

E-Business
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Lecture 19
Supply Chain Management - II

So we continue our discussion on integration and interoperability and so far we have understood, what is the meaning of integration? This integration is something which is strategic in nature and it has two components, one is collaboration and second one is interoperability.

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Supply chain Integration

- The extent to which the firm can strategically collaborate with their supply chain partners and collaboratively manage the intra- and inter-organization processes to achieve the effective and efficient flows of products and services, information, money, and decisions with the objective of providing the maximum value to the customer at low cost and high speed

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Then we started talking about interoperability. Interoperability is about technical and semantic compatibility between two interacting systems. These two interacting systems can be two ERP systems or it can be each individual ERP connecting to a centralized supply chain management system.

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Supply chain Interoperability

- Interoperability is the ability of two or more systems or components to exchange and to use the information that has been exchanged
- Interoperable systems require both the technical and semantics level interoperability.
 - technical interoperability: deals with hardware and software compatibility
 - semantic interoperability: ensures both the systems have the same understanding of different concepts.

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Then we also saw that why it is difficult to achieve interoperability? And now we are going to see, what are the basic concerns about interoperability? The two major dimensions which are of important for interoperability are interoperability of data and interoperability of service. Now coming to this interoperability of data two major issues come in. First one is finding and sharing information from heterogeneous databases.

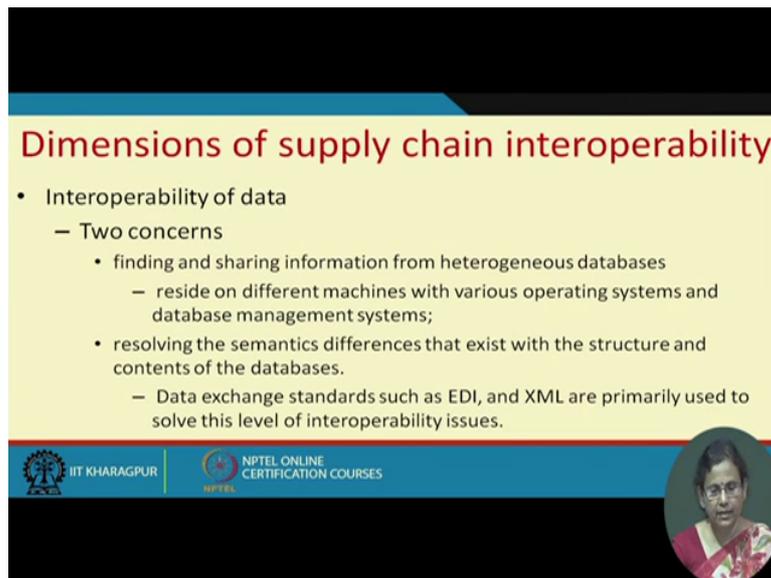
So these databases actually reside on different machines with different operating systems and different database management systems. So as I was telling you last class suppose on both the sides the operating systems are different and the databases are different and each databases the representation of the data they are actually different then appropriate measure has to be taken to resolve this issue.

Then second one is about resolving the semantic differences that exist between the systems with respect to the structure and contents of the database. So by structure of the database we mean let us say in one side we have this database one let us say it is Oracle and where we have the data stored let us say that shipping data stored.

We will continue with example of that transferring the advanced shipping notice from the supplier to the manufacturer. So let us say that advanced shipping notice is something which is stored in certain format in supplier database. Now how exactly it will go to the manufacturer database?

It will be going to the manufacturer database either in some form which has to be machine readable and it has to be understood by your manufacturer system. So there are many data exchanges standards which actually bring the data from one system to a common form and that common form is actually understandable by the second system. So there are many such (exten) exchange standards, they include EDI and XML which are primarily used to resolve this incompatibility issue.

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Dimensions of supply chain interoperability

- Interoperability of data
 - Two concerns
 - finding and sharing information from heterogeneous databases
 - reside on different machines with various operating systems and database management systems;
 - resolving the semantics differences that exist with the structure and contents of the databases.
 - Data exchange standards such as EDI, and XML are primarily used to solve this level of interoperability issues.

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Then second one is about interoperability of service. So here though we will be talking more in detail about the services which is a more technical term here I would like to just give a little idea about a what service is. Continue with our example of that sending advanced shipping notice. Think that two different systems are going to interact. The first system is sending the advance shipping notice and the second system is going to receive it. Now the question is how does the second system know that the advanced shipping notice is coming?

See we are now automating the process, automating this inter-organisational business process of sending the advance shipping notice without involving any human being in between. One way of looking at it is that you get the advance shipping notice email to you. It comes in certain PDF format and that PDF format some human being will sit and read and enter into your ERP system.

The second way you can think that advance shipping notice is displayed (HT) in the HTML format in the other companies database and you can look at it but still then also you (remem) have to involve a human being who will be reading it from the website and entering into the

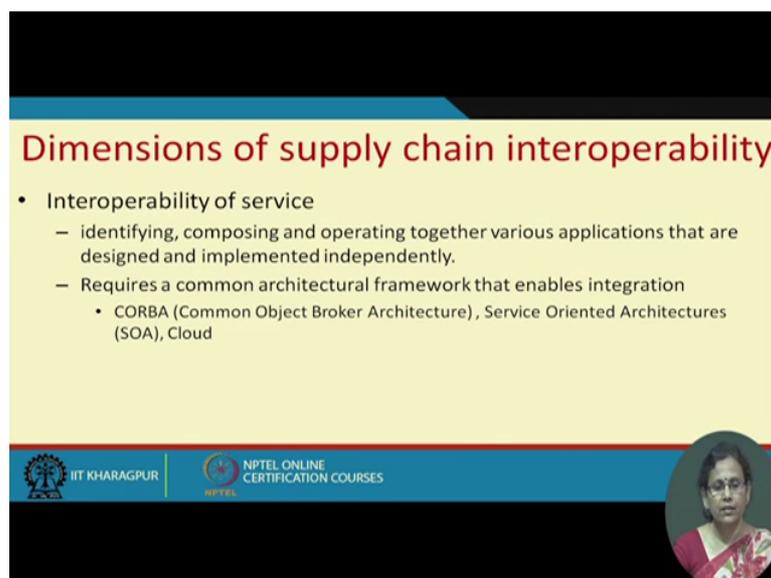
ERP system. But the third way is the data comes in a format which the machine itself can read. There is no need for the human being.

So in that case a service will be hosted in the supplier system who is sending the advance shipping notice and there will be one client program running on the manufacturer side who will be consuming that service. So that client program from time to time will be accessing the service and will be storing it. If you have problem in understanding this information about the concept of service just at least all of us now use some kind of cloud based storage.

Let us say we put our file in some directory in the cloud which is there in our own computers that cloud directory is there in our local machine. So once we put that file do you think that immediately goes to the corresponding cloud storage? It has to be synchronized with that cloud storage and your machine will have certain client installed who will be accessing the cloud service for storing your file.

So such kind of interoperability of service so that you have the appropriate client installed in one of the systems is also very important. So it is not about resolving the technical issues, it is about making the service compatibility as well. So this interoperability of service is about identifying, composing and operating together various applications that are designed and (inde) implemented independently. And they require many technologies and while discussing about the technologies we will be talking about them little bit more.

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Dimensions of supply chain interoperability

- Interoperability of service
 - identifying, composing and operating together various applications that are designed and implemented independently.
 - Requires a common architectural framework that enables integration
 - CORBA (Common Object Broker Architecture), Service Oriented Architectures (SOA), Cloud

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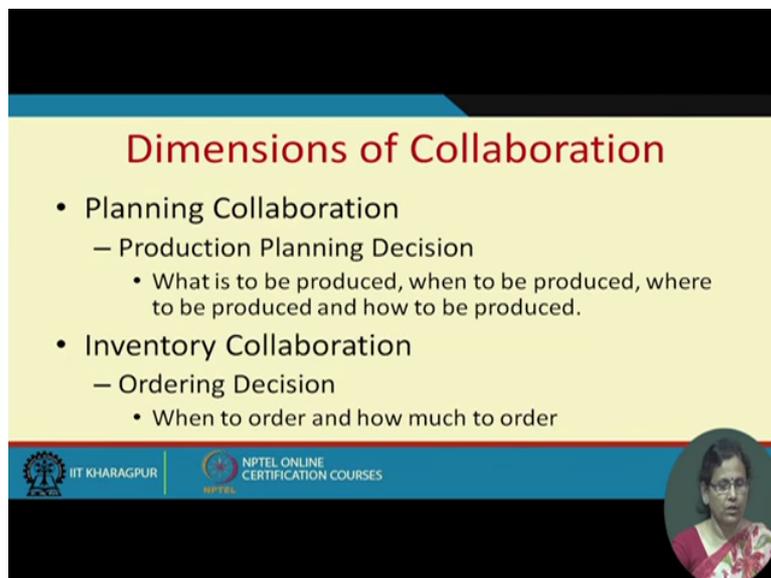


So what we have understood so far is that in case you would like your supply chain to be successful and the data sharing to be happening you have to have supply chain integration. Now this supply chain integration is about resolving both strategic level as well as technical level issues. So we can say two (inter) integrated system has to be interoperable but two interoperable systems unless there is a strategic level problems are resolved they cannot be integrated.

So let us try to see the strategic level activity. The strategic part of integration is about collaborating two business partners. Now this collaboration can happen in two dimensions. First in the planning dimension, it can be in the planning level or it can be in the inventory level. Now what is about planning collaboration? It is about taking this products on planning decision in consultation with each other. So this planning collaboration is about taking this production planning decision in collaboration with the business partner.

What is to be produced? When it is to be produced? Where it is to be produced? And how much to be produced? Then second level of collaboration is about inventory level. It is about considering taking help of your partner while taking ordering decision. When to order and how much to order?

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The slide is titled "Dimensions of Collaboration" in red text. It lists two main dimensions: Planning Collaboration and Inventory Collaboration. Planning Collaboration includes Production Planning Decision, which involves determining what, when, where, and how to produce. Inventory Collaboration includes Ordering Decision, which involves determining when and how much to order. The slide footer includes the IIT Kharagpur logo, NPTEL Online Certification Courses logo, and a small circular portrait of a woman.

Dimensions of Collaboration

- Planning Collaboration
 - Production Planning Decision
 - What is to be produced, when to be produced, where to be produced and how to be produced.
- Inventory Collaboration
 - Ordering Decision
 - When to order and how much to order

If we try to put the supply chain collaboration in these two dimensions that is planning collaboration and inventory collaboration then the traditional supply chain is the one where there is no inventory level collaboration and there is no planning level collaboration. And if

planning level collaboration is there and inventory collaboration is not there then it is called collaborative planning and forecasting.

Then in case only inventory collaboration is there it is called vendor managed inventory system. And if both the collaborations are there then it is called a synchronized supply chain.

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Strategies for Supply Chain Collaboration

Planning Collaboration	Yes	Type 1 Collaborative Planning and Forecasting	Type 3 Synchronized Supply Chain
	No	Type 0 Traditional Supply Chain	Type 2 Vendor managed inventory
		No	Yes
		Inventory Collaboration	

Supply Chain Collaboration: Making Sense of the Strategy Continuum, *European Management Journal*, Volume 23, Issue 2, April 2005, Pages 170-181, Matthias Holweg, Stephen Disney, Jan Holmström and Johanna Småros






Now this traditional supply chain where there is neither production planning collaboration nor inventory level collaboration, there is no visibility. In this model each level in a supply chain issues production orders and replenishes stock without considering the situation either up or down stream tier of the supply chain. Naturally such supply chains are not optimized. In fact we are not dealing with the supply chain optimization part.

We are simply concerned about the information flow and to know more about this you have to be actually going through some supply chain course about the optimization part of the supply chain. Now because there is no information flow, there is no information visibility. By no visibility we mean the information visibility between two partners. And as a result they cannot collaborate with each other. And as we have told you because of this lack of information sharing there will be demand variability in the supply chain.

By demand variability in the supply chain we mean due to lack of information when the (info) order you try to because you do not have the direct information so when you will be predicting you will be actually estimating your demand without (knowl) actual knowledge of

what is happening in your downstream then you will go through huge amount of uncertainty. And that uncertainty will be reflected in your (produ) production system.

Either you will end up keeping huge amount of stock which you cannot really push into the market or you will not be able to meet your service level because of high variability. So this effect I have already told you this is called bullwhip effect. Now most of the supply chain where people have not put (ex) explicit (ef) effort for integration still continue operating in this manner.

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The traditional supply chain

- In this model each level in the supply chain issues production orders and replenishes stock without considering the situations at either up- or downstream tiers of the supply chain.
- No visibility
- No Collaboration
- Bullwhip effect
- Most supply chains still operate this way.

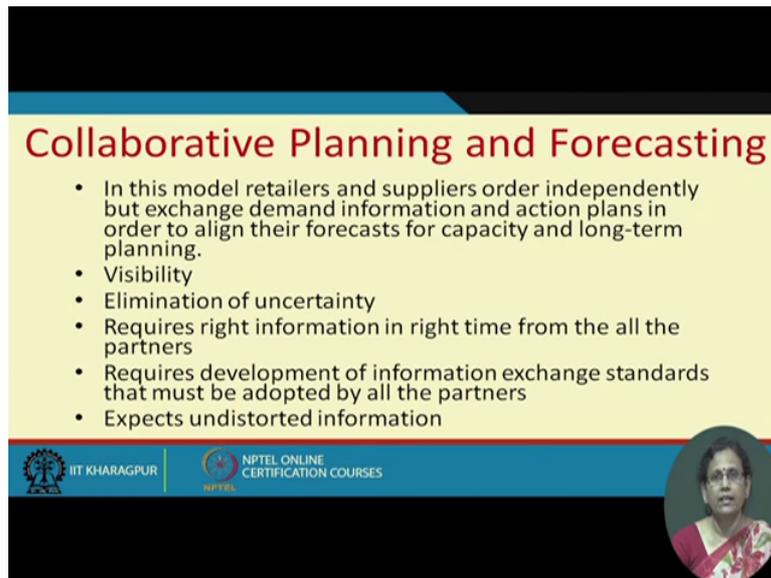
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Then if there is planning level collaboration but no inventory level collaboration then it is called collaborative planning and forecasting. When we say there is planning level collaboration not inventory level collaboration we do not mean that there is no inventory information sharing. There is definitely (info) inventory information sharing. Otherwise even planning level collaboration cannot have.

The information sharing is there but both the entities independently take their ordering decision. So both of them do not depend on each other while ordering to their respective suppliers. But they will be planning together I mean they will be together making their production planning. So now in this model the retailers and the suppliers order independently but they exchange the demand information and action plans in order to align their forecast for capacity and long term planning.

Here there is visibility and this visibility ultimately reduces your uncertainty. However for successful collaborative planning and forecasting you require right information at the right time from all the partners. Then it requires development of information exchange standards that must be adopted by all the partners and again to be successful it requires undistorted information.

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Collaborative Planning and Forecasting

- In this model retailers and suppliers order independently but exchange demand information and action plans in order to align their forecasts for capacity and long-term planning.
- Visibility
- Elimination of uncertainty
- Requires right information in right time from the all the partners
- Requires development of information exchange standards that must be adopted by all the partners
- Expects undistorted information

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Then if there is inventory level collaboration and not planning level collaboration then the model that is followed is called vendor managed inventory. Look here also there is full visibility and in collaborative planning and forecasting there is also full visibility. In both the cases you actually share the demand information. But in the collaborative planning and forecasting both the manufacturer and the supplier they I mean the retailer and the manufacturer they independently take their ordering decisions.

But they independently take the ordering decisions but the manufacturer actually makes its production plan in consultation with the downstream member. But in case your vendor managed inventory both the manufacturer and supplier they share the information and supplier takes care of the stock replenishment decisions because of this visibility of the stock position of the manufacturer.

And the demand being sensed at his end the supplier takes care of replenishing the item from his side. So this is called vendor managed inventory system. So here in fact I would like to add in case of vendor managed inventory system it works like this, let us say we are talking about two members either manufacturer or supplier or it is a retailer or a supplier.

Suppose usually a vendor managed inventory system is followed by large retail giants like that of your Wal-Mart and all. So let us say Wal-Mart is in VMI relationship with that of Campbell Soup. So the stock details and the point of sales details at the Wal-Mart is shared with that soup company. The soup company has the full visibility what is the stock level at a specific retail store in Wal-Mart?

Then your vendor that is the soup company also knows what is the kind of lead time he is going to take to send the items to the retailer. So he keeps sensing the retailer's stock level and once it comes down to some level where he has to actually send items taking care of his own lead time because he is managing the retailer's inventory without expecting the explicit order from the retailer that is Wal-Mart, the soup company will be sending the stock.

Look the retailer is not completely out of the stock. Retailer is not actually sending the purchase order but the supplier is sensing what is the stock level, he is sending the stock. This stock which is sent by the supplier now goes to the retailer's premises, it is called the consignment stock and this consignment stock though is kept at the retailer's premises it does not go to the stock book of the retailer.

But retailer takes care of that stock. The moment that stock is opened by the retailer the information comes to the supplier after opening it. I mean when it will be opened? When actually the available stock at the retailer side goes to zero, the consignment stock will be opened. so far the consignment stock has not taken into the stock book of the retailer. It is still in the stock book of the supplier and supplier is also not paid for this.

Now once it is opened, once the retailer starts using the consignment stock now it goes to the retailer's inventory and that inventory so far it was in the supplier's inventory though it was kept in the (retai) retailer's location. So now it is used by and then the supplier actually updates its inventory position and retailer starts using the consignment stock. both the parties are benefited by this. The retailer service level is maintained.

Almost all the time it will be hundred percent if the VMI supplier carries out its task perfectly and supplier is also benefit. How he is benefited? Because he knows exactly when to produce how much? So therefore if both the partners are in VMI relationship it helps both of them because of this centralized inventory decision making, okay?

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Vendor Managed Inventory (VMI)

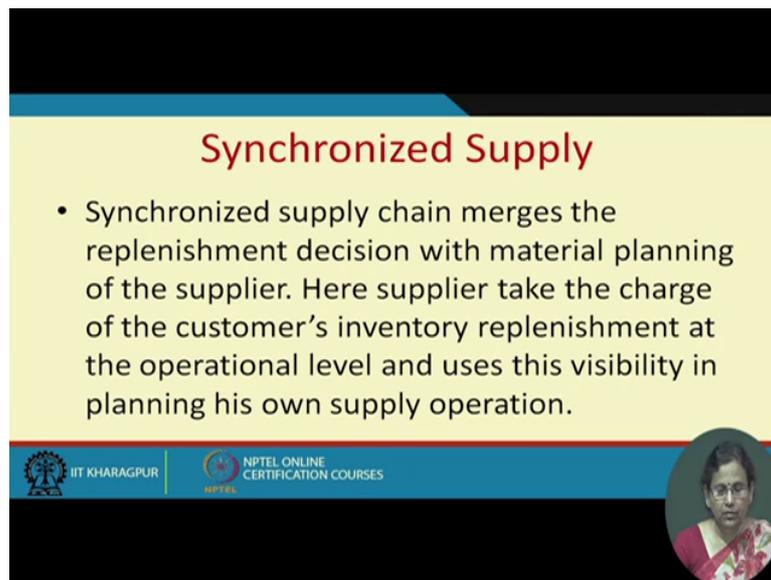
- The task of generating the replenishment order is given to the supplier, who then takes the responsibility for maintaining the retailer's inventory and subsequently retailer's service level.
- Full Visibility
- Information sharing
- Consignment stock
- Prioritization of VMI partners in case of shortages
- Centralized inventory decision making
- Supplier may not share the production planning information

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However it is different from your collaborative planning and forecasting because supplier may not share the production planning information. How he is planning your production why he has to share? He is simply taking care. So we can say this may be a good model for a retailer. I mean for a retailer like that of your Wal-Mart. For a retail supply chain rather I can say. But it may not be a suitable model in some other situation.

Whereas this (clo) collaborative planning and forecasting maybe this is a very good model for a manufacturing system where the manufacturer is heavily dependent on its supplier for certain component. Both of them can together sit down and decide about their respective production plan. But they can independently order their own inventories. Then the last one is your synchronized supply chain. A synchronized supply chain is a very ideal supply chain where both (inven) there is inventory level collaboration as well as planning level collaboration.

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Synchronized Supply

- Synchronized supply chain merges the replenishment decision with material planning of the supplier. Here supplier take the charge of the customer's inventory replenishment at the operational level and uses this visibility in planning his own supply operation.

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In fact in fact there are many factors without which this synchronization is not possible. So what are these factors? First of all if both the supplier and the manufacturer both are geographically apart, the physical distance between them is very large it is difficult to achieve this complete synchronization. So this geographical dispersion of the customer and supplier plant they have to be physically located as close as possible.

The closer and more dedicated supply is, the easier it is to implement the synchronized production and inventory control. Then the demand pattern of the product is also important. The more stable is the products consumer demand, the greater dynamic effect of eliminating the bullwhip and synchronizing the demand and supply in the system. Then product characteristics, in particular the selling period and shelf life as well as the value is also another factor.

The longer the shelf life or the selling period of the product, the more sensible it is to consider the collaborative practices for synchronising the supply chain. The more valuable the product, the more impact tighter inventory control can yield.

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Key factors that guide supply chain collaboration strategy

Factor	Why important?
Geographical dispersion of customers and suppliers plant	The closer, and more dedicated supply is, the easier it is to implement synchronized production and inventory control.
Demand pattern of the product	The more stable the product's consumer demand, the greater the dynamic benefits of eliminating bullwhip effect and synchronizing demand and supply in the system.
Product characteristics, in particular selling periods and shelf life, as well as value	The longer the shelf life or the selling period of the product, the more sensible it is to consider collaborative practices. The more valuable the product, the more impact tighter inventory control yields

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Thank you very much. So we will continue with a motivating example how the information actually flows between collaborating partners in our next lecture. Thank you very much.