

Indian Institute of Science
Bangalore
NPTEL
National Programme on
Technology Enhanced Learning

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Global Supply Chain Management
Lecture -14
Innovation in Supply Chain Ecosystem

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Our focus in the this lecture and the next one.

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Is going to be on innovation so of course innovation is an important subject and it is a very popular subject now everybody talks of innovation the tower focus is going to be innovation in emerging markets and I am going to first define emerging markets and then look at what kinds of innovations are needed for the growth in the emerging markets arena and also will I will use the ecosystem framework to find out all the possible innovations and so that once.

You have a company or you have a vertical then if you want to study the possible innovations and how they can coil wall and everything will lead to a blockbuster industry then that can be studied using what we are doing today so the innovation by itself in a product or a process is not very useful it requires lots of other things for being for being successful so we are going to deal with this in the next lecture in this lecture and the next one so when first as I said.

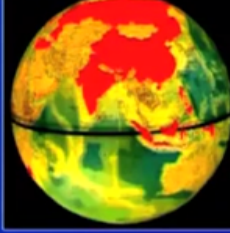
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Ecosystem Aware
Global Supply Chain Management



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We first define mature markets and define what is called successful innovation. I mean there are lots of innovations that came in but do they lead to successful industries and so that they are useful to humanity and we will talk about the innovation framework the innovations in the supply chain resources governments and delivery mechanisms these four are the components of our ecosystem.

I will give innovations examples of innovation the Telecom growth and will conclude so here this particular picture is the one that they were shows you bought they developed an innovation in the emerging markets so the red ones which is India China and several other of this one the so-called south there are the emerging markets and the developed market are the United States Europe and so on.

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What are Emerging Markets?

- Emerging markets are countries having increasing disposable incomes, large young populations and markets with characteristics as high-growth, high-potential, and high-risk, a consequence of economic liberalization.
- Most of these are protected economies for decades & have poor industrial infrastructure.
- Governments liberalized the economies to attract foreign investments in Manufacturing, Services & Infrastructure and introduced initiatives such as PPP & SEZs.
- Politics & Social issues are very important for Businesses.
- Most populations live in rural areas with poorer connectivity than their urban counter parts. Rural development is largely in the hands of the government.

So what are emerging markets emerging markets are or countries having high disposable income large young populations and market with characteristics as high growth high potential high risk and as a consequence of economic liberalization so this particular definition is important because countries like India China the so-called BRIC countries Brazil and Russia.

They have basically high populations but the 50% of the these populations or yet in other words they are between 80 they are below 25 years of age and the markets are high growth because the industrialization has started and that led to high retail and it has high potential and also high-risk high risk because if you do not do the marketing well if you do not produce the right kind of products then you are likely to fail and these level economies have liberalized or levelized only recently they were all protected economies like India.

And so the liberalization has led to the MNCs the multinational companies coming into the country but also it has good it has led to a lot of growth so emerging markets having populations one has to take these into consideration and population and a market with high growth high potential as well as high risk they are just coming out there just getting liberalized and so what kind of products and services they need and at what cost and can you make them available and so on.

So that is the issues most of these are protected economies for decades and have poor in industrial infrastructure for example the initial infrastructure are the clusters the ports the airports roads not on just people traveling but the roads were they trucks heavy-duty trucks

traveling and also the trades you had transport and so on and also shipping so this industrial infrastructure and the vehicles was transfer of freight is very important and they have poor industrial infrastructure .

So government liberalized these economies to attract foreign investments because the economics takes over politics and in manufacturing services and infrastructure they have introduced initiatives such as public-private partnership it is also called PPP and also special economic zones and they have given a lot of sobs to these companies so that they can enter into the country and do their business here so this is so-called business friendliness of these countries to foreign this one this is basically to attract investments.

Because any manufacturing a service infrastructure takes a lot of money and these countries which are just liberalizing they do not have the government's do not have the money to develop the infrastructure so they enter into private partner public-private partnerships and also just create assets and ask people to set up their own shops well the result of this will be employment creation and also all the goods and services or will be available to its people and so on.

So that is why the government's have liberalized its economies political and social issues were important for businesses so business is not just business so you had to worry about the societal issues that you are causing because of the business and for example when you are doing the foreign direct investments that is when the money has to come inside whether money has to go outside of the country are also people from other countries need to work for you require visas you require permits you require foreign exchange .

We have to follow foreign exchange regulations and so on and similarly social issues if you start giving jobs to outsiders just for whatever reasons because they are more efficient because they have more skills or something then the local people will try to get into hesitations because they think their jobs and whatever I do for them is being taken by taken away by others another thing is if you take a country like India you have one point to 2 billion population and after which 400 people 400 million people they live in urban areas and 800 million people live in rural areas .

Now the rural areas have poorer connectivity than urban counterparts and rural development is largely in the hands of the government in other words if you want to develop robots and the

telecom infrastructure the aqua infrastructure and so on or any SMEs small and medium enterprises and so on the government has to do it because the private partnerships will not work there A and private companies are much more afraid to get into the rural areas because A infrastructure is low and the population is not very well . So very well-educated to understand the implications of the government .

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So if you look at the emerging markets here is something which I took from Wikipedia and have Brazil Chile China Colombia Czech Republic Egypt Hungary India Indonesia Malaysia Mexico Morocco Peru and so on these are some countries which are the list but the list gets updated every year so you need not have taken this seriously but this is a representation of what are the emerging market countries .

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Emerging markets can be classified into two groups

- **The first group** consists of countries such as Mexico and those in Eastern Europe which are on the periphery of the industrially advanced continents such as North America and Western Europe.
- **The second group** are primarily independent production and consumption spaces such as China and India. In these countries, production is oriented predominantly towards the domestic market and these requirements are met predominantly by local production.



So there are basically two kinds of emerging markets the first group consists of countries such as Mexico and China and Eastern Europe which are in the periphery of initially advanced countries such as North America and Western Europe for example Mexico is on the border of United States so a lot of people since the Mexico is an emerging market not have a lot of companies in the United States set of factories in Mexico using the NAFTA FTA.

The North American Free Trade Agreement this one they will establish factories and use the Mexican manpower and the resources that Mexico has to basically produce products cheap and they send it across the border to buy trucks to the United States so that is the kind of first group of countries that they do similar is the case with the Eastern Europe countries but they are second groups which are primarily independent production and consumption spaces like China and India.

Now this country's production is oriented predominantly towards domestic market and these requirements are met by local production now whatever the whatever they are going to produce for the local market they are going to export so this is one of the principles of global trade where you know countries which are which have high local markets are the ones who are basically exporters of goods.

So that is what is happening for the second group so the first group just produces products for export the second group produces products both for local consumption as well as for export but suppose we should mention that we both in China and India have special economic zones and

other kinds of places regions inside the country where goods are produced only for export but these goods are also produced inside the country not outside of this special economic zones. So that they can be used by the local population.

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The slide features a blue background with white and yellow text. On the left, a vertical banner reads 'Ecosystem Aware Global Supply Chain Management' with the NPTEL logo at the bottom. The main title is 'Emerging markets will be the World's Next Fount of Innovation'. Below it, a bulleted list contains four points. A man in a light blue shirt is shown from the chest up, speaking, overlaid on the bottom right of the slide.

Emerging markets will be the World's Next Fount of Innovation

- Each week, nearly one-and-a-half-million people move to cities, almost all in developing markets.
 - China and India are seeing five time labor productivity growth as they move from agrarian economies to become manufacturing and service powerhouses.
- By the end of the decade (2020), roughly 40 % of the world's population will be middle-class (20% today).
- In the next decade, emerging-market economies, currently suppliers of low-cost goods and services, will become large-scale providers of capital, talent, and innovation.
- To tap these new markets, organizations must reinvent business models, innovate new products and services.

So emerging markets will be next fount of innovations this one that is because each week nearly one and a half million people move to cities almost all of them in developing markets China and India seeing five times labor productivity growth as they move from agrarian economics to become manufacturing and service powerhouses so it is known that China is the manufacturing happened India is the IT hub or the back office of the world and so on.

And so basically because of this that the labor productivity if you compare the labor productivity from agriculture to manufacturing to services then it is increasing several folds and they are becoming powerhouses by the end of the decade roughly 40% of the world population will be middle class which is 20% today so what is a middle-class mean middle-class means that these are people with high incomes and they spend more on transportation education and food another healthy food and so on.

So it becomes that this emerging markets as they become more middle-class oriented then there is going to be the industries which is like food industry the retail industry and the education and other services they need to be upgraded in the next decade emerging market economies currently suppliers of low-cost goods and services will become large-scale providers of capital talent and innovation.

I mean this is a hope that since the economies are growing at 8% 6% whatever so the emerging market economies they are basically at the tail end of the supply chain that is they produce low-cost goods and services and the components and so on but soon because of the increase in the middle class and so on they will become providers of capital that means they can they can become MNC's as well as talent and innovation.

So this is already happening in some other countries so to tap these new markets organizations must reinvent business models innovate new products and services so how do you tap an amateur market what are the kinds of innovations that you need is it the same thing that you do in advanced countries the answer is no so what are the kinds of products and services that I should do and how do I make my company more blockbuster industry or how do I make more money how do I get more make more brand orientation. How do I make my product the best product in the market these are the kinds of things that one should think of .

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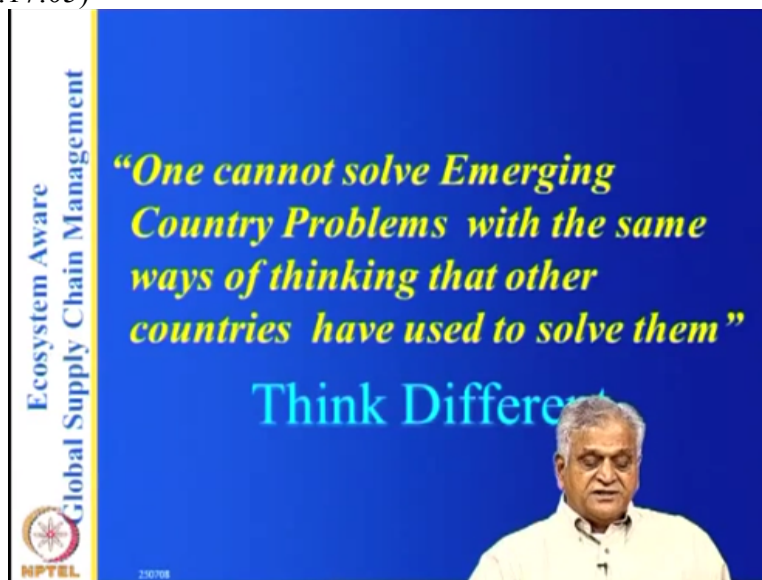
So what is innovation so we defined the emerging markets and what they want and so on innovation is search for and discovery of development and improvement adoption and commercialization of new products processes and new organization structures and procedures so everything is new is innovation that it be a new product like a cell phone like a PC like a laptop or anything is a new product it can be a new service like IT service it like search .

It is a new service that is provided advertising using search is another service that that comes on and so on there can be new organization structure previously people used to have hierarchical structures for their companies nowadays people are talking of orchestrate in other words you do not want anything but you basically manage the orchestrate all these activities by having connections not power so you may not have any authority over the others but there you basically use the market power to make people collaborate with you and so on.

So these are the kinds of innovations that we are talking I will define the innovations in the ecosystem framework which is a much broader perspective then the innovations that usually people talk about people usually talk about innovation of products and innovation of processes but there are other innovations like government deregulation is an innovation anything that leads to a block buster industry is an innovation.

But it is also important to note just an innovation is not enough like you have a product innovation but the history is full of examples their products which are very good useful but the companies can manufacture it but they could not market it and so they have to leave them and some others have taken out they taken it up later so basically that is the innovation is just not a definition but it is a process .

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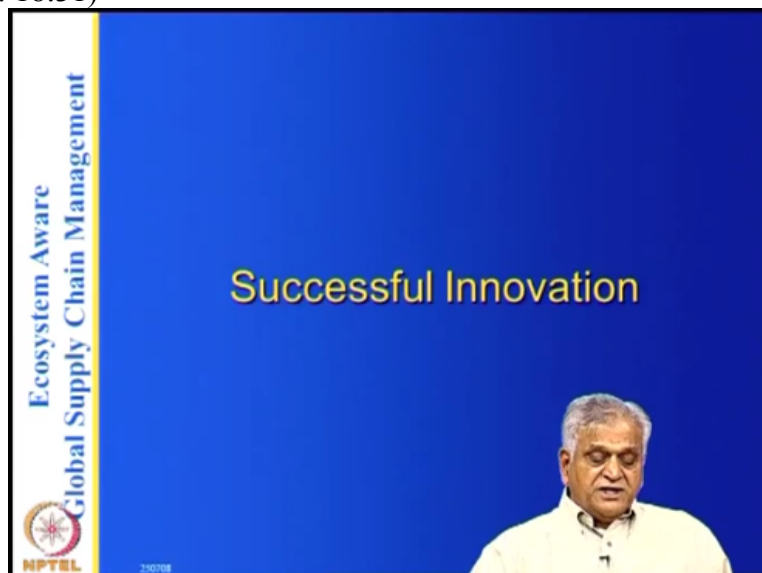


And another thing people should remember since we are talking of him innovations in emerging markets one cannot solve a mature market country problems with the same ways of thinking that countries have used to solve them other countries have used to solve them you know for

example if you want to have energy-efficient car in the United States that is different from an energy-efficient car in the US energy-efficient car in the United States could be electric cars.

If you want to reduce the use of oil and so on but then in India electricity is expensive it is not available and so on it would be a different source in Russia it could be oil this oil is very cheap so it could be diesel and so people have to look at their own solutions for example which the small car in India people the big companies have started their marketing their cars the highly fuel-efficient cars although they are being into India.

But they were not successful until they make small car using Indian components and so on. So basically it is important that you look at the countries each country as a different one take the culture take the social groups and the habits into account while designing the new products .
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Wider Innovation Policy Needed

- Traditional science policy** is rooted in scientific discovery & invention followed by commercialization of new products and services.
- A Wider innovation Framework** includes both the new to the market as well as new to the world innovations
- Innovations in Management** (like Outsourcing) and Institutions (Policy, Regulation & Governance) need to be incorporated
- Innovations due to convergence** (Finance with Mobile) as well as co-evolution (Globalization) are very important.
- Science, Technology, Engineering, Regulations & Policy, Management (STERM)** contribute to innovations.

So what is successful innovation. So we need a wider innovation policy traditional science policy is rooted in science discovery invention followed by commercialization of new products and services so if you talk to people what they do is they have a scientific discovery and invention they patent it and follows by commercialization and if it is a pharmaceutical product then what they do is they test it with various people and then the clinical trials along with the products and all are submitted for clearance.

And the new products then are commercialized but the wider innovation policy is needed emerging markets so if the product has to be new supposing you are looking at in a emerging market with some services like telephone now telephone services exist in other countries and the telephone cell phones exist in other countries but if you want to bring the telephones to an emerging market like India.

Then it is not enough if you just bring those telephones and then try to sell them here and set up a network we will see that it is much more is needed because the government is regulated and history and if you want to have a cell phone for \$500 that is very expensive for India and if you want a cell phone with videos audios and so on then that is not needed here so what is the market like in India like 800 million people.

They had 7th grade or less and they want something to talk and here they can they are intelligent people they can talk and do business talking they cannot read or write so for such people you require the technologies are different it has to be audio-visual technologies and so basically you

have to look at it is a new product but it has to be market and it has to be much cheaper because if you have \$500 that is very expensive in India.

So basically you have to take care of what are the local conditions and introduce this and the product need not have to be new to the world they need not be innovative product a cell phone there is no innovation in the cell phone but what you have to do you have to innovations come in manufacturing a cell phone for a lower cost by using standardized components so that is the kind of innovations that are needed in emerging markets innovations in management for example outsourcing is an innovation instead of doing at home .

You outsource innovations in institution like policy regulation and governance they need to be incorporated for example the history is full of examples where deregulation of the airlines the regulation of telecom and several D regulations have created two blockbuster industries private industries so like they so many airlines have come in the United States as well as in India Jet type and so on there are several telephone companies have come in like Airtel and others.

So but their innovations also due to convergence for example they financed with mobile as well as co evolution or Glow evolution very important so an innovation by itself may not be very good a cell phone a financial innovation like you can transfer money through a cell phone that is an innovation so it is a kind of a chance of two fields one is the finance services as well as the telephone services .

And the cell phone as well as co evolution it is not just enough to have a product this one you have to basically have resources for a manufacturer of the product at affordable prices and you have to have the government clearances for those kind of products and you should be able to deliver it to your customers so whenever you are looking at manufacturing a product and patenting it you should also look at how innovatively you can deliver that particular product .

And what are the government institute your regulations that you require if we do not require any government clearances that is fine first most cases you require government clearances but how do you get them and also what are the kinds of resources that you will need highly skilled labor or power or is it telecommunications infrastructure so you have to basically look at this the other elements of the ecosystem.

So that things can go a wall in other words it one anything cannot survive by its own so wider innovation policy is much more than just the drug disk discovery and commercialization it is it

can be a new discovery or it can be new to the market kind of thing you it is available somewhere else you are bringing it into this country and to during this process you can make several innovations in the business models in management in the government regulations as well as you can basically do convergence with other technologies and so on .

Science technology engineering regulations and management this is called this term framework contribute to innovations all contribute to innovations and the evolution co evolution of all this is important for getting this. So let us look at innovations that created the blockbuster industries.

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The slide is titled "Innovations Created Block Buster Industries" in yellow text on a blue background. On the left side, there is a vertical banner with the text "Ecosystem Aware Global Supply Chain Management" and the NPTEL logo at the bottom. The main content is a bulleted list in yellow text:

- **Products:** Nano, Video Games, Cell phones, Search engines, iPod, Wikipedia
- **Services:** E-mail, e-retail, Face book (social networking), Solar Power
- **New technology solutions** to redesign of services (water, power, gas, construction, banks, education) to be intelligent and smart
- **New Business models:** Containerization, Outsourcing, BPOs, FDI, Sell direct, e-retail, ATMs, Clouds, PPP, Orchestration,

A man in a light blue shirt is visible in the bottom right corner of the slide.

So these are for example the products like Nano and video games , cell phones, search engines iPod, Wikipedia for example you have the search engines because of these search engines you know you can get almost anything and a people it is a library by itself if we go to Google or Google Scholar you can search for all the papers that others have written it and you need not have to sometimes.

We may have to subscribe you can do online subscription and so you need to do the library physical libraries or basically or getting a beating because of the search engines of course Wikipedia is like an circular encyclopedia which is referred very widely and so on and of course there are video games there are cell phones and the search engines is the biggest thing that has happened in recent times .

Because at the libraries advertising and are all basically being replaced by these search engines you have iPod basically for music iPod for all kinds of things it is a computer it is like a cell phone it is a music player all integrated into one and a textbook or a magazine anything you can download and read this so it becomes there once one destination for several things that you want to enjoy.

So all that you have to carry is whatever thing your presentations your reports your bank accounts everything an iPod and you can you can safely travel on this there of course services like email ,e-retail a Facebook social networking like and then solar power there are all these new services that have come of course all of us know how much email has revolutionized and people have thought that the postal services which will take letters will disappear .

And also the people have predicted that FedEx kind of document transfer as is also getting a hit but it so happens that also the another thing is the newspapers printed versions are getting a hit because you know everything is available all the news is available in one form or the other in a customized fashion to the subscribe to the subscribers or to the viewers it is almost free.

So that is where you are getting services which are replacing the newspaper , e –retail literally you can order a telephone you can pay your telephone services using this one you can order your airline tickets bus tickets you can order your train tickets everything through the email or through the web and of course the Facebook is one of the things that has come recently that is the this is a social medium .

But person-to-person where you can network with all your friends share photos share everything with them of course solar power is the one with the oil prices increasing and also with the concerns of the governments and the people on the GHE gases the solar power has become quite prominent nowadays.

So we have a new technology solutions and this to redesign the services for example the water power gas construction ,banks ,education these are all service networks which were designed several decades ago but if you want to make them they redesign them say water network with sensor networks with the smart meters and if there is any leak somewhere anywhere then you know automatic detection .

And then it is confirming it to the maintenance to the staff where the leak is and how it is to be filled and all that similarly with the power gas and construction a banks and education so all

these services need to be designed for example in the banks you have ATMs now basically which use the several automation technologies there is the material automation and you had to insert your card then it will automatically find out whether you are the owner and once you have the password then it will search for your account and find out you have the money and the money you still word here .

So there is the material there is the information that is the control and also there is the machine to person that human to machine interaction that is when you insert the card you it is usually insert able into the machine and also the machine interacts with you so that and it also machine finally gives you the money so there are there are four kinds of automation that are involved the material information and as well as the human machine interaction are all automated.

In an ATM machine and of course there is the control aspect here whenever if you typed the wrong password or if you the money does not exist in the ATM or something then it is going to be indicated saying that sorry we cannot give you this money so new technology solutions are basically taking the forward taken forward new business models for example containerization any earlier it used to be a brake book in other words you put it in bags.

And then put it on the ship but now you have standardized 24 by 24 by 24 containers and you put them all whatever material you have whether it is full or not then that container is identified with the materials it has so there is standardization of transport and of course this has to tenderize the container has to move from the factory to the ship to the port from port to port as well as the port again back to the warehouse .

So there are several things which needs to be standardized up depending on the size of the container one is in the shipping second one is in the transport third one is the forks and other things at the port where the container is located or stored now of course outsourcing has become so common with the global globalization and that is an innovation and you have BPOs Business Process Outsourcing .

Where you have people across the world anywhere in the world who are monitoring and I am dictating what should be done in the other part of the world this can be I give an example of the trucks of Penske basically how they are executed the truck the transfer of materials from a supplier in somewhere in one state in the United States to Detroit why the trucks of Penske

which is a logistics which is a freight for a wiring company and that basically shows you how a BPO can execute.

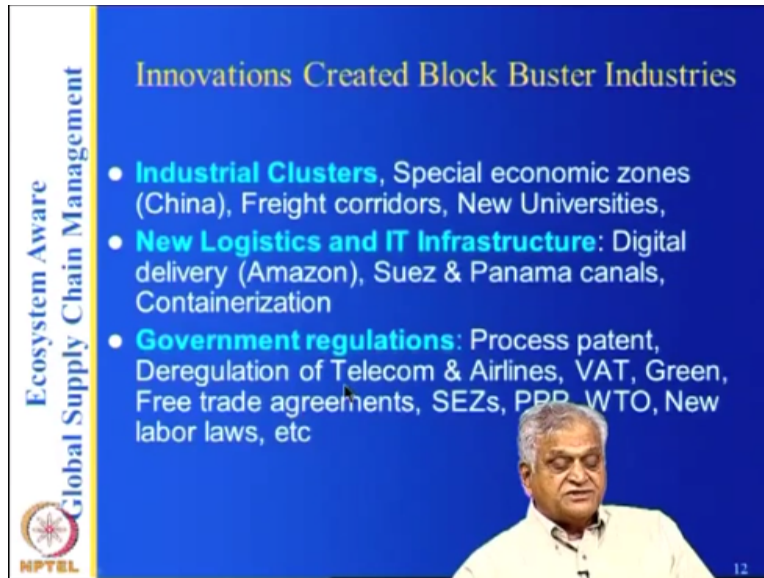
BPOs have jumped back in India and all the transactions are conducted by the BPO staff here you have foreign direct investment that is the sell direct in other words earlier any of these sales you used to happen through either distributors and retailers or some brokers but now can you sell the items directly to the customer well this is one of the innovations of Dell and where Dell was selling the computers there pieces directly to the this one .

I sell direct of course e- retail ATMs cloud computing is one of the innovations we are going to talk about this one of the biggest innovations now earlier if you want to set up a company you have to have your computer systems all your data stored in servers and other equipment and interconnection and all that but then you know in other words if you want to start a company having all this computer hardware ,software and all that and is going to be an expensive proposition particularly for startups .

So what people are doing you have a cloud where basically it is a service you basically connect with a cloud store or your data and you pay per use in other words depending on the gigabytes of data that you are stored and the amount of time you have stored so you can pay this is like you pay for storing some of your goods in inventory in a warehouse it is a similar concept it is called paper use.

But of course there are other this one like PPP which is public private partnership in stuff one single fellow the government doing everything you know you have partnerships with the private companies orchestration is where you do not want everything you just orchestrate you take responsibility for the functioning of all the always is one and so on so instead of this one you can do you can sell items eBay basically is an auction site where items are sold on the web.

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Innovations Created Block Buster Industries

- **Industrial Clusters**, Special economic zones (China), Freight corridors, New Universities,
- **New Logistics and IT Infrastructure**: Digital delivery (Amazon), Suez & Panama canals, Containerization
- **Government regulations**: Process patent, Deregulation of Telecom & Airlines, VAT, Green, Free trade agreements, SEZs, PPP, WTO, New labor laws, etc

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There are other you know industries like in the industrial clusters these are special economic zones in China freight, corridors new universities now for example there are several innovation you new universities which were created to support certain industry verticals like IT like the university like skilled training centers a new logistics and infrastructure digital delivery for example Amazon sells on the web and it tells all the products .who make them the books and other kinds of things you deliver them on this and they are basically Suez and Panama Canal .

So as I told you yesterday it saves thousands of kilometers of travel distance because of the creation of these canals so these are all new logistics and IT infrastructure that has happened and of course the government regulations has said the patents whether it is a product patent or process patent the government has to decide deregulation of telecom and Airlines the value added tax green regulations are another one that that is going to impact the industry very well .

In other words how much GHG cases per vertical free trade agreements between two countries and then special economic zones PPP WTO the membership at the World Trade Organization new labor laws for example labor laws in terms of their wages in terms of the holidays they get in terms of how to their exit in other words if somebody is not doing well or you the labor laws may not allow you to fire them but will they will they this entry and exit strategies for the labor. They are all is it possible to change them these are all could be innovations that can create this one.

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What is Successful Innovation?

- Innovation involves acting on the creative ideas to produce products or services that make a tangible difference in their use.
- Innovations leading to commercial success are of interest in both Developed & Emerging markets
- Block buster industries are generally a result of co-evolution and convergence of several innovations
- **There were several innovations in recent times that have revolutionized the way we live, the way we communicate, the way we work and the way we spend our leisure time.**

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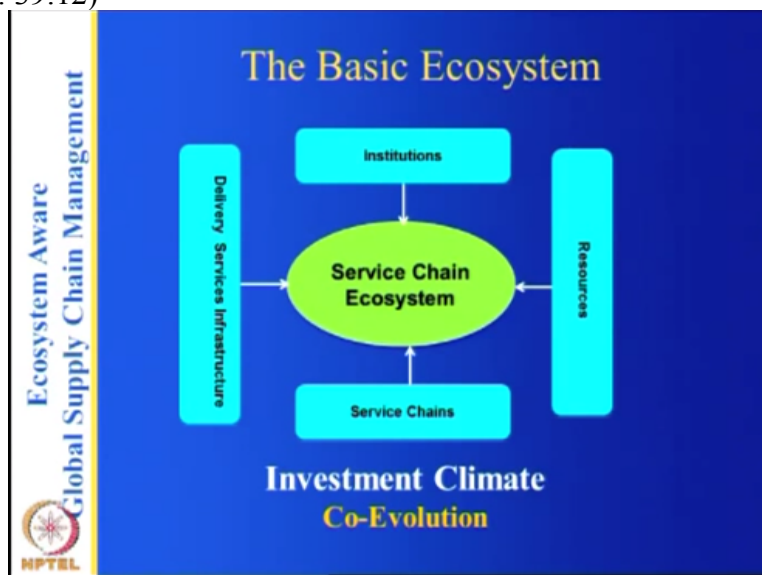
So what is a successful innovation basically a successful innovation acting on the creative ideas to produce products and services that make tangible difference in their use that is a creative idea and innovations leading to commercial success are of interest in both developed and emerging markets and blockbuster industries are generally result of co evolution and convergence of several innovations.

See one should understand one single innovation in a product or service may not lead you to a market success to basically get that product manufacture it take it to the market make it acceptable to the compute to the community to the customers that takes the but that takes a lot of factors needed this so if you want to create a blockbuster industry this is a result of co evolution of several things and also convergence of several innovations .

Several innovations can be combined together in several technology as well as in other ecosystem parameters to get into a blockbuster industry there were several innovations in recent times that have revolutionized the way we live the way we communicate the way we work and the way we spend our leisure time alright so they are basically the TV the cell phone and so on. (Refer Slide Time: 39:07)



So what is the innovation framework.
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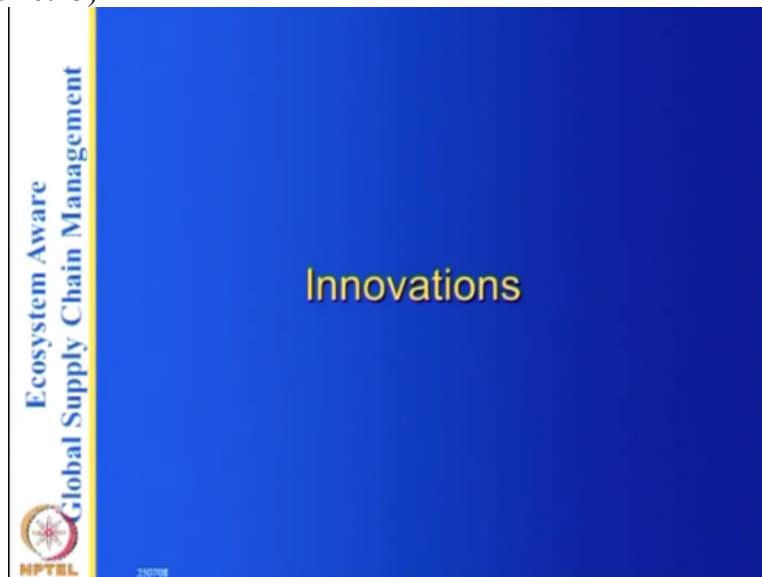
The innovation framework is that you have the service chain ecosystem this is the basic ecosystem framework and you have the service chains or supply chains you have the resources you have the institutions and the delivery service infrastructure so there is a basically an investment climate and co evolution so for the service chain for any innovations this is the innovation investment climate and there is a co evolution in other words if you want to make a product or a process .

And if you want it to succeed you require resources these resources could be skilled manpower or it could be some product resources and you require government clearances and social

acceptance you require finally whatever you product or service you have to make a delivery and you require the delivery surface service infrastructure sometimes you may have to have innovations in this to delivery your product.

For example to deliver a low-cost airline you may require deregulation without that help you will not be able to do it you may require several spare parts the petrol and other kinds of things available for a low-cost airline and you also have sufficient delivery mechanisms for airline tickets as well as the gas and other kinds of things.

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A blue presentation slide titled "Innovations in Supply Chain Networks" in yellow text. On the left side, there is a vertical yellow bar containing the text "Ecosystem Aware" and "Global Supply Chain Management" in black, and the NPTEL logo at the bottom. The NPTEL logo consists of a circular emblem with a red and yellow design and the word "NPTEL" in red below it. The main content of the slide is a bulleted list in white text:

- **Product and Value Chains**
 - Low cost high quality blockbuster products: Nano, Video Games, Cell phones, iPod, Search engines, www, Wikipedia
 - Designing products for efficient logistics: *Modularization*, Process Standardization
 - Distributed manufacturing, JIT, TQM, Procurement.
 - New technology solutions: Redesign services (water, power, gas, construction, banks, education) to be intelligent and smart, UID, e-health records, Clouds
 - Market Channel Innovation: Supply chain visibility, Joint Inventory management, CPFR, RFID, . Direct to customer, Home delivery, e-retail, International markets through JVs, Packaging for all sections of populations
 - New Business models: Outsourcing, BPOs, FDI, Sell direct, e-retail, PPP

So what are the kinds of innovations in the supply chain Network so in the four things I am just going to give you a list a very quick list we are going to get them into detail in the next lecture so product and value chains or low cost high quality blockbuster products like Nano video games and so on and designing products for efficient Logistics Modularization, Process standardization distributed manufacturing like JIT, TQM procurement .

New technology solutions like what I said like water, power, gas construction banks will be intelligent and smart and market channel supply chain visibility joint inventory management and so on and new business models like outsourcing the BPOs, FDI ,Sell direct ,e-retail and PPP and so on very quickly these are all the kinds of kinds of innovations that we required in the in the supply chain network.

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The slide is titled "Innovations in Supply Chain Networks" in yellow text on a blue background. On the left side, there is a vertical banner with the text "Ecosystem Aware" and "Global Supply Chain Management" in white, and the NPTEL logo at the bottom. The main content is a bulleted list under the heading "Institutions" in yellow. The list includes three items: Government regulations (Process or Product patent, Deregulation of service industry (Telecom & Airlines), VAT, Free trade agreements, WTO, New labour laws, Competition act, land acquisition act, etc), Green, Customs for perishable goods, Trade, Hygiene, Regulations on packaging, formulations, pricing, procurement like APMC act, Essential commodities act, Minimum support price for PDS, and Social factors, Labor unions, NGOs.

- **Institutions**
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 - Social factors, Labor unions, NGOs

And if you look at the institution's the government regulations like process or product patent deregulation of service industry , VAT free trade agreements new labor laws ,computation act ,Land Acquisition Act etc .so there the green customs of perishable goods trade hygiene regulations on packaging formulation pricing procurement like APMC Act I mean this APMC Act is an Act which basically prohibits the farmers directly selling to retailers they have to go through an intermediary called mundi ,essential commodities act minimum support price Act and so on.

So several acts in agriculture which are basically affecting the retail in agriculture social factors labor unions and so on.
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The slide is titled "Innovations in Supply Chain Networks" in yellow text on a blue background. On the left side, there is a vertical banner with the text "Ecosystem Aware Global Supply Chain Management" and the NPTEL logo at the bottom. The main content is a bulleted list under the heading "Delivery Services Infrastructure".

- **Delivery Services Infrastructure**
 - *Supply hubs, Cross docks, Postponement, Product recalls,*
 - **Shared services:** Containerization ATMs, Clouds, Orchestration, e-bay, social networking :Face book, Linked in, Twister, Canals: Suez, Panama
 - Cold chain, Packaging, Sensor networks for visibility, Delivery with bad infrastructure, Distribution backbone, Linking Ports and airports into the global transportation network
 - Soft Infrastructure: Trade facilitation, e-approval, e-letter of credits

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So we look at the products institutions and the delivery in the delivery you have for example we talked about supply hubs cross dogs postponement and so on shared services like containerization ,ATMs, Clouds ,orchestration and so on and cold chain packaging sensor networks for a visibility delivery I mean bad infrastructures distribution backbone and then also in addition to the hard infrastructure like wall chain and so on we have soft infrastructure like trade facilitation ,e-approval, e- letter of credits and so on .
So basically in terms of the delivery there are so many things that can be done now if you have a product to make that product a blockbuster industry and how to make it acceptable to all the people you have to look at the delivery how we are you going to deliver this product to the people if you want to make a digital delivery then you need to have the resources like the communication network the email and the search engines and so on.

So basically does your community help those so you may have to provide that kind of thing for example for containerization which is a simple thing like instead of having a bulk products export in bulk products you have put them all in a container in a 24 to 30 foot container and then send them across to make that happen it took several innovations several where you have to make these ships require you had to make the trucks carry those and there should be equipment to put this heavy 20 foot by 24 foot container into the cranes .

And other kinds of equipment which can carry these heavy loads and so several things had to need to happen before the containerization took place and in countries like India containerization is not a very popular mode of transport even today.

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**Ecosystem Aware
Global Supply Chain Management**

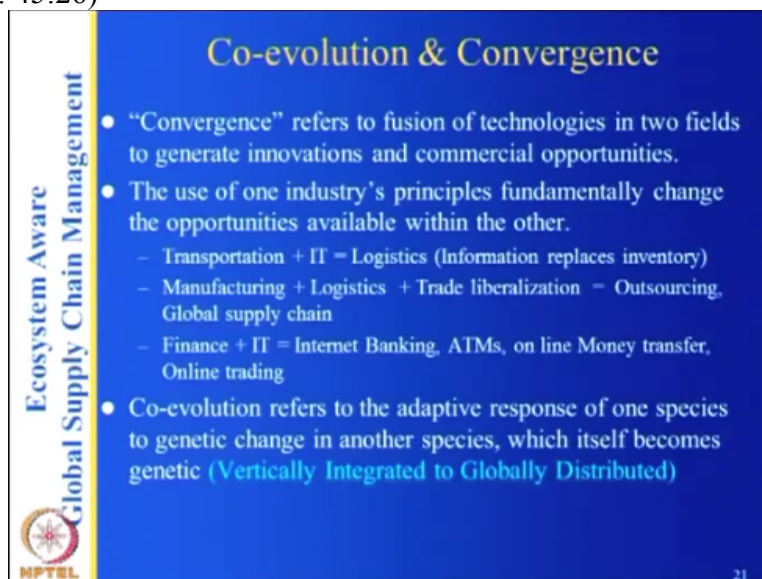
Innovations in Supply Chain Networks

- **Resources**
 - Water, Power, Financial Institutions, Research institutions & Universities, Product development and Testing laboratories, Creating new industrial clusters, Special economic zones, Talent.
 - New technology solutions to redesign of services (water, power, gas, construction, banks, education) to be intelligent and smart, UID, e-health records, land records

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So innovations like in resources their financial resources , research institutions and universities product development and testing laboratories creating new industrial clusters special economic zones talent and so on there for example new technology solutions as we talked about earlier .

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**Ecosystem Aware
Global Supply Chain Management**

Co-evolution & Convergence

- “Convergence” refers to fusion of technologies in two fields to generate innovations and commercial opportunities.
- The use of one industry’s principles fundamentally change the opportunities available within the other.
 - Transportation + IT = Logistics (Information replaces inventory)
 - Manufacturing + Logistics + Trade liberalization = Outsourcing, Global supply chain
 - Finance + IT = Internet Banking, ATMs, on line Money transfer, Online trading
- Co-evolution refers to the adaptive response of one species to genetic change in another species, which itself becomes genetic (**Vertically Integrated to Globally Distributed**)

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So what we are saying here is that you have all the four elements there is a list of innovations that can happen depending on the product that you have in order process you have in mind you have to basically look at convolution there co evolution as well as convergence refers to fusion of technologies in two fields to generate innovations and commercial opportunities like the fusion between cell phone and banking sector.

You could do transactional things online so that is a fusion here and the use of one industry principles fundamentally change opportunities available within data for example you have transportation industry add IT industry to that it becomes logistics now what is logistics information replaces inventory if you do not have IT if you cannot communicate with other people your communication among partner is difficult then what happens you have to keep lot of inventory .

Now if there is supply chain visibility if you know when your shipment is coming almost surely then you do not keep the inventory supposing your production starts tomorrow 9 o'clock and there is a delivery made today at 6 o'clock almost surely then in such a case you do not keep any inventory you take the truck directly to your factory and without inventory you can load whatever unloads in your truck near the factory and then start using it for this one.

So that is what happens by combining both transportation and industry manufacturing plus logistics plus trade liberalization plus outsourcing this is a global supply chain so basically it is the combination of all this Finance + IT = Internet banking ATMs online money transfer ,online trading and so on.

So co evolution refers to adaptive response of one species to genetic change in other species which itself becomes genetic rather words you have vertically integrated enterprises you know how to respond to them how to control them how to govern them and so on now you have globally distributed enterprises so you should be able to now manage them and now a wall various structures the innovations the risk how to calculate the risk how to mitigate the risk and how to govern the whole system using this that becomes a part of the co evolution like in this species .

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Ecosystem Aware
Global Supply Chain Management

Global Manufacturing Result of Virtuous Co-evolution

- Modularization of products and services had lead to local outsourcing within USA and later to outsourcing to low cost countries such as Mexico, China etc.
- Countries started liberalizing their economies and reducing the tariffs further encouraging outsourcing.
- The Internet has enabled error free secure communication among partners and also interconnection of company computer systems.
- Ports, Airports have been developed to enable transport of people and also freight of raw materials as well as intermediate goods . Trade facilitation and other innovations have helped the rapid processing of goods transfer across the borders.
- **Contract manufacturers and Third party logistics providers have proliferated boosting outsourcing in other sectors**

Globalization has become the genetic order of manufacturing and service industries

So basically if you look at the global manufacturing as I said several times before modularization of products has led to outsourcing and outsourcing has liberalized the economies and Internet has enabled into error-free communications ports airports have been developed to enable transport of freight and contract manufacturers and third-party logistics providers have proliferated and you have globalization has become the genetic order of manufacturing and service industries .So it is a kind of globalization is a kind of co evolution that has happened.

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So if you want to look at this and diagrammatically you have in earlier days the supply chain is products produced and integrated locally and you have resources vertically integrated localized enterprises which are the resources are there and institutions are local manufacturing that is controlled export and you have delivery service mechanisms ,paper communications truck transport serving local markets.

Now you can see the co evolution here of all this on all this you have from products produced integrated products to modular global production networks and that is made possible by globally distributed resource networks and that is you can you can basically use the other countries resources to manufacture your products and institutions have changed from local manufacturing controlled export to free trade enable global markets and paper communications have changed to Internet enabled 3PLs serving global markets .

So it is the convergence of all these forces that has led to the GSN whether this co evolution weather to evolve the instantaneous co evolution is not possible but one thing lead to the other and once this is successful then you get into you get into a big this one so that is how what co evolution is.

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Conclusion

- Emerging market innovations are to be socially responsible, environmentally friendly and audio-visual technologically advanced, delivering high quality products at affordable prices in accessible locations to their populations
- Co evolution of innovations in resources, delivery, Government supporting policies and in supply chains and convergence of technologies need to be orchestrated

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So to conclude this lecture we are talking of emerging market inter innovations they are to be socially responsible environmentally friendly an audio-visual technological advance delivering high quality products at affordable prices in accessible locations to their populations now each

of these adjectives is very important socially responsible because you should produce the things what are needed at their places and environmental friendly .

You should spoil those should not spoil the environment during the process audio-visual because people do not know how to read and write they can speak and intelligently and make decisions so it has to be audio-visual it has to be deliver high-quality products quality should not be compromised but affordable prices and they should be accessible if I am in a village and if you provide this in an in a city.

I had to go to the city and spend more mind going to the city then for the goods so you had to be make it accessible to this co evolution of innovation and resources delivery government supporting policies and in supply chains and convergence of technology needs to be orchestrated so basically one should look at how complex is innovation here it is not just the product or process or something how do you make it work and make the product reach the customers and make it a blockbuster industry thank you and then we will consider the next lecture .

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