phases of evolution of engineering and strategy.

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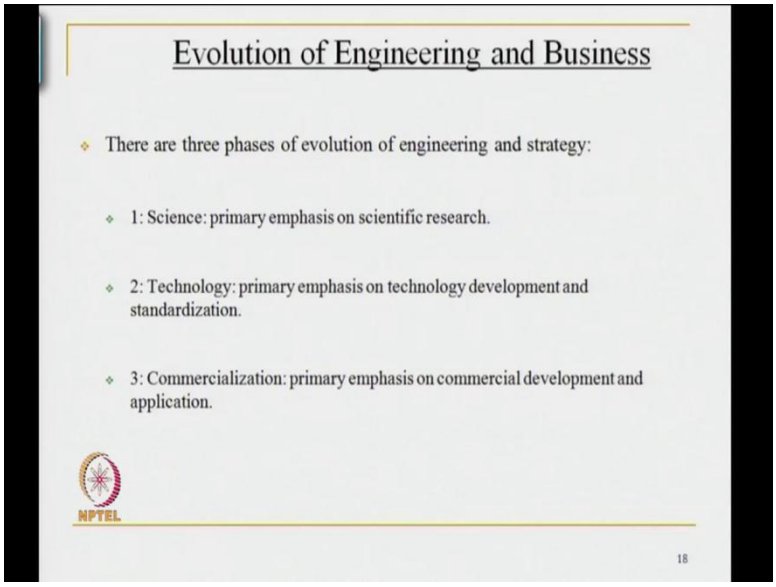

First is the science, which requires primary emphasis on scientific research. The relationship between science and technology is very often taken to be one of theory and practice that is certainly a simplification, but for our purposes, one needs to come to certain generalized assumptions to take the argument forward. And to that extent, I think it is important to realize that the relationship to science and technology is must the same as it is between creativity and innovation or between economics and applied economics.

The fundamental research alone can help to establish the primary principles on which technology would be rooted, which is what has led to a chain of Indian Institutes of Science Education and Research being established to the country and this is the welcome move, because it helps to lay sounder foundation of technological growth. Technology is primary emphasis being on standardization, well science principles of scientific research

yield place to certain assumptions and paradigms, and they are put in technological form then standardization becomes necessary.

From standardization emerges commercialization where the primary emphasis as on commercial development and application. It is important to realize that, what is technologically standardized does not necessarily have to be commercially viable. There are many common place examples and not so common place examples of this; take for example, the slow permeation of goober gas or not so popular use of solar panels. Because technically something was feasible, but commercially there seems seem to be all types of limitations in the use of say solar panels.

If the roof is on slope it would not work, if the buildings adjacent to the structure were you want to put solar panels are of a height where the sun light during the day is not as optimal as it needs to be then the panels do not work, and ultimately it has to be more economical than other sources of energy. So, there are considerations which grow in to the commercialization of any technological innovation and that source obvious there is no need to ham on that.

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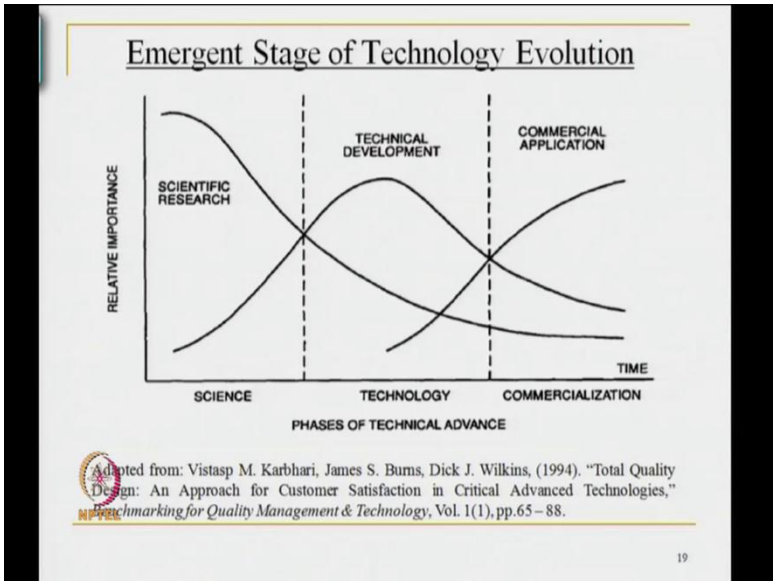

This diagram borrowed from Vistas M. Karbhari and James S. Burns and Dick J. Wilkins work on total quality design an approach for customer satisfaction; in critical advanced technologies, marks the relationship between the science and technology and commercialization. Because it shows the phases of technological advances and the

presentation there draws a comparative growth and dip profile of scientific research technical development and commercial application I do not think there is any need to elaborate or what I suggest simple, but a clear diagram of a relationship which would exists amongst science research technology development and the commercial applications.

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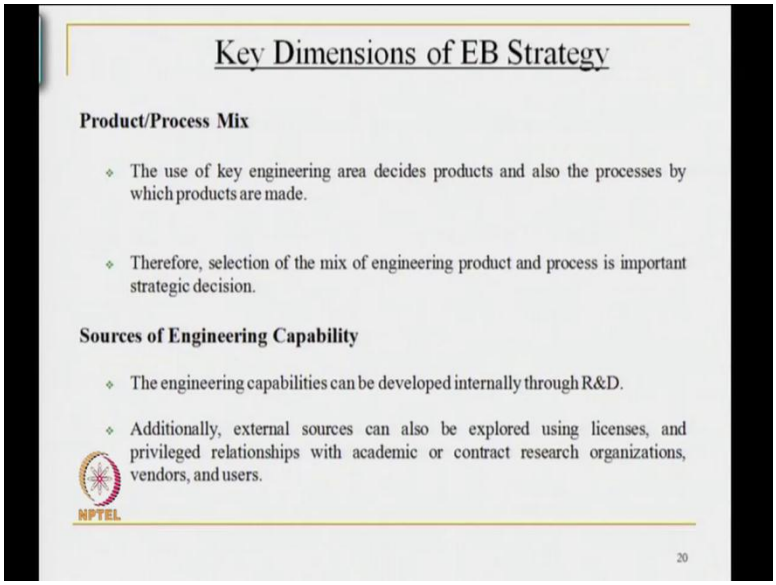

That brings us to the key dimensions of engineering business strategy. There are 2 components to which I would like to draw your attention to begin with, first is the product and the process mix. The use of a key engineering area decides products and also the process by which products are made, perhaps the choice of the first is critical. Because that determents the destination, but the precursor activity of getting those products out on to the market is equally important because unless the processes are in place the products will not be able to function in a fully packaged form, which are acceptable to the customer. Therefore, selection of the mix of engineering products and processes is important strategic decision. This selection of engineering products and processes is where the engineer needs to understand.

The compulsion of moving from being the designer of the engineering process, to put in that process to productive use and that as I have earlier on also have pointed out, is the bridge between the engineering and management and how they two are in a complementarily relationship. I would like to draw your attention to sources of

engineering capability, the engineering capabilities can be developed internally through R and D and which is why, I am personally of the opinion and there are many would agree with me. That one needs to have a good R and D component in any engineering based organization. In fact, I am of the view that R and D is essential in any commercial organization, because R and D is not just related to products and processes, it is also related to knowledge management; it is also related to what applies to a permit; also related to how ex genes ideas may be adopted and adapted by the firm. Additionally external sources can be explored and using licenses and privileged relationship with academic or contract research organizations; vendors and users, one may push once commercial interest further.

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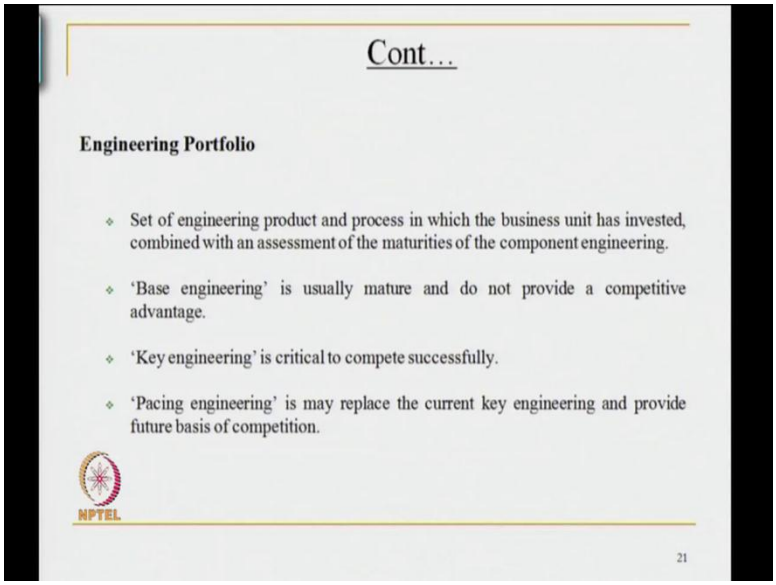

The engineering portfolio requires such an engineering products and processes, in which the business unit has invested combined with an assessment of the maturities of the component engineering. Because there is an engineering cycle and if you do not understand that engineering cycle, the set of engineering product and processes will be difficult to sell at in which you would need to invest. Base engineering is usually mature and do not provide a competitive advantage, because every other firm has same axes. Key engineering is critical to complete to compete successfully and finally, pacing engineering may replace the current key engineering and provide future basis of competition. Therefore, I would like to position this elaboration progressively on the need to understand competitiveness to survive in business.

And your assumptions of technology and the way that technology is converted in to a engineering outcome, is important if you are to understand how we are going to piece together the different elements to make engineering business and viable preposition.

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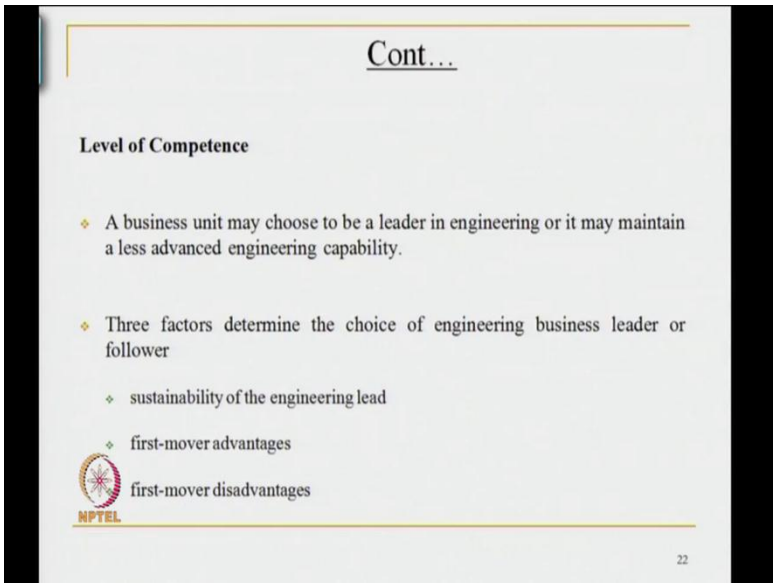

There are levels of competence which are required, to operate any frame work. A business unit may choose to be a leader in a engine in engineering or it may maintain a less advanced engineering capability. Because the territory in which it operates is not a very demanding one, but to get this clearly one needs to recognize that there are 3 factors that determine the choice of engineering business leader or the follower. The 3 choices are sustainability of the engineering lead, first mover advantages and the first mover disadvantages, because remember I have pointed earlier on that in the final analysis. Everyone gets on to a similar kind of technology and that does not provide too much of break through; the break through comes essentially through the manifestations of managerial skills and post sales field engineering.

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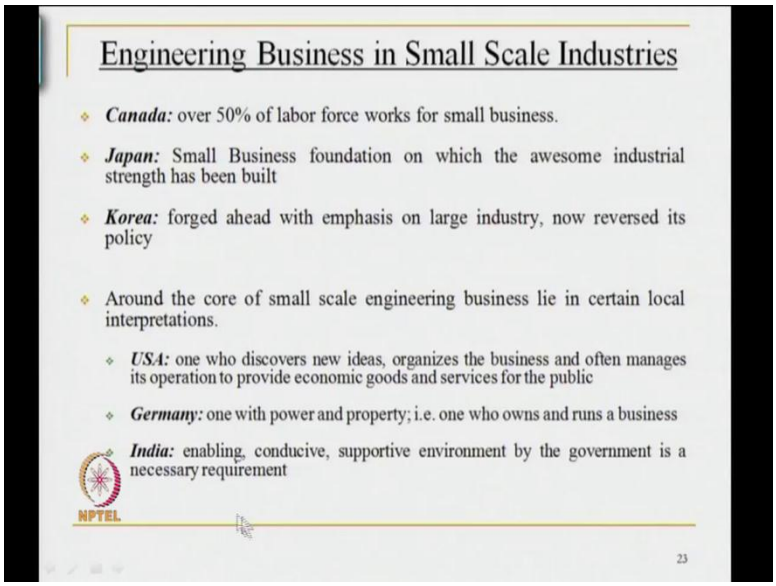

Engineering business needs now to be considered sector wise, because engineering business has a different profile in small scale industries, in medium scale industries and large scale industries. Different territories of the world have different experiences in dealing with small scale industries and in the projection before you; I will walk you through some important industrial zones of the globe. So, that you begin to appreciate how the experience of engineering business, in one path of the globe is not necessarily identical with the growth of engineering business in another path of globe.

Let us begin with Canada, over 50 percent of the labor cost works for small business. Japan, small business foundation on which the awesome industrial strength has been built. Korea, forged head with emphasis on large industry, now reversed its policy. Now you have got 3 areas, Canada were more than 50 percent of the labor force works for small business; therefore, you do not get a very large number of mega firms originating from Canada. In Japan, it is a sequential relationship be it automobiles; be it electronics; the components are supplied for the assembly units and the vendors do good business and the ultimate products also do good business.

So, this has helped Japan, acquire a very unique industrial strength. In Korea, the emphasis to begin with was on the large industry, but now it has been reversed around the core of small scale engineering business lies certain local interpretations. For

example in USA, one who discovers new ideas; organizes the business and manages the operations to provide economical goods and services for the public forges ahead.

So, clearly you see, there is a huge emphasis on new ideas, which really speaking an managerial terms converts once own ability to ideate in to innovation and innovation is converted in to a business opportunity and business opportunity continuously needs to be up scaled. Therefore, new ideas are forever necessary and patenting is huge sector in USA. In Germany, one of the one with power and property is one who owns and runs a business. So, there is clearly hierarchical dimension in Germany.

In India enabling conducive supportive environment by the government is necessary requirement. In fact, it very few parts of the world does the government plays such a significant role in the growth of a given sector. So, government policies very often in India determine the trajectory of operations, which brings us to innovation as a concept in engineering business.

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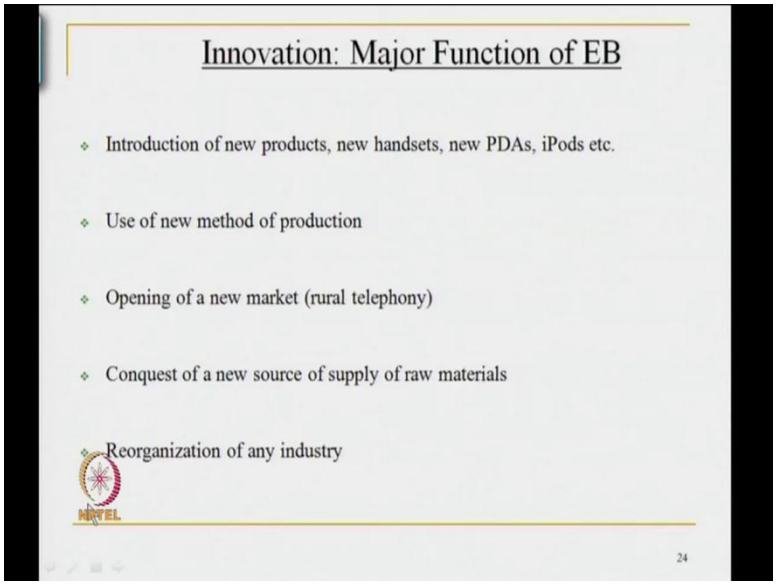

The introduction of new products, new handsets, new PDAs, new iPods are good example and I will through this presentation now try to focus on a given sector. So, that the illustrations and the applications come out to you powerfully and help you to understand what is the larger principle which I want to emphasize, and that the sector of our choice will be telecom, but will take little while to get there. I was mentioning that introduction of new products, new handsets, new PDAs, new iPods all taken as

illustrations from telecom; are the major propellers of engineering business there, which requires very often use of new methods of production an indeed opening of new markets. Rural telephony is a good example under reference and this gets linked up at least with many developing countries; many contexts of developing countries, with equity and distributive advantage being made available to deprive sections of the national population.

So, there is always a heavy role for government to play such an economy, but opening new markets has a large business dimension, if there is profitability at the end of the tunnel. Conquest of a new source of supply of raw materials is forever necessary, because that also effects the material which goes in to the making of the product and if all this is put together that is introduction of new product.

Use of new methods of productions, opening of new market, conquest of new sources, of supply of raw material, then there will be an in evitable reorganization of any industry. Therefore, again one of the basic concerns for you to register would be that engineering business forever requires: redesign of organizations, restructuring of work floors and a look at processing of information in way in which competitive advantage is continuously being strengthen.

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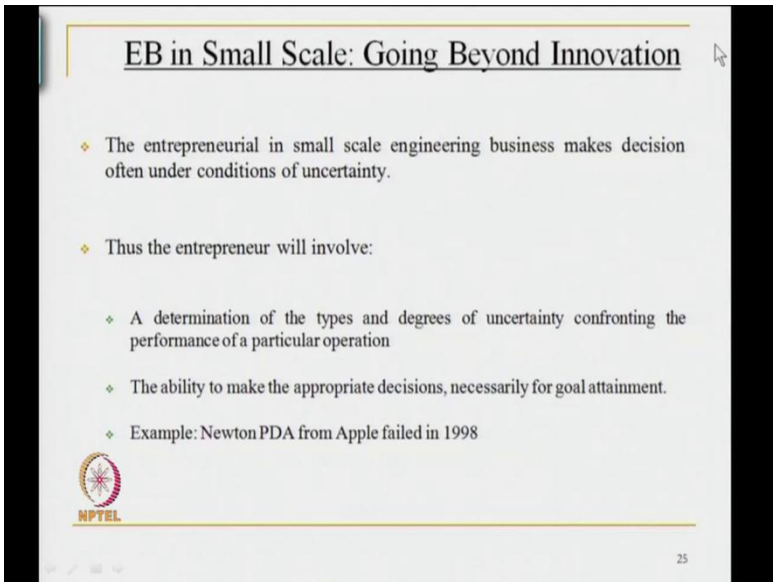

One can we look at being in engineering business again in the small scale sector, but the attempt would be go beyond innovation. The entrepreneurial effort in small scale

engineering business makes decision often under conditions of uncertainty. Any small scale business has a relatively small R and D base, it will require multi skilling, its holding capacity will be definitionaly low. And therefore, in the ultimate analysis it will be necessary, to ensure that business keeps working before it can even consider risking, but then the close loop principle starts operating and in any case, the adequate data base makes it necessary that the entrepreneurial firm operates under conditions of uncertainty. Now if the endemic condition is of uncertainty ability to hue ability to take huge risks that is reduced.

The entrepreneurial will a determination of the types and degrees of uncertainty, confronting the performance of a particular operation. Now anyone who is in the small sector, will have to be conscious of the uncertainty confronting performance, if not be specific in mapping it. The ability to make appropriate decisions are therefore, necessary for goal attainment which is their management as a discipline becomes hugely important for running of entrepreneurial firms; example is the Newton PDA from the Apple failed in 1998.

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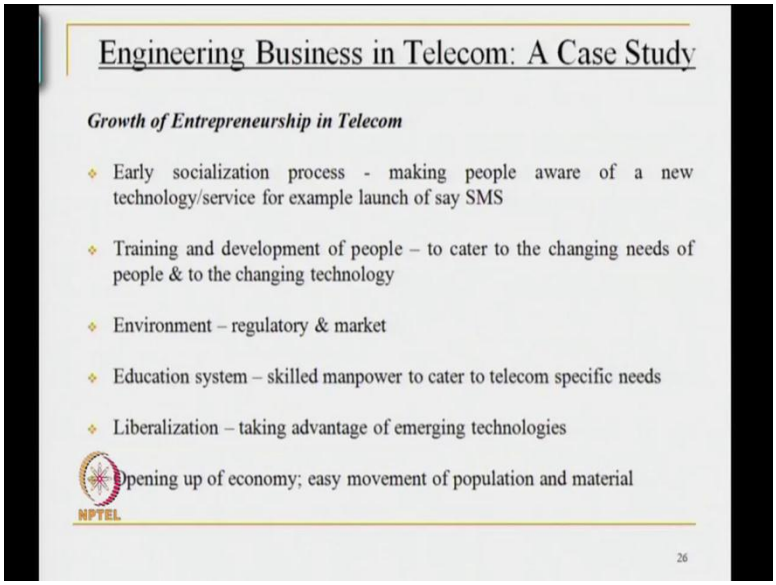

The engineering process in telecom therefore, if taken as a case study; is illustrated of many of the observations which I want to make. First and foremost growth of entrepreneurship in telecom requires early socialization process, making people aware of a new technology service and then it can catch on like a forest fire. Launch of a SMS is

good example, but then what will catch on and what will not remains forever dubious and that is the risk element in this sector and other sectors would have then equally defining characteristics. Training and development of people to cater to changing needs of people and to the changing technology is important.

One of the bigger hurdles, in the optimal use of new handsets say in telecom is that, there are not enough centers orientation of a people who acquire these instruments. Therefore, they are not able to use the value added services to the extent and to the intensity which, with it may be in order. Then there are problems of environment, were regulation is forever, chasing some stretching of point with some business genius and I use the word genius in quotes has discovered and the market. Now coming in of regulatory system then very often acquires very limited success in mitigating the abuse, but can cause huge inconveniences to the people who are really law abiding and that is the middle path with which any regulator will forever be concerned.

The education system gets affected, as the technology changes as the business environment changes and a skilled man power needed to cater to the industry, under goes swift transformation and telecom is a very good example. All these puts in place an urgent need to have an education components and training component, an orientation component attached to all industrial houses and this trend is gathering strength, but then the investment of this is very low.

If you look around the kind of investment, which the telecom firm are making an executive education is not quite up to there actual requirements, because unlike an engineering short fall the disaster of a training or an educational shot fall is not all that dramatic. Opening up of the economy and easy of movement of population material has also made man power planning in telecom, somewhat complicated the rate of attrition is high, people mobility is high. Change of technology is high therefore; principals of redeployment do not quite work out with the same efficiency and with the same speed with, which the system may be required.

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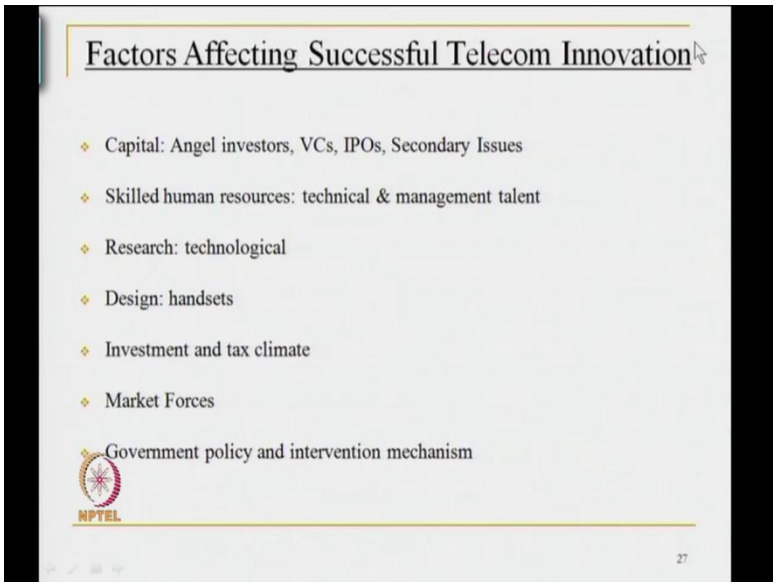

I look at the factors which affect successful telecom innovation may help. First of course is Capital and Angel investors, VCs, IPOs, Secondary issues are some of the instrument for it. I have already talked to you about the skilled humorous sources of both technical and management talent. The important thing is to remember that, technical and management talent does not necessarily come in packets which discrete and a mutually exclusive, but some man power would also be required for techno managerial talent.

There is the need for continuous research and I have already pointed this out, there is a need for newer designs especially when it comes for handsets and above all the investment and tax climate has to be favorable. If tax climate is not sensitive to entrepreneurial prepositions and what causes the growth of business and what causes it is declined, then investment is going to be effected and if investment is going to be effected. Then growth of in engineering business is going to be effective and this is the whole business of a market forces which have to be understood for which again management education is a must.

This particular course will not be very helpful to you in understanding an entire domain of expertise, which affects market operations. And for that you may need to take up courses in marketing, but please remember this course is an introductory course, more focused on causing awareness of what you need to know to be successful, rather than give you all the capabilities which are require to run engineering business successfully.

And finally, government policy an intervention mechanisms are the key determinants of the growth of the telecom sector, whether you call it as liberalization or you do not call it liberalization, the principle is simple. We cannot wish away the government, because the government is a going to be a player in all operations, because the policy dimension of a sector like a telecom has to do with inter governmental relationships.

So, in certain ways there are areas in which the role of government actually gone up; rather than gone down; and this is important to understand, straight jacketed understanding of the market, straight jacketed understanding of governmental policy, straight go (( )) forward understanding of simple investment does not work. Investment complexity is vary from sector to sector, the requirements at the returns in telecom sector are certainly not those of what come in textile, the market forces in operation in telecom are also unique and as I have just stated the government policy also becomes remarkable player.

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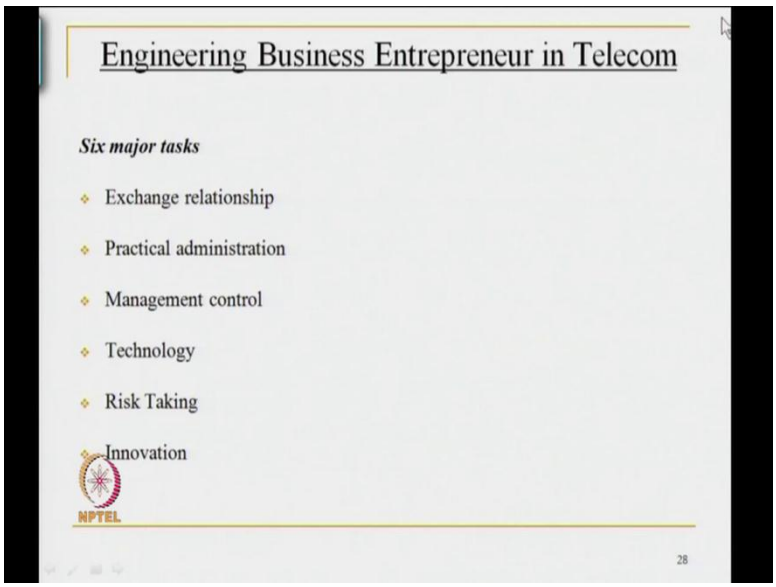

So, engineering business has few generic dimensions, but it has also few context specific elements and you should be able to follow it all. The engineering business entrepreneurial in telecom would have 6 major tasks; he must understand exchange relationship. Exchange relationship not in a human relation since, but in terms of the exchanges of the sub sector in telecom, say switching to transmission, to customer interface in terms of the material instruments, which the customer uses and finally field

engineering. These exchange relationships will work only if you have appreciation of what the previous sub sector is doing; then there is need to focus on practical administration.

There are no laws on how to administer a telecom industry; it will have to do with the scale, it will have to do with sub specialization in which the firm is placed, it will have to do with the kind of investment which has taken place and above all it would depend upon the supply chain management; under which that sector is operating. This in turn affects management control, when we are talking of understanding organization; we talked of a very large number of choices which are there in terms of management control.

It is best to understand those management styles and organizational forms not with a value judgment of what is better or what is wrong, but more from the point of view of how it works. So, that that is; what is here meant as management control, then the technology; all technologies do not work every were in the same manner, at times a technology may be imbedded in an environment which basically believes in repair as an instrument of maintenance. If however, the technology has originated in an environment where use and throw principle operates, it will be a different kind technology.

Now, this is something which very often is not kept mind by firms which either design a product or when they are marketing the product, but believe me you these considerations do effect survival of the product. A culture which is used to repair technology to keep an instrument going will never be comfortable with the product which is from an industrial environment of use and throw. These four elements they are for exchange relationships, practical administration, management control would affect risk taking. Risk taking is an important characteristic of any firm, very often risk is seen in financial terms, but risk can take many forms.

Risk today is perhaps, most endemically available as a security risk almost nothing and nobody seems to be safe without taking the basic precautions and I am not just referring to physical safety; I am also referring to the kind of risk which is inherent. In online dealings in terms of new ways of a payments and deposits, there are huge risks there and the perfect system has and been device. So, each investor; each person who is operating a system, will have to define risks for himself and position himself in a manner where

wonder abilities are low and the risk taking is not one which will undo the entire system and then off course, inevitably it ends on innovation, because innovation would cut through all these phases, innovation remains a different way of doing something, which is more elegant, more economical and less time consuming and of course less resource consuming and that is the definition of innovation.

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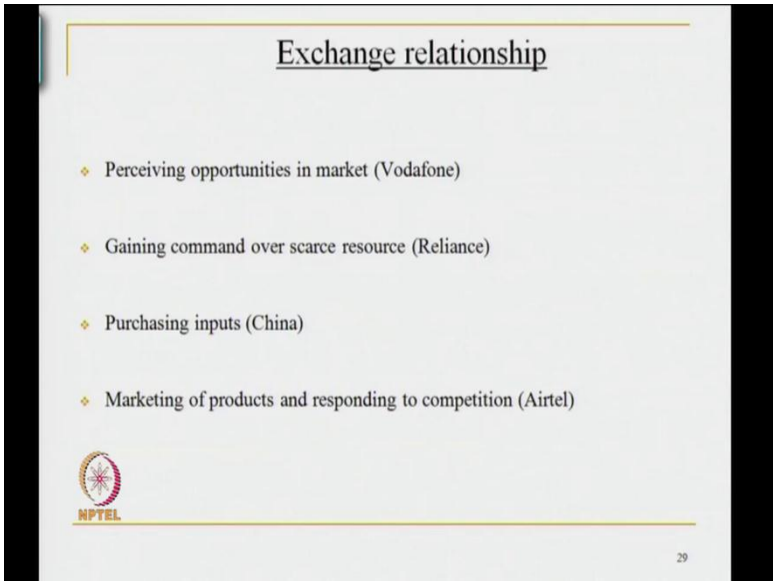

I would like to walk you through each one of them in a manner were you will find it simpler to appreciate their nuances, but let us first focus on exchange relationship. Exchange relationship has to do with perceiving opportunities in the market. The best example I can think of is the way Vodafone opened in to India; the second is gaining command over scarce resources and the example which comes to my mind is the way Reliance operates. Then there is exchange relationship of purchasing inputs and in my judgment China is a good example of purchasing inputs. The dimension of marketing a products and responding to competition is again an exchange relationship and Airtel comes to me as a good example of this, size off course is a factor of a competitive advantage or this advantage and since the reference was earlier or to small firms.

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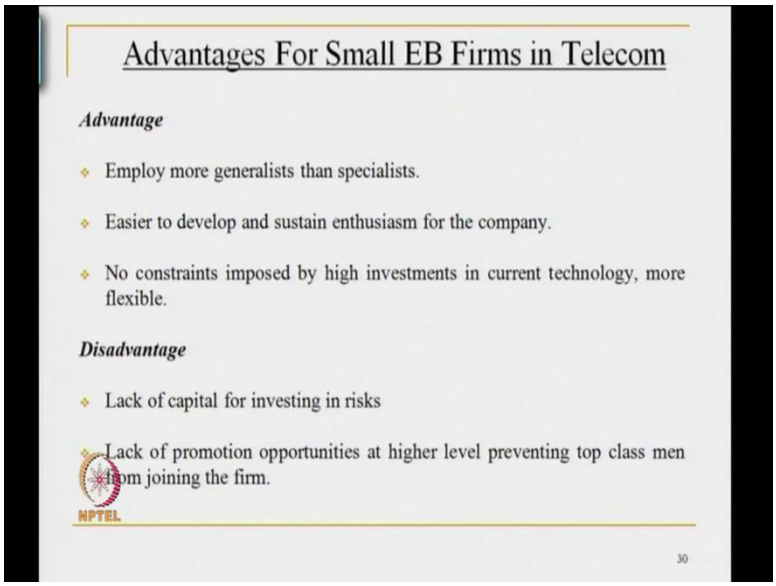

Let us look at; what are the advantageous for small engineering business firms in telecom. The advantages is it is employs more generalists than specialists and generalists are more easily available. It is easier to develop sustain enthusiasm for the company in a small business firm and it applies to small engineering business firm. In a small firm there are no constraints imposed by, high investments in current technology is therefore, more flexible. But there are disadvantages for small business firm in telecom two, one is lack of capital for investing in risks, the second is lack of promotion opportunities at higher level preventing top class men from joining the firm.

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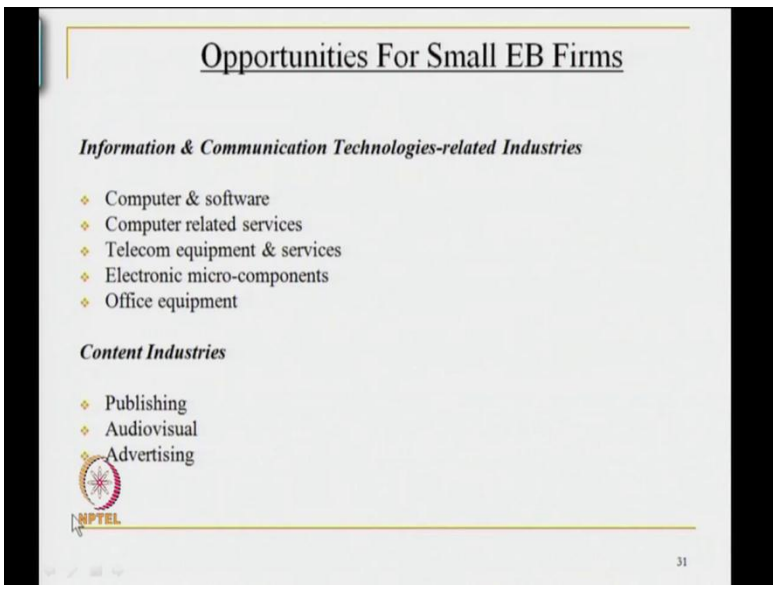

The list can go on, but I would like to now walk you over to the opportunities of small firms in engineering business. Small firms in engineering business would have large opportunities in information and communication technologies related industries; this includes computer and software; it includes computer related services; it includes telecom equipment services; electronic micro components and office components. In content related industries, small businesses will have a huge potential in publishing audiovisual and in advertising; an obviously, you can make out that this list is neither exhaustive nor limited.

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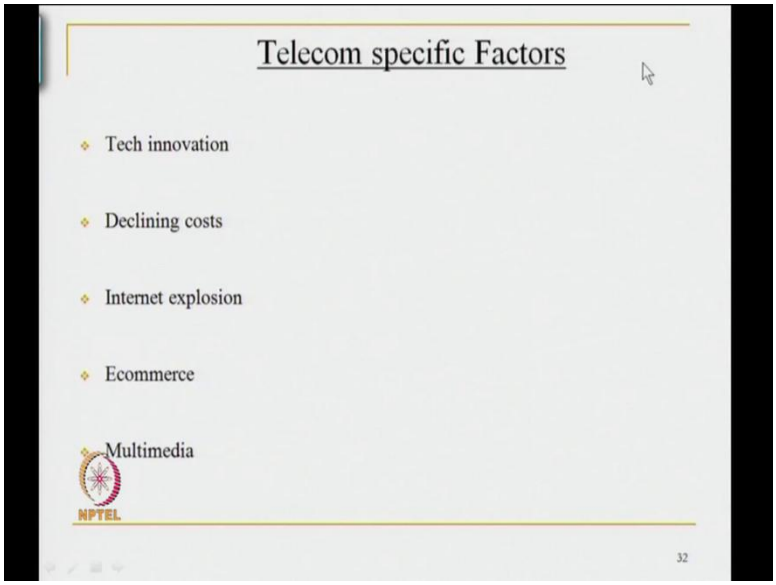

So, far as telecom specific factors are concerned for growth you need technical innovation, you need to flag the declining costs and work around it, you need to recognize the internet explosion, you need to recognize the principles of e-commerce and you need to understand multimedia. Now in these elaborations, 5 of them I have tried to focus your attention on telecom specific factors, which effect growth. In other words each sector will have its own defining characteristics of growth and for limitations of time I have chosen just telecom to illustrate to you how the system would actually work.

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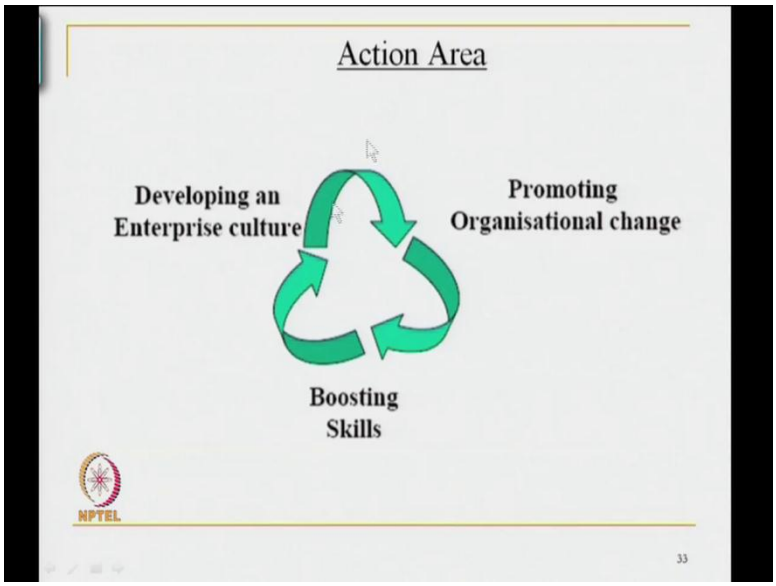

Let us move on to the action areas. The action areas informs promoting organizational change boosting skills and developing an enterprise culture; now this is more generic in character this can be found almost any were. When you applied to telecom then let us go back to the preceding slide (Refer Slide Time: 41:14), it would cover the 5 areas which I have outlined here. So, you applying this 5 areas in to this diagram and you position the 5 areas here in the center of the what appears a triangle which has equal weightage to all sides and you have the diagram complete.

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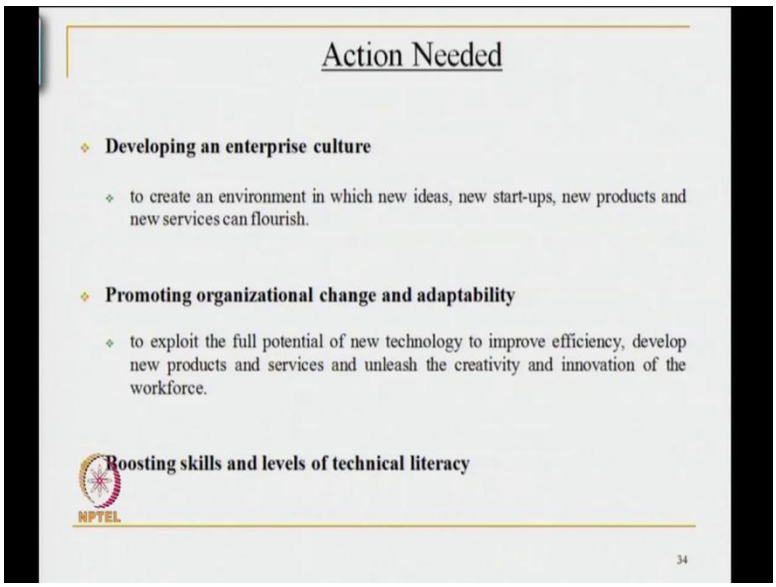

The action therefore, is needed in developing enterprise culture and that is the management component which we will be focusing more, not only in the treatment on this topic, but other topics in this course. How do you develop enterprise culture, you create an environment in which new ideas, new startups, new products and new services can flourish. What I am trying to put across to you is, your practices would continuously need to be up scaled, your practices would continuously need to be improved, your practices continuously need to be refined through innovation if you want to develop an enterprise culture which is competitive.

Promoting organizational change and adaptability is equally important, because please remember organizations are organizibic entities. They have a life cycle, they are born, they grow, they at times undergo entropy and therefore, again go back to growth after overcoming the constraints there are crusts and trough. They have a life cycle and they all die.

So, if organization are organizibic entities promoting organizational change and an adaptability is the part of the learning process of an organization. To exploit the full potential of the new technology, to improve efficiency, develop new products and all services and unleash the creativity and innovation of the work force, you need to promote an organizational change and adaptability culture, which means that all ideas would be welcome any idea is worth trying out once and ideal leadership is duly recognized. To sum up this component of the action plan, it is important to emphasize that you need to boost skills and levels of technical literacy. Both within the organization and amongst the users the system and in telecom area, there are evidently large gaps in sensitizing the user system to the technical literacy which helps the optimal use of the technology.

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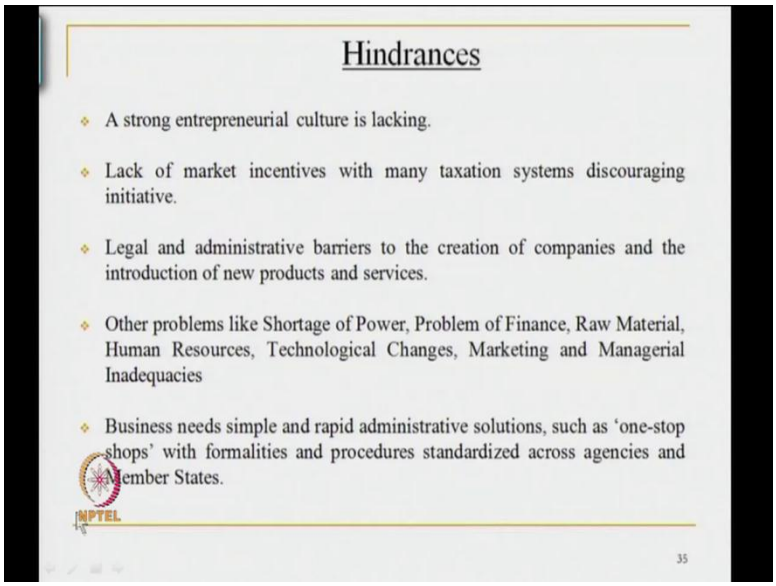

What are some of hindrances in the situation? The hindrances would be a strong entrepreneurial culture being absent. Therefore, hierarchy takes place bureaucracy this starts calling the shots and nobody really gains. This is the hindrances, which needs to be overcome. Couple this up with the absence of market incentives, with which many taxation systems, do create this discouragement of initiative is a huge impediment in growth of engineering business and the management culture which goes with it, will have to factor this end.

The legal and administrative barriers to the creation of companies and the introduction of new products and services are formidable in several developing countries, and those countries which have leap frock to development. It has been largely, because they have been able to handle the legal and administrative barriers to growth, here again corruption is a huge factor, because corruption would flourish on the kind of legal and administrative barriers which can be created. Therefore, there are systemic propositions which need to be handled at an operational and administrative frame, in a proactive manner before engineering business can grow.

There are the problems like shortage of power, problems of finance, raw materials, human resources, technological changes, marketing and managerial inadequacies. I am sure you have heard of all this before and infectious has been repeated so often that one has almost got immune to either understanding it or doing something about it. That does

not take away from the fact that the shortage of power, the problem of finance, raw material, human resources, technological changes do continue to be important hindrances in growth of engineering business and no business can grow if these impediments are not removed.

Business what really needs is simple rapid administrative solutions, such as one stop shops with formalities and procedures standardized across agencies and member states, member constituencies all the stake holders. In fact, in my limited experience of consulting and research in this area; I have come to the conclusion that even a simple step of alerting the respondent to all that is required, and all the questions which can be asked, prepare simply, handle better and it does not become one question at a time. He rushing back to find an answer to that question, and coming back with the answer to be raised at another question, and that makes it really a complicated process.