Organization of Engineering Systems and Human Resource Management
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Module - 1
Basics of Organizations and Human Resources Management
Lecture - 4
Concerns of Organising Engineering Business and Systems

This is a presentation on concerns of organizing engineering business and systems, which is the second component of the first module on business engineering organizations and human resources management, as the course topic.

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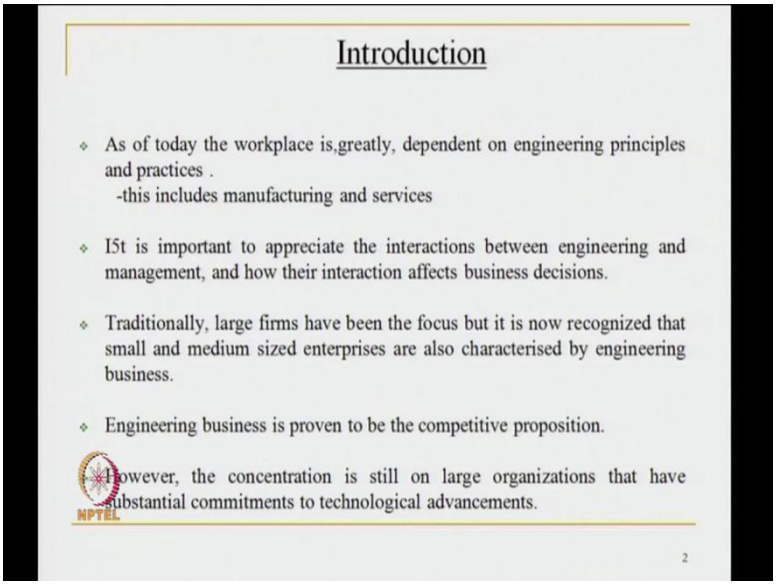

As of today the workplace is greatly dependent on engineering principles and practices. In fact, it is my view that there are only two types of organizations which exist; engineering driven organizations and engineering determinant organizations. This includes manufacturing and services. Therefore, it is important to appreciate the interaction between engineering and management, and how their interaction affects business decisions. So, for the coming 3 hours or so I will be drawing your attention to the nuances of interaction between engineering and management, and how to move on from being an effective designer of system, that is an engineer or how from being a person who is operating a system, to a person who puts that system to productive use, that is a manager.

Traditionally large firms have been the focus of engineering action, but it is now recognize that even small and medium size enterprises are characterized by engineering business. So, engineering business is now becoming a competitive proposition and like any element, which becomes competitive proposition is adopted by everyone; un-ultimately looses it is sheen and gets it is success otherwise by the human elements which are operated.

Let me restate that for the sake of clarity, the earlier stages of competitive proposition comes out of the technological factor and the engineering business, but subsequently all competitors get on to the same kind of platform of technology and engineering business. And the critical competitive proposition, then comes out of human resources management and human (( )). However, the concentration is still in terms of focus on large organizations, who find the resources for technological advancement, but then I want to emphasis every simple proposition. Engineering business is common to all shapes and sizes of the organizations; small, medium, large and obviously, the sub categories which exist there.

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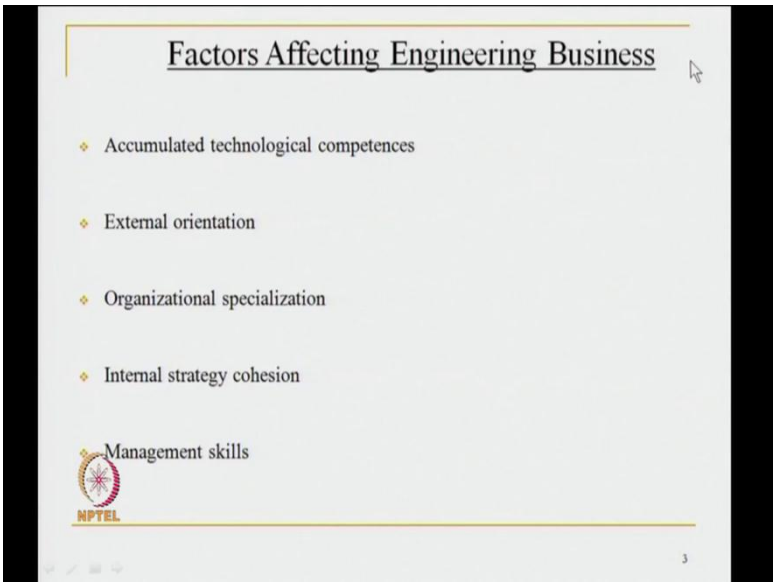

A quick run through the factors affecting engineering business will help to bring clarity to the situation. Accumulated technological competences, this is very important in the success of an organization. Because, ultimately engineering business succeeds from a whole spectrum of activities from the R and D, which is an edginess to the organization to the field engineering; which keeps their equipment's which the organization markets going.

And I would put this spectrum from R and D to field engineering as the factor of accumulated technological competence; then there is a question of external orientation after all to make success of any engineering business, the machine acclimatization competency of the user community is clearly an important variable.

How good would be the effectiveness of an RO; a water purifier, if the filters want regularly changed, and if the maintenance of that critical but small equipment was not as per engineering specifications? Therefore, external orientation of engineering business is important, and for the success of engineering business and awareness programs on the niceties; it sticks to keep the system running. On behalf of the user community is absolutely important. Then there is a question of organizational specialization.

Engineering business requires within the system, a specialization into the different kind of functions, the equipment's or the services has to under grow; take for example, telecom. To make a success of telecom business, you need engineering business competencies in a whole set of sub specialization; bringing from the beginning from the switching system to the transmission system, the maintenance of tars, not to overlook the capacities and the capabilities of the instruments through which the transmission would be sent out or received.

Therefore, organizational specializations in engineering systems are progressively acquiring the shape of super specializations; though they have not yet been accepted as such in institutes dealing with skill formation. The matter does not stop there as a manner in a manner of speaking for engineering business to flourish were phasing out is such a common exercise, and upscale ability is such a fundamental characteristic. People look for in buying engineering based gadgets, equipment, setups, services which draw their strength from engineering specialization. That unless there is a user familiarity with the basic commands of running a system you will find that everything from digital television to a handset will run at a huge possibility of underutilization. And therefore, ultimately will risk losing of the market because, after a few years people would not be willing to pay for services, which they do not use or they are not comfortable using or they have no use of. So, there is such a thing as organizer to specialization in engineering business.

Then there is a concern of the internal strategy cohesion, going back to the telecom example; if you are dealing with switches and you are dealing with transmission tars, and

you are dealing with equipment or handsets; there has to be a strategy cohesion and I am not quite sure, whether this has been recognized an integrated in skill formation for engineering systems and finally, there is a question of management skills. The kind of management skills which are needed in running of engineering business are not the same, as those which are needed in running of trading activity or tourist activity or stock exchanges. Therefore, this listing of five dimensions of factors affecting engineering business is going to be the touch stone of much that, I am going to elaborate in terms of scope of engineering business.

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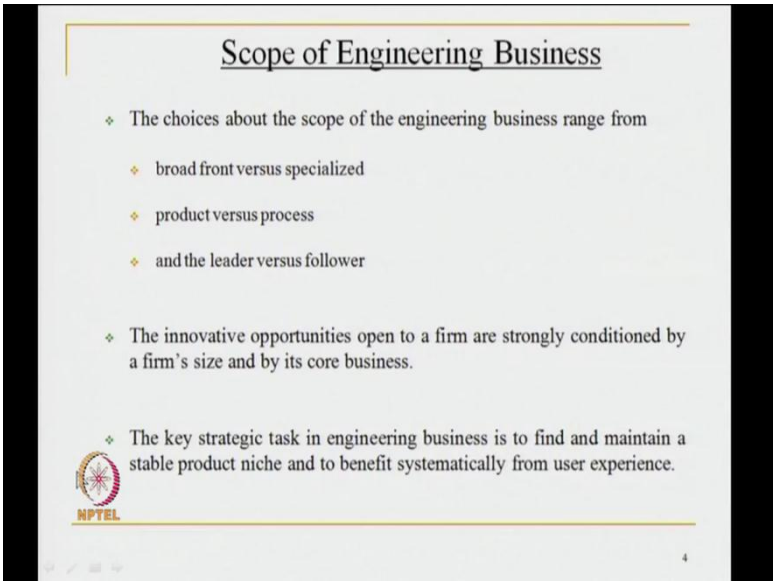

The choices about the scope of engineering business range from broad front versus specialized operations. I will repeat that for you; the choices about the scope of engineering business range from broad front versus specialized operations, products versus processes, and the leader versus the followership. The innovative opportunities open to a firm are strongly conditioned by a firm's size and by its core business. Therefore, talking of innovation is not enough; input innovation is embedded in certain material conditions, and it can range as far widely from firm size to the core business. The key strategy task in engineering business is to find and maintain a stable product dish and benefit systematically from user experience. Here again user feedback has to be far more effective and sensitive, than it is in very many businesses.

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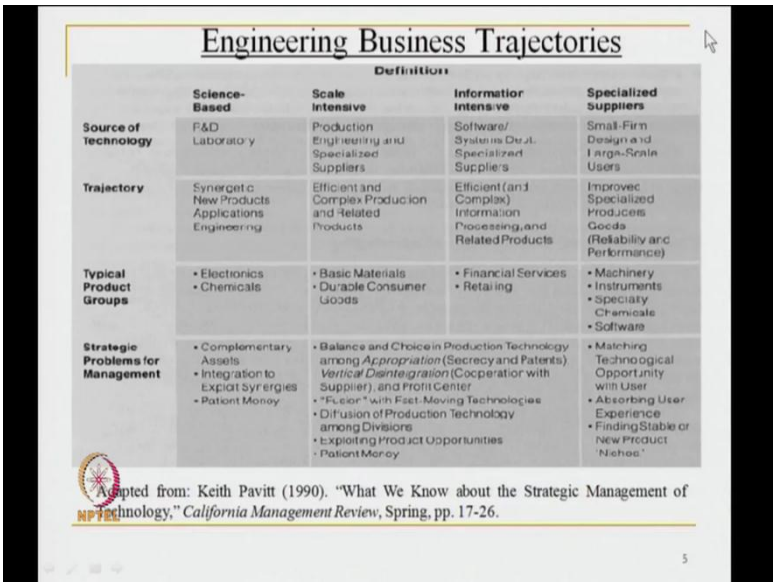

I present to you a matrix, which is adopted from Keith Pavitt on what we know about the strategic management of technology, which I consider a semi classic, which has held that test of time for over 2 and a half decades, and as you can see form the projection on the screen; on the Y axis you have got the source of technology, the trajectory, typical product groups and strategic problems for management; on the X axis you have the bases of differentiation, science based, scale intensive, informatior or intensive, specialized suppliers.

I believe these blocks are self explanatory and I will give leave a little time for you; to go through it and see the inter relationship and then I will build up on it. The matrix to my mind demonstrates the range of possibilities; which exists in engineering business and how it is important to position your organization and your investments, carefully to get the best out of it. In the ultimest analysis, the supply change management also becomes important because, it is this specialized supplier, which will determine into a very large extent the nature of the market swing.

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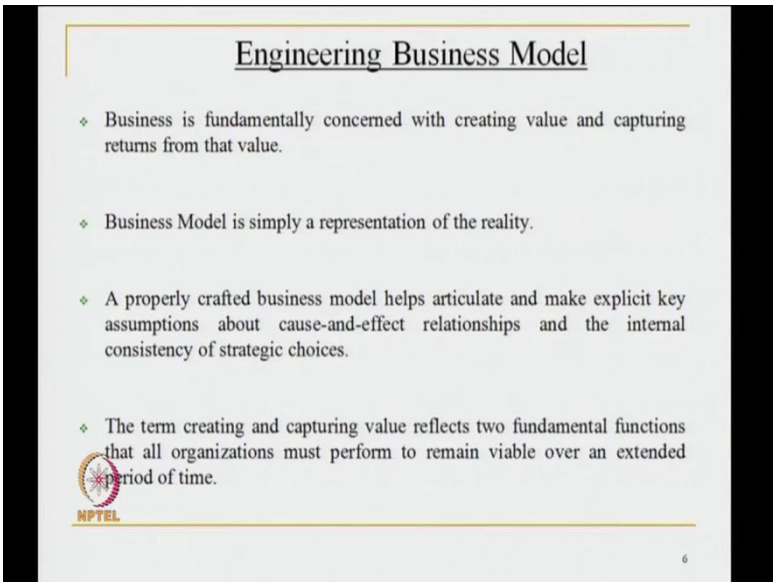

I would like to draw your attention then to the emerging engineering business module which could arise because, business is fundamentally concerned with creating value and capturing return from that value. Now this is the point which I believe is very often missed. It is missed because; business is seen as one of the roots for making profits. Now no one can quarrel with that, but profits in business come through a particular delivery mechanism, and profits in engineering engineering business comes out of a very, very specialized method of action. An in engineering business it requires creating value and then and then alone, you can capture returns form that value. In other words; continuous product improvement is at the core of promoting engineering business.

Business model therefore, like anywhere else in engineering business is simply a representation of a reality. I have already elaborated with you the external realities which determine the context of business and tried to show to you; how even in a given sector there are sub divisions of specialization, which have to be internally consistent. A properly crafted business model helps articulate and make explicit key assumptions about; cause and effect relationships and the internal consistency of strategic choices. I would wish you to internalize both these elements if you are trying to understand; what engineering business model is all about.

There is always a cause and effect relationships among several segments and if there is a cause and effect relationships in the internal segments; then the internal consistency of

strategic choices is important. The kind of choices exercise the design of switching systems cannot be very different from kind of strategic choices which are exercise in receiving tars, which cannot be very different from kind of strategic choices which are exercise in the making of the handsets; therefore, understanding the nature of the engineering business across the various elements is essential to making a success of the overall business model, which means to my final submission. The term creating and capturing the value, reflects 2 fundamental functions; that all organizations must perform to remain viable over an extended period of time. What are the two functions? Creating and capturing the value. The word value here is a utilitarian concept, which has to be converted into engineering terms.

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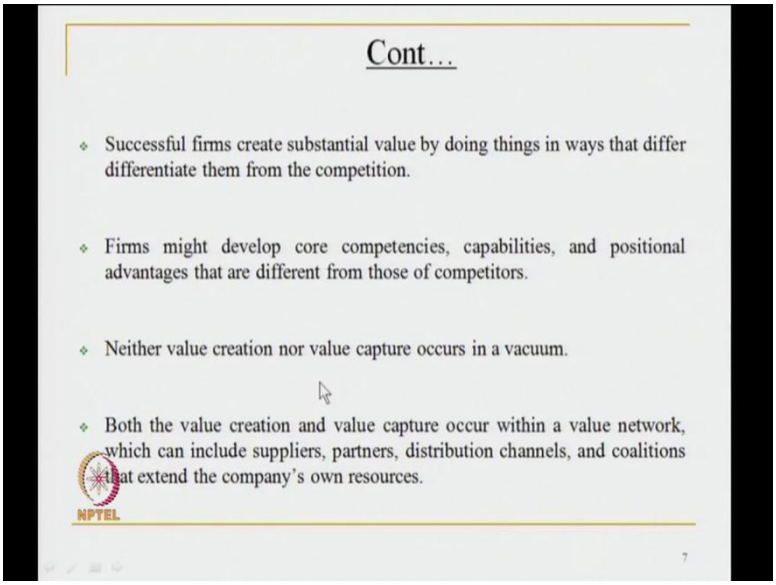

Successful firm creates substantial value by doing things in way that differ, differentiate them from the competition. In other words the project propulsion principles may be common, but the way an illusion flies is very different from the way of Boeing flies. And the principle of aviation as interpreted by the 2 streams will do what it did to their businesses; because, firms may develop core competencies capabilities and positional advantage that at different from those of competitors.

Therefore, there is a strange contradiction there, you can only compete when you are unique or when you are different; you cannot compete by competitions of imitation or you cannot compete by rules which are drafted by your competitors. Neither value creation nor value capture occurs in a vacuum. Therefore, engineering business a requires breathing of

technological life in to the engineering action, and I believe this is the right stage in the discussion to urge for a clarity amongst words, which are used very often in a manner; which cause a confusion and indeed something which creates a proposition, where you believe that to be different, you have to outdo. Which brings me to a submission which considering important in this context; value creation and value capture occurs within a value network. When I am talking of a value creation, I am talking of a product which creates value for the customer. Value capture is used in a sense in which the return from that kind of equipment is critical.

To the business advantage, but above all it has to done in a value network, which will help to underscore the difference which I was wanted to register and I have to go into a slight deviation (( )). That is the differentiation between technology, engineering and equipment. They are not all synonymous. Management of technology therefore, does not become a management of engineering business and management of engineering business does not become managing equipments.

We are here focused on business which comes out of the engineering activity. It is another matter that all engineering business will have a backward linkage to technology development and a forward linkage to equipment distribution and maintenance. Therefore, this would include; suppliers, partners, distribution channels and coalitions that extend the company's own resources and this is critical to engineering business. And in the light what I have just elaborated. Please notice the players include; suppliers, partners, distribution channels and coalitions. That extend beyond the company's resources and that is what makes engineering business tick. This is where just understanding general management is not good enough, but it has to be put in a frame work of engineering business.

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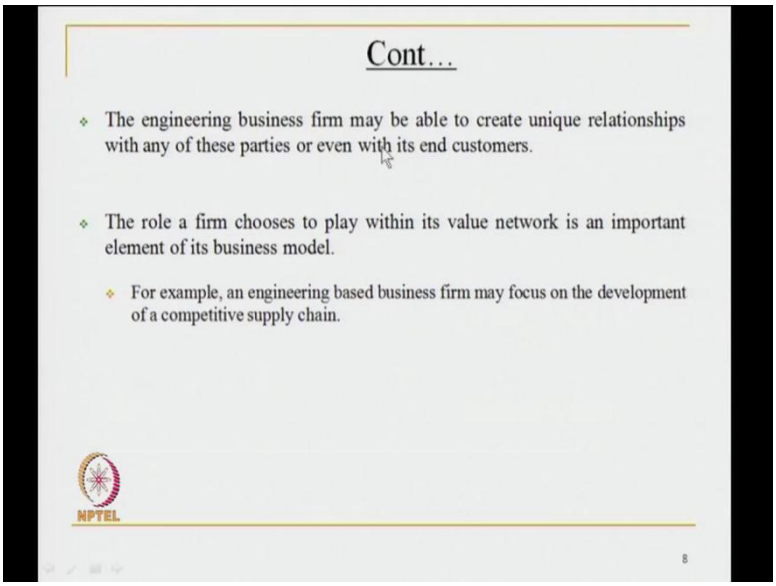

The engineering business firm may be able to create unique relationships with any of these parties or even with its end customers. In fact, it is my case if I go back to the slide. (Refer Slide Time: 17:44) The way the firm links up with suppliers, partners, distribution channels, coalitions singlely or to coin a phrase a word doublely or in a multiple manner or in a holistic manner to take all of them together will create the business propositions, on which it is flourish, which is why I am saying the engineering business firm may be able to create unique relationships with any of these parties or even with its own end customers which is what then leads to brand loyalty.

And of course, this has been converted into engineering business. What is messaging from equipments of the same from one to another? I do not want to name these messaging devices which operate free of charge, devised by companies with equipment which 2 parties may hold, but which have the same underpinning technology. Anyone who deals telecom knows what I am talking about. But this business of creating engineering models which talk to each other is meant to promote a loyalty which has operational beading. And this is where again engineering business acquires strange connotation. The role of firm chooses to play within the value network is an important element in its business model; for example, an engineering base business firm may focus on the development of a competitive supply chain.

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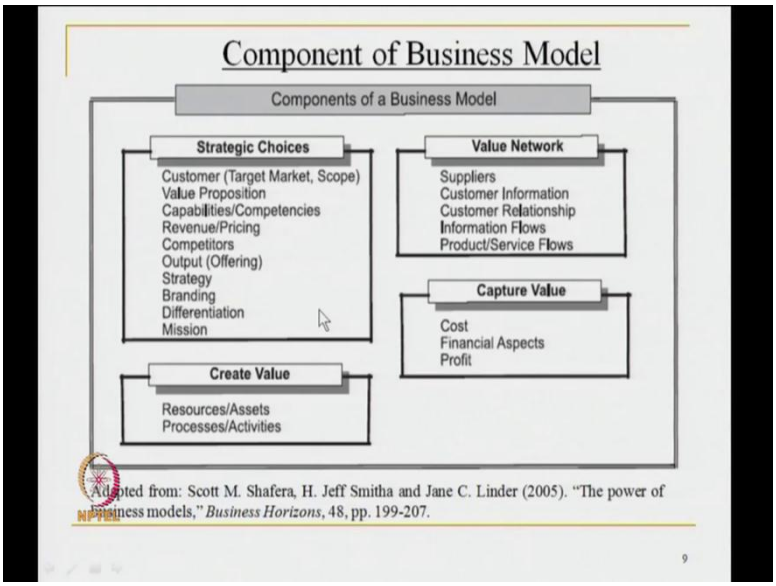

I like to draw your attention again to the components of a business model which is from Scott M. Shafera and H. Jeff Smitha and Jane C Linder. Comparatively recent one and it shows in a summary form what is called the power of business model? The components of business model are shown as strategic choices, value network, create value and capture value. So, another word it sums up what I have been trying to explain to you and I am going to leave it on your screen for a while.

So, that you may try to absorb it, basically it is summing up what I have already explained; therefore, there is nothing really to add. The strategic choices stretched upon customer, value proposition, capabilities, revenue, competitors, output, strategy, branding, differentiation, mission; value network talks of suppliers, customer information, customer relationship, information flows, product services; creating value would be resources or an assets, processes or an activities; capture value would be cost, financial aspects and obviously, the profits.

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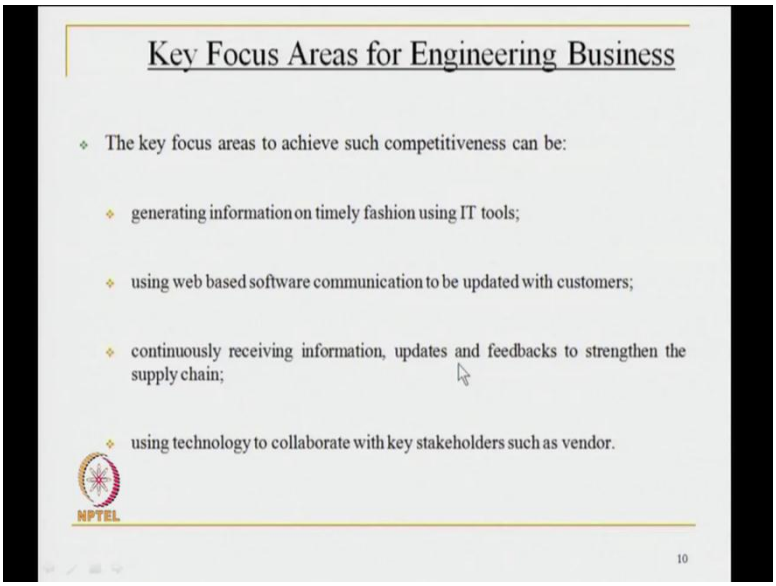

The key focus area for engineering business therefore, becomes generating information on timely fashion using IT tools. Now generating information on time is more easily set than done. Because, the software which you need for generating and disseminating information requires a careful market observation mechanism, a careful market watch on what is available?

A sensitive evaluation of the products which are in the market; a careful selection in terms of their maintenance and upscale ability and a very proactive phasing out; not when the promoter company decides to phase it out, but when your requirements have phased out that equipment. I would also suggest the need to have an internal R and D. So, that these products can be internally adapted for use; because, there is no such thing as a perfect product for once own use. One wise an approximation and then develops it, adapts it, modifies it is to the once usage and that is the good way of running engineering business.

If you use the web based software communication to be updated with the customers and many cases it works and one should not rule that out. Continuous receiving information updates and feedbacks to strengthen the supply chain would be an obvious choice, but using technology to collaborate with keys stake holders; such as vendors is just as important as, technological innovations on the product or high degree of sensitization of field engineers or your ability to service repair and respond with alacrity to a customer need. All these are essential components of engineering business.

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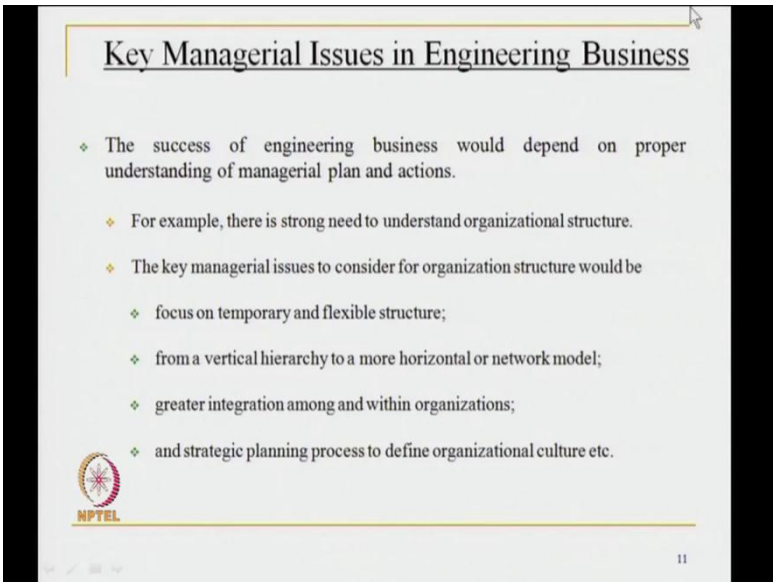

What then are the key managerial issues in engineering business? As you notice I am conveying through the screen, the need for proper understanding of managerial plans and actions; for example, there is strong need to understand organizational structure. Because work flows through the organization structure and we will have a separate input on organization structure, even in this module; which means that a conscious and a sensitive intervention on the part of the manager, for channelizing activities and handling processes is the key to handling in engineering business proactively.

Structure should not be taken as permanent entities but need to be adapted to the business needs. Therefore, the recognition that all structural designs are by definition temporary and need to be hugely responsive to the demands which are made on them and not preempted a good business decisions; because, the structure has not been enabled to handle it. In organization, after organization I have noticed, that systems and processes becomes so oppressive; that are times good business deals fall through. Because, internally somebody knocks it down as not acceptable because it has not been incorporated in to organizational functioning and it seems to me that is the last argument in business relationship to accept and yet we all know that it can be very true.

The supply is indeed not just to engineering business, but this supply is even to mega organizational firms when it comes to their recruitment; the compensation packages, the kind of flexibility some individuals may need, but the system does not take it in. Because

nobody knows; what is the acceptation to be made, where it is to be maid and where the acceptation has to be stop to say this is not a precedence to be quoted? In other words, if you want a good engineering business if I might say so you would need a structure which is capable of being sensitive to business requirements. From a visible vertical structure to a more horizontal or network model is an old argument we have heard that before, but that does not prevent it from being valid still.

Greater integration among and within organizations again is essential because, there should be not only an interactary relationship; what an opportunity to influence each other and if not influencing each other, at least tell each other. What your requirements are because, it is only then and then that the other components of the organization can be expected to the possibilities respond to what your requirements are. The strategic planning process needs to be of help to define organizational culture. That does not need too much of elaborations.

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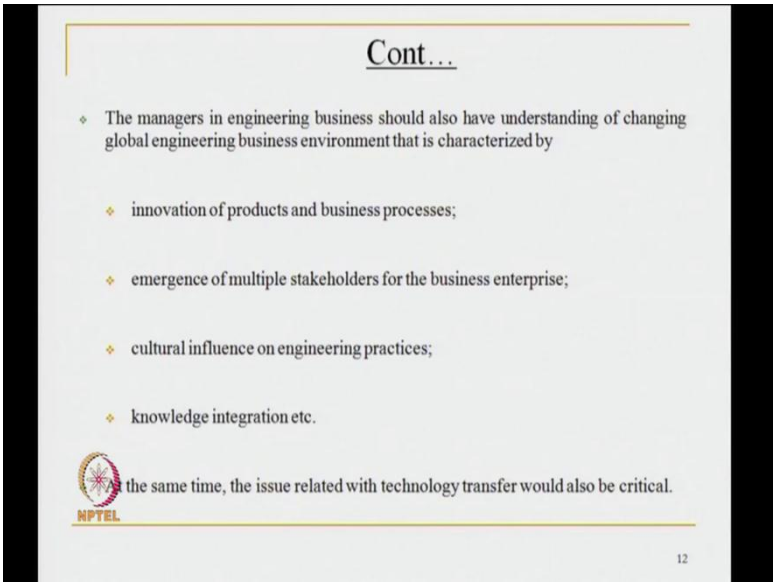

The manger of an engineering business; should also have an understanding of changing global engineering business environment which as of now is characterized by innovation of products and business processes; emergence of multiple stakeholders for the business enterprises; cultural influence on engineering practices; knowledge integration. Now why do I emphasis here, the need for understanding and global engineering business because, engineering business is really rooted in creation of standards and creation of standards is

rooted in compatibility of equipment. The need to have, patterns which are serviceable beyond linguistic barriers, because engineering has to have as its element of compatibility.

Of course depending upon the type of the product the scale of compatibility can be limited or large, but if you come to say again to go back to a highly useful example in this kind of discussion if you go back to telecom; you needed an international telecom union because, you cannot run the telecom business without cross border handling of technology. That however, may not be a situation when handling water pumps, which is why right in the beginning I talk to you about engineering business in the small firm area, in the medium firm area, in the large firm area. What I need to have awareness of the changing global patterns in engineering business is a must because, this can lead to local innovation, it can lead to cross cutting, it can lead to optimization of materials and above all it can give messages for direction of the forecasting of skill deeds and therefore, kind of skill formation that needs to be in encouraging engineering institutions.

So, to give a quick recap; innovation of products and business processes is a must emergence of multiple stake holders, requires a business enterprise to be responsive because, earlier on the environmental stake holders was not as articulated as where today; the policy complexity was not as large as they are today; the kind of turbulence which notices in the business environment; the kind of a currency fluctuations which are taking place were unheard of 15 years ago.

So, it is quite obvious that there is an emergence of multiple stake holders and no stake holders can be ignored unless they are ignored at once own peril. As the world goes more global the local influences or global patterns are have become larger; which is why I have said here in this slide, cultural influences on engineering practices have to be understood and this is an area, which at the movement has not been receiving as much as attention as to my mind, which is important. While talking of the cultural influences on engineering practices; obviously, one has to look at knowledge integration.

But none of this is likely to happen unless the issue related with technology transfer would be critical and issues of technology transfer are as tricky as international relations. And I have seen studies which have established how the same technology was sold multiple times to different clients, within the boundaries of same sovern states. Because, the clients themselves did not know what the other client has purchased, or the price at which they had

purchased and anyhow exclusivity of technology transfer falls; where it is sold to multiple clients were in a competitive mode in the same domain.

So, there are tricky areas of business which need to be accounted for, which need to be understood, if engineering business is to have practical orientation and it is obvious, that many engineers are not aware of these kind of fluctuations which can and do take place and if there are people who understand the commercial transactions and no such fluctuations can take place are not in a position to influence the engineering practices. So, it seems to me, that there is an obvious of creating a dialogue and the dialogue would come through creating skill formation through management of engineering business there are other ways of creating this dialogue, but this certainly is an important way.

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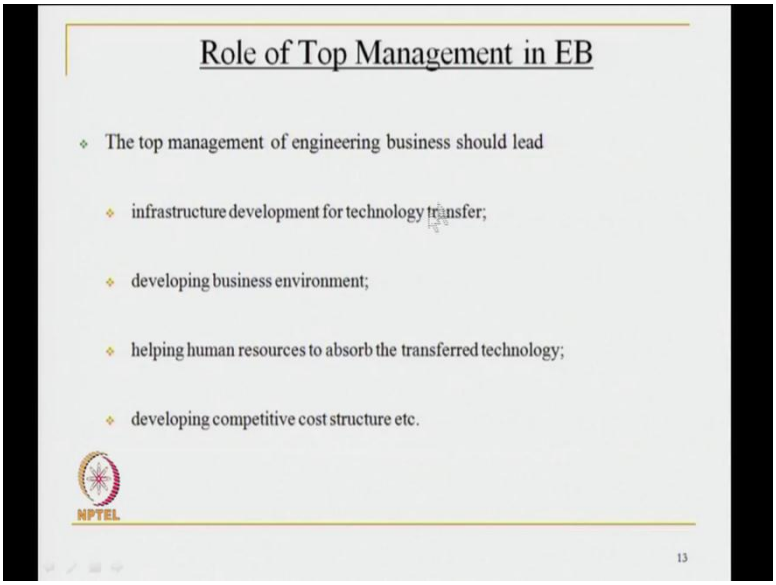

The role of top management in engineering business; the top management of engineering business should lead to infrastructure development for technology transfer. This to my mind is a must; it is only then that you will able to develop a business environment.

If you have created the infrastructure development, for created the infrastructure; for development of technology transfer. It will lead to technology flow and this I consider important to register, technology transfer is never a one stage phenomena. In fact, technology transfer has no meaning; unless continuous upscale ability is an essential part of the transfer. Similarly developing business environment would be essential to make sure the infrastructure developed is sustainable. How do you create a business environment? Which

is supportive to this, by a sustained comprehensive awareness campaign; which I believe should be developed as a specialization in management of engineering business.

What is the specialization I am talking about? I am talking about creating all, in all stake holders and awareness of what it takes to run engineering business successfully. Technology transfer however, does not stop with technology, being move one point to another. Technology transfer can be complete only and only when, the human elements have absorbed that technology and that takes lot of time. If you want me to make an illustration, just consider how many other wise perfectly competent gadgets of television use recording device to record a program while they are watching another and how often they go back to replaying it and what is the incidence of the usage of this technology at engineering business option by the user even when it is available. Developing competitive cost structures will inevitably becoming a factor of this and that will have a downward spiral. If the facility is which arise out of engineering business are not being used.

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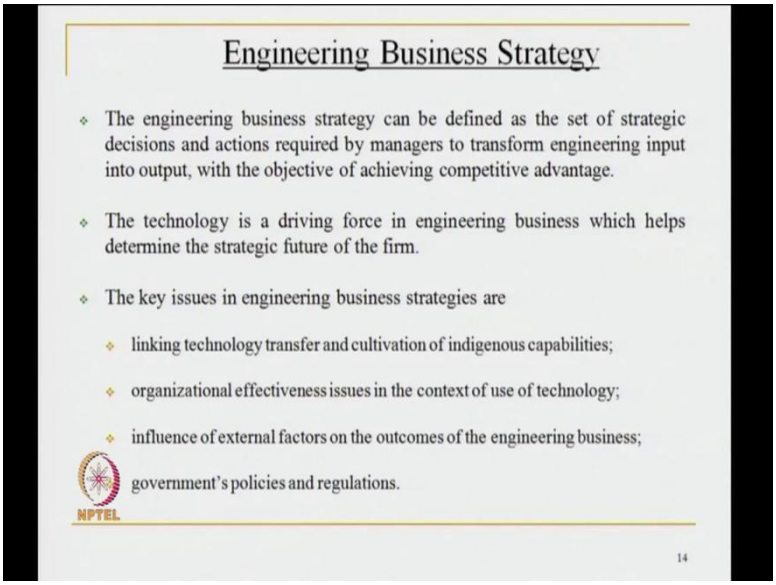

This leads me to a very important proposition; which I will partly discuss in this session and will come back to later on when I want to focus attention on how, engineering business will require a strategy. But before we talk of engineering business as a strategy; you would do well to appreciate that, engineering business can be defined as the set of strategic decisions and actions required by managers to transform engineering input into output with the objective of achieving competitive advantage.

Let me read this out to you because, it is an important line of thought; the engineering business strategy can be defined as a set of strategic decisions and actions required by managers to transform engineering inputs into outputs, with the objective of achieving competitive advantage. Each engineering business activity therefore, requires a culminant strategy. The technology is a driving force in engineering business; remember the distinction which I have drew between technology engineering and equipment; which helps determine the strategic future of the firm.

The key issues in engineering business strategies are linking technology transfer and cultivation of indigenous capabilities. I am building upon sensitizations and the absorption factor, as elaborated earlier to cover now indigenous capabilities. Organizational effectiveness issues in the context of the use of technology; machine maintenance and acclimatization, up gradation, upscale ability.

Whether proudness, or if I might use a word which lost it sheens some decades ago, but I think it remains valid even today mansoonized. It is not just space temperature control, but prevention of the corrosive influences of moisture on equipment. Context of the use of technology, influence of external factors on the outcomes of the engineering business, and government's policies and regulations. All these together creative frame work for engineering business, which will have to be interpreted in the context of the firm; in the context of the industry; in the context of the actual products which you it in hand.

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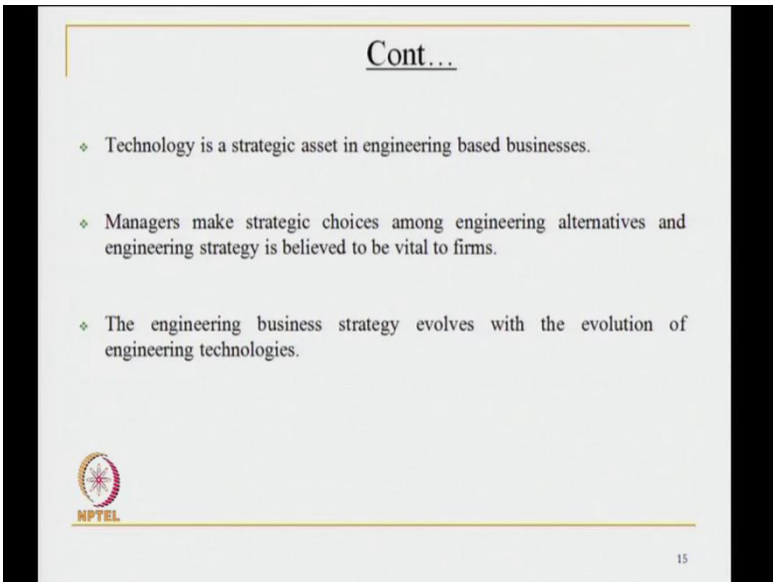

Because technology is a strategic asset in any engineering based businesses, and how do create a strategic choice around a technology assessment an evaluation which will lead to an enhancement of engineering business is the question, which will be the seed bed for a lot of business success or a lot of business disasters. The manager makes strategic choices amongst engineering alternatives, yes that needs a reputation. The manager will have to make strategic choices amongst engineering alternatives and for that engineering strategy would be vital to firms; the engineering business strategy evolves with engineering technologies, which in turned have close linkage with engineering business. So, to sum up therefore, I am drawing your attention to a linkage between engineering business strategy, with engineering technologies, with engineering business and if the three can be put in a comfortable relationship with each other, I think the act is on.