Introduction to Industry 4.0 and Industrial Internet of things

Prof. Sudip Misra
Department of Computer Science and Engineering
Indian Institute of Technology, Kharagpur

Lecture - 09
Industry 4.0: Smart and Connected Business Perspective

Another very important aspect of Industry 4.0 is the business perspective; the Smart and Connected Business Perspective. From a business point of view, looking at the smartness and connectivity that we have been talking about in the context of Industry 4.0; trying to look deeper into these different issues concerning it.

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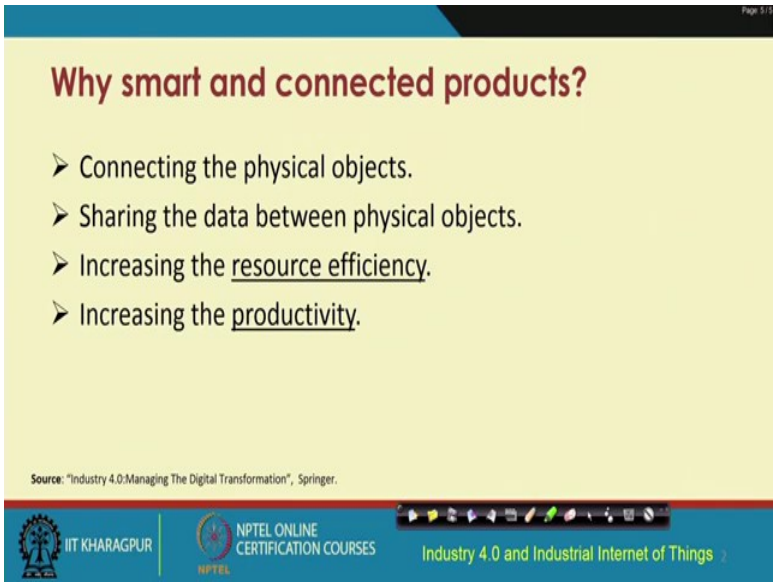

First of all, the question is that we have been talking about that in industry 4.0; we need this connectivity, connected machinery, connectivity everywhere, sensing connectivity, and so on.

So, the question is that why do we need this kind of connected products, what is so good about it? Why we want to transform ourselves from whatever we were doing in the past to connected products? Why do we need connectivity between these different products this machinery? Why at all we need to make these machineries smarter?

First of all, this connectivity is required in order to connect these physical objects, different machines in the industries. The second thing is that it is very important to

collect these different data from these physical objects and share between themselves between themselves and also share the data through some network to elsewhere where it is going to be analyzed.

So, this connectivity is essentially going to be required, because through this connectivity and smart perspective; we are going to increase the overall resource efficiency. Overall efficiency is going to be increased in terms of resource consumption, resource utilization, and improves the overall productivity in the manufacturing process.

So, improved resource efficiency, improved productivity, are the reasons why we need to take smart and connected business perspective.

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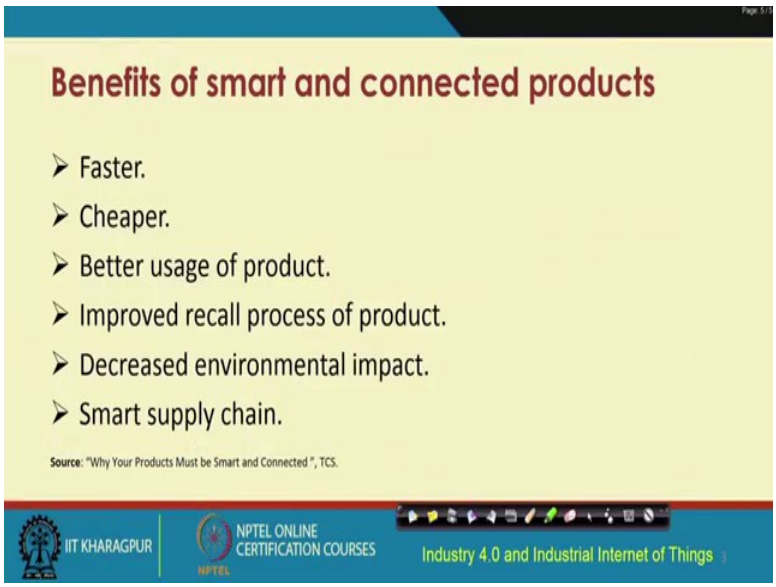

So, what are the benefits once again? Faster we are going to have these products manufactured at a faster rate than before it was being done in the past without the use of IoT-centric solutions.

Cheaper products are going to be developed; these products will be used in a better way through the incorporation of these smart solutions. Improved recall process of the product, it happens that certain product will have to be recalled right by the industry. So, that recall process is a very complex process and hard to track. This recall process can be improved with the incorporation of smart and smartness and connectivity. Decreased

environmental impact is the other one and finally, improved supply chain; smart supply chain, these are the different benefits of having smart and connected products.

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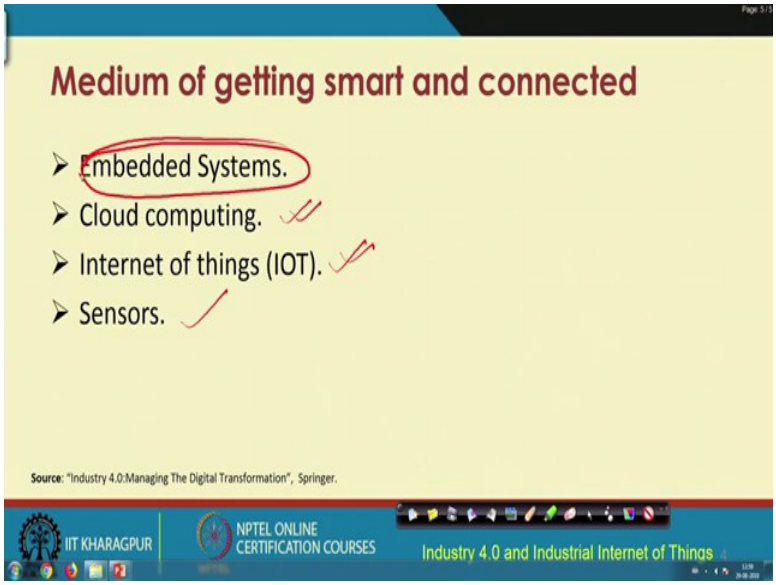

The medium of getting smart and connected are the use of sensors, the core of making smarter systems. Sensors are associated with the actuators, all these sensors and actuators will make these systems smarter. In IoT the network is important; cloud is also important, because lot of data are coming in, who is going to process the data; huge amount of data to handle.

So, cloud is going to handle so much of data in terms of storage, in terms of processing and so on. And this is the most important of all embedded systems. By the help of these embedded systems, fitting all of these different objects, the physical objects with different embedded devices, which again will have sensors communication device; so all of these are going to be embedded into each of these physical objects.

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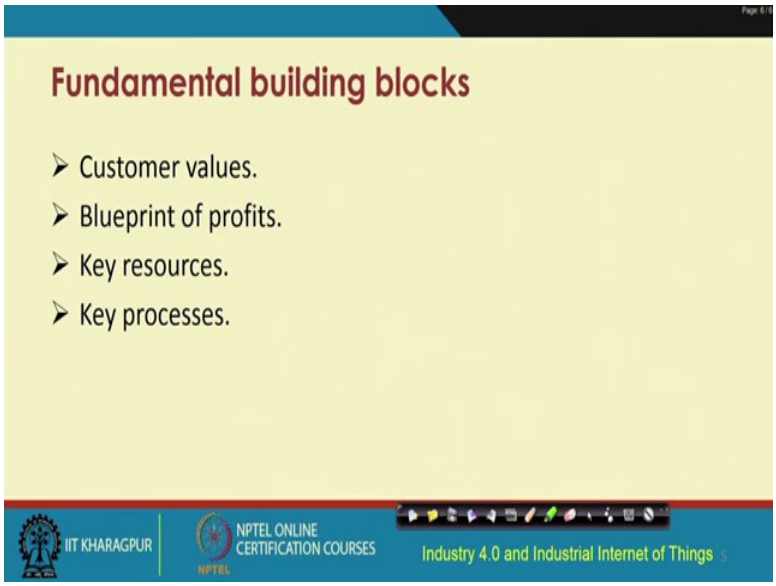

These are the fundamental building blocks for smartness and connectivity. Number one is the customer values, blueprint of profits; key resources and key processes. Customer values are about the value proposition. So, value proposition means like through the incorporation of all of these things that we are talking about; the smartness, IoT sensors, actuators whatever how the product is going to be improved; in terms of usage. From a customer viewpoint, how the product has improved, what is the value proposition and the services that the product offers; how these services are going to be improved, what is the overall value proposition.

Next thing is the blueprint of the profits. The smartness and connectivity is going to help in coming up with a blueprint for improving the profit. The efficiency of the key resources in the companies, industrial processes, manufacturing process will have to be improved, they will have to be tracked and optimized over time. And same thing goes for these different key processes as well.

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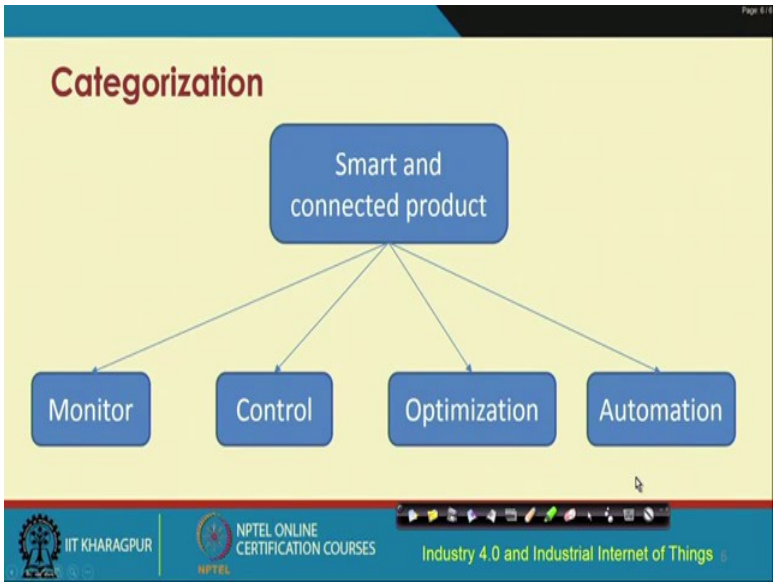

The next thing is that; what are the different categories of these smart and connected products; monitor, control, optimization, and automation; these are these different categories of smart and connected products. So, monitoring, control, optimization, and automation these are the ones, that are self-understood.

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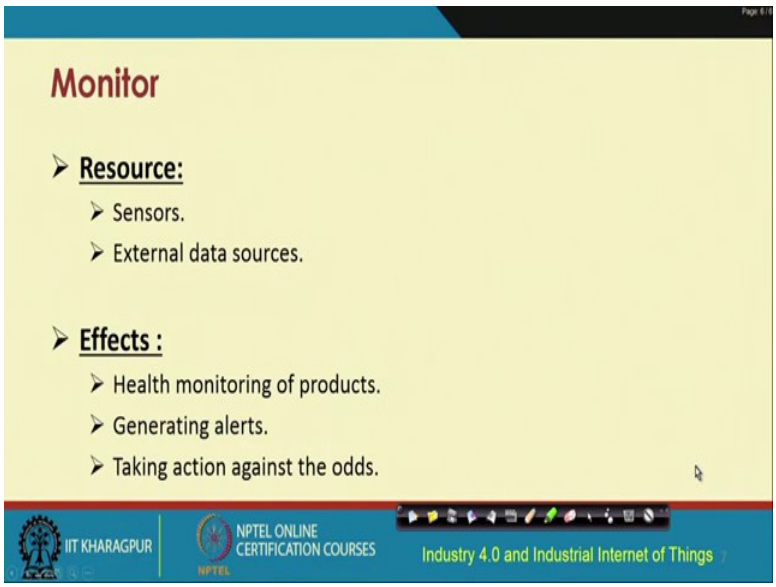

Monitoring the resources; resources such as sensors, sensor-equipped resources such as this machinery and monitoring the external data sources, these are important; so

monitoring of all kinds of different resources and also the monitoring of the effects through the use of these different resources.

The effects such as the health monitoring of this machinery, health monitoring of the products; if something has gone down, if something is likely to increase the downtime in the future generating alerts, beforehand, is also something that will help in improving the overall efficiency. So, this is another effect and taking action against the odds; this is also the third effect in terms of monitoring.

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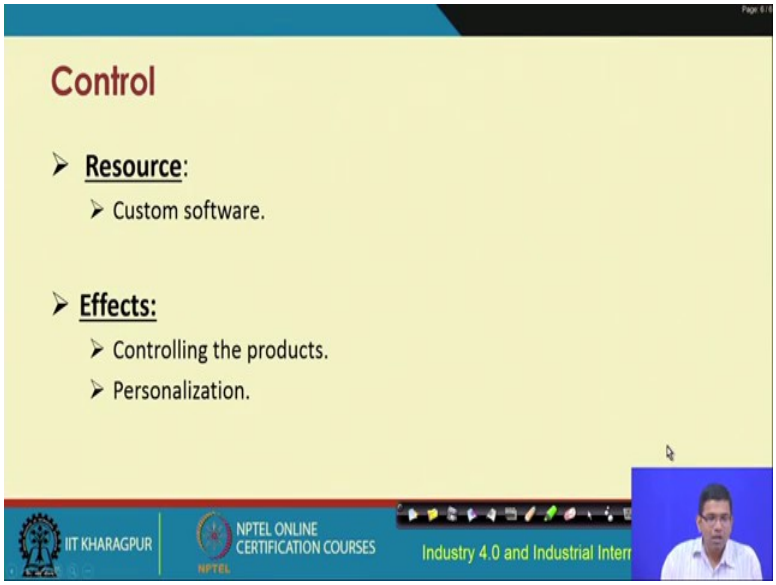

Control of these resources through the use of different custom designed, software or different other software used for the resource control optimization. And optimization of these resources through the use of these different software, this software can help in the optimization process and the effects; controlling the products and the personalization of the products based on the different requirements of the end-users.

We are discussing about the use of different optimization solutions and different algorithms. The effect is to increase or enhance the overall performance of the system, machinery, enabling remote services, and assisting in repairing the product.

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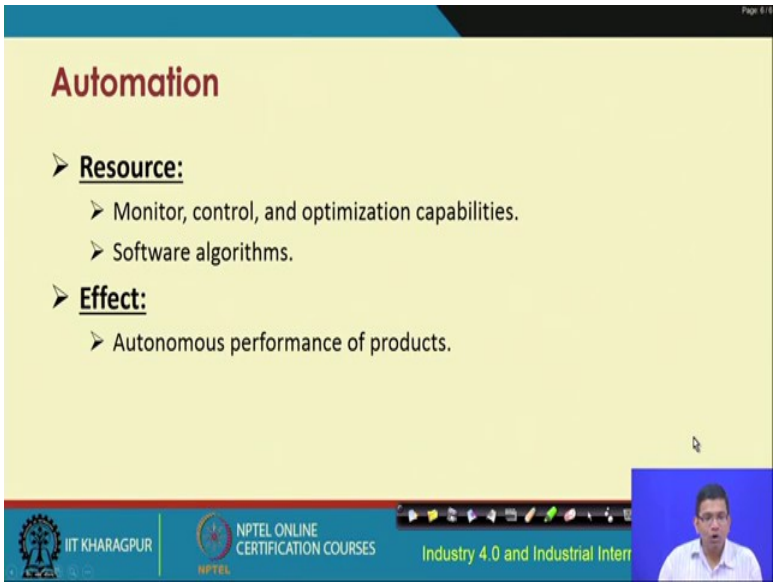

Automation of these resources, monitoring, control, and optimization capabilities, different software algorithms will have to be used for the automation, and the effect is having autonomous performance of these different products.

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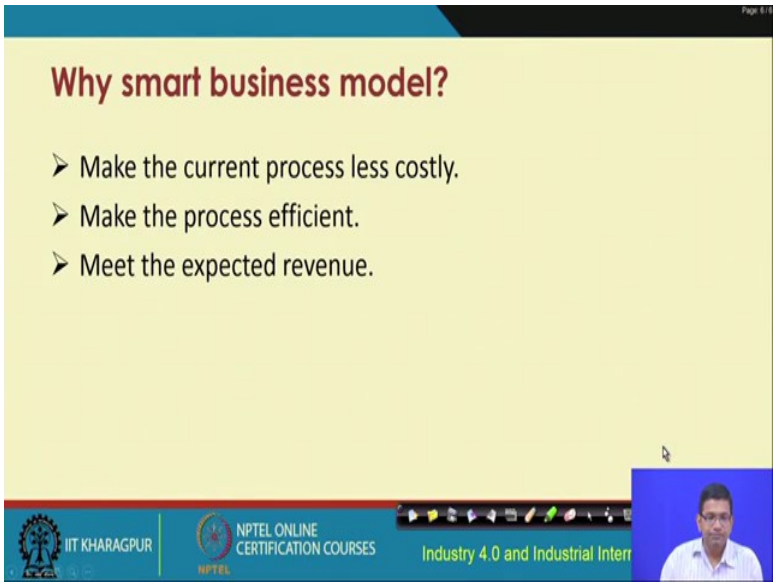

Smart systems from a business perspective, is very important. So, what is this business model? What is the smart business model? Why at all we need this smart business model?

So, we need the smart business model in order to make the current processes less costly, more efficient, and to improve upon the receiving of increased revenue. So, you need to achieve the expected revenue plus, to have some surplus that is also required often. So, you need to have a smart business model, that is, that will help in reducing the overall process cost, making the processes more efficient and meeting the expected revenue and in fact, exceeding the expected revenue.

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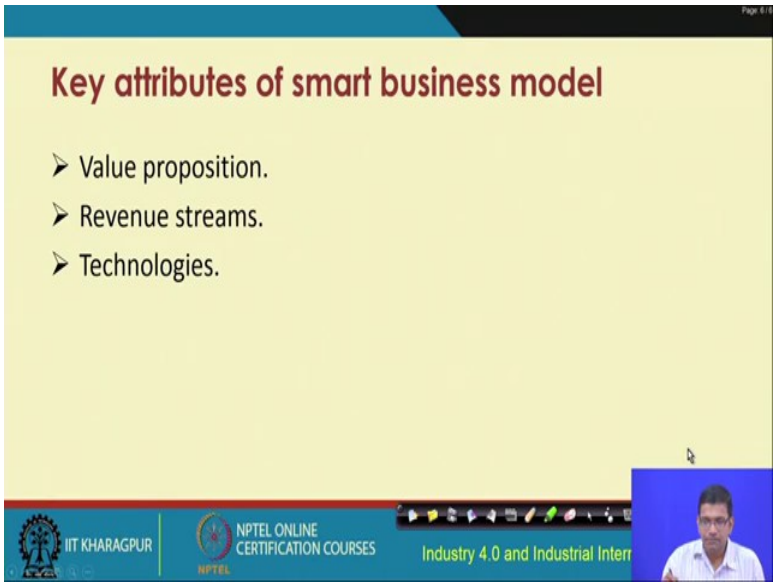

So, these are some of the key attributes of the smart business model value proposition, which I have talked a lot earlier. So, what value it is going to have to the customers in terms of the product and the services it is offering to the customer; value proposition. This is the first key attribute when you are trying to come up with a smart business model. Revenue stream means like what are the different sources of the revenues that are coming in, what are the different sources that from different sources the revenue can come for helping in the manufacturing process or undertaking a particular project.

So, what are the different sources of the revenues that is the revenue stream and finally, that revenue is going to be used in order to help in the manufacturing process; incurring the different costs. So, that is the revenue stream and the different technologies that are going to be used are the three different key attributes of a smart business model.

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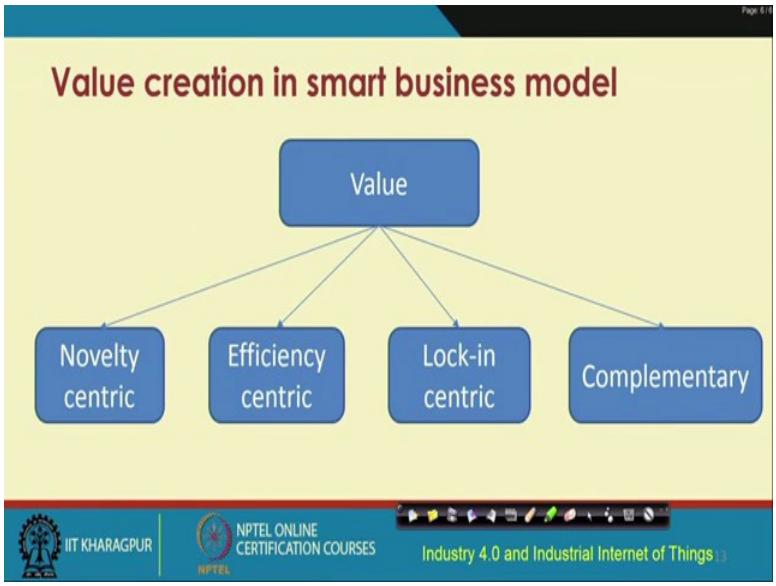

If we are talking about the value creation in a smart business model, there are different perspectives, different aspects, that will need to be understood.

One is the novelty centricity, second is the efficiency centricity, lock-in-centricity, and the complementarity; these are the four different perspectives that will need to be understood.

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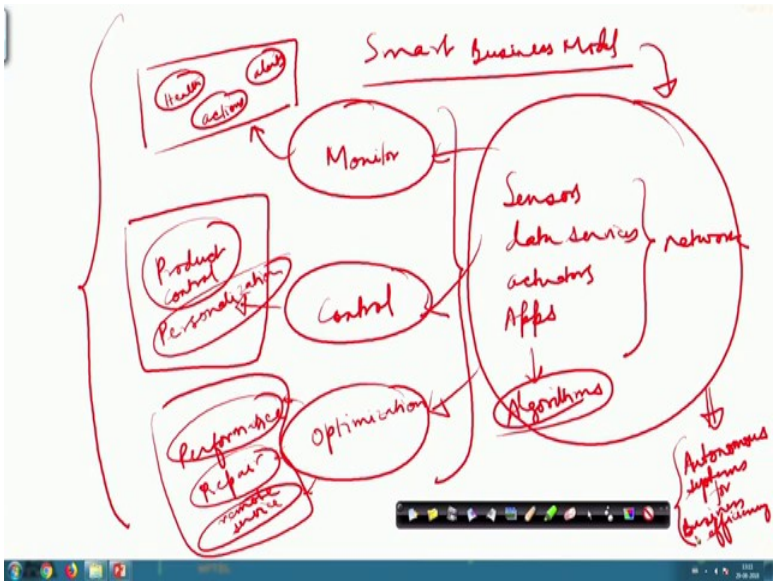

So, what is important is to monitor in a smart business model; if you have to come up with a smart business model. These are the key things that; we have seen we need to monitor, we need to have a control mechanism, and have some optimization.

We have things like monitoring the health of the machines. So, health of the machines, taking some actions, offering different alerts; then, for control we have what? Control of the product; personalization, so based on the custom requirements, this kind of control and personalization can be done. We have the optimization; here through the use of different optimization algorithms, we want to improve the performance of the system the process and so on performance, and then product repair, and also remote service.

This is one thing; so all of these things can be done with the help of what? What is the backbone? The backbone is use of different sensors, data services, actuators and in fact, the different applications and the network. One very important thing I have not mentioned is the algorithms, the different algorithms that can help in achieving all of these. Algorithms for monitoring, control algorithms, and optimization.

So, we need to come up with something like this; the business model, a smart business model that can help achieve this overall thing that we have talked about. So, a smart business model will need to take into consideration all of these different things. Why do we need a smart business model? Because in order to improve upon the efficiency, productivity, and essentially will help in achieving autonomous systems for improving business efficiency.

We were looking into the value aspect the value proposition where we have seen there is this novelty aspect, efficiency, lock-in, and complementarity, these are the different value creation aspects in a smart business model.

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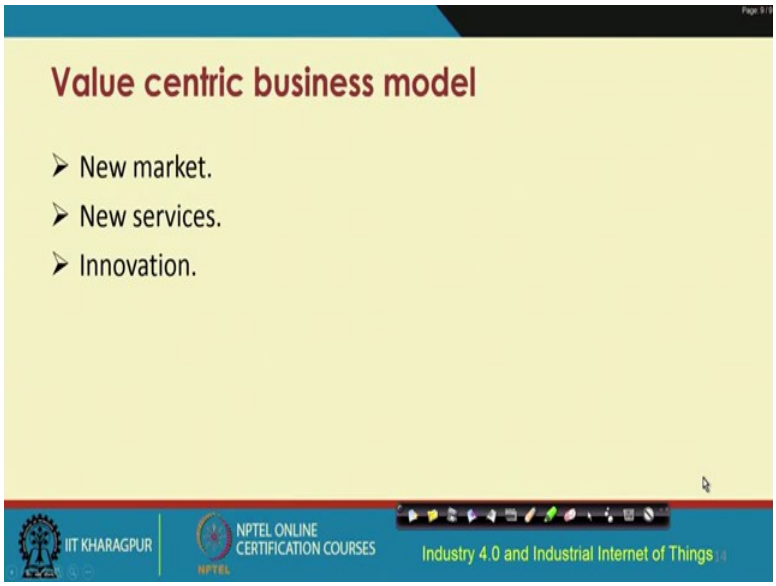

We need to have a value-centric business model, which the customers find to be useful to be of value to the customers. This kind of value-centric business model will open up new markets, new services will give solutions, which are innovative, new, which we are not there before customers find it useful exciting, so that is the value centricity.

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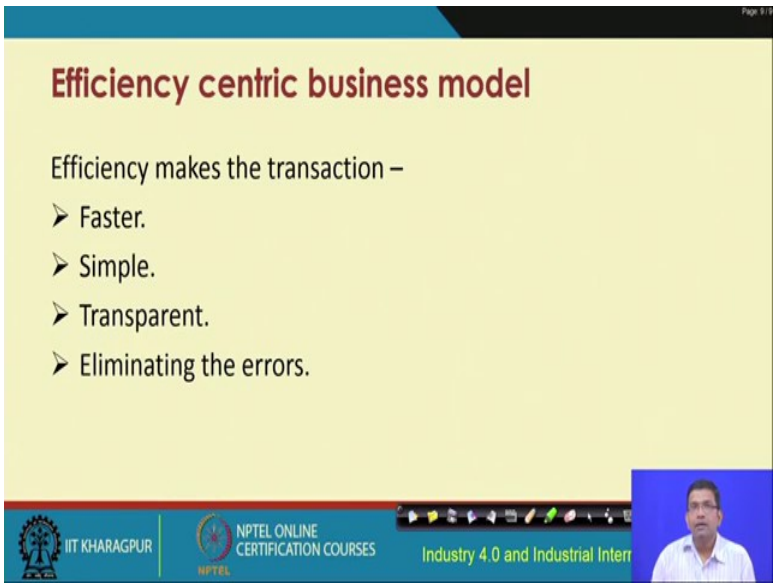

Next thing is the efficiency; efficiency in terms of improving the products, faster productivity, simpler production processes, transparent production processes, which will

eliminate errors or reduce the number of errors from occurring; overall efficiency centricity.

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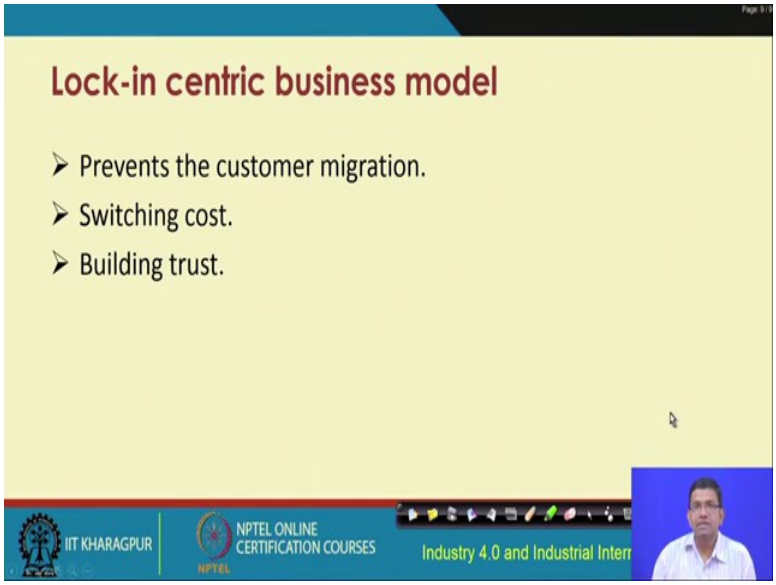

Lock-in centric business model prevents the customer from migration. There will be a lock in time period during which the customers will not migrate from one vendor to another. This will help in reducing the switching cost and improves building the trust between these different customers, suppliers or the vendors.

Complementary business model talks about things such as the product and services, online and offline assets, technologies, activities all these different complementary things, which are required in order to come up with the smart business model.

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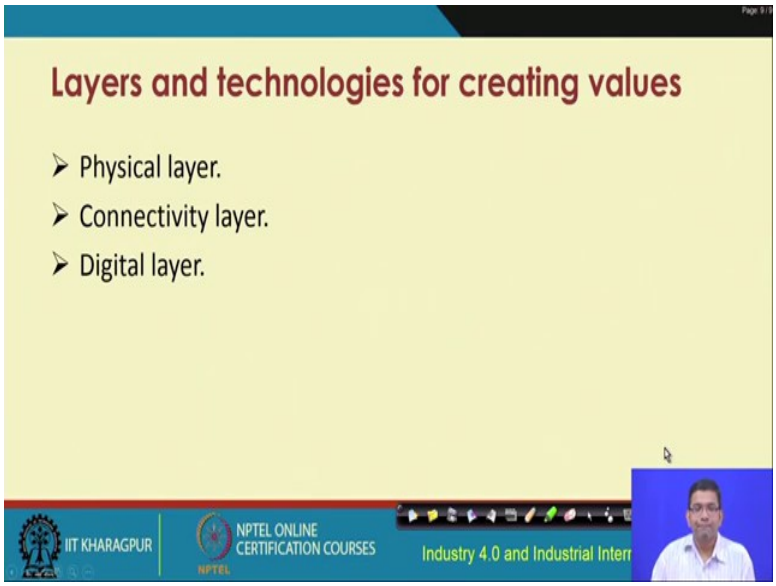

So, what are the layers and technologies that will help in creating values? Number one is the physical layer, second is the connectivity layer, and the third is the digital layer.

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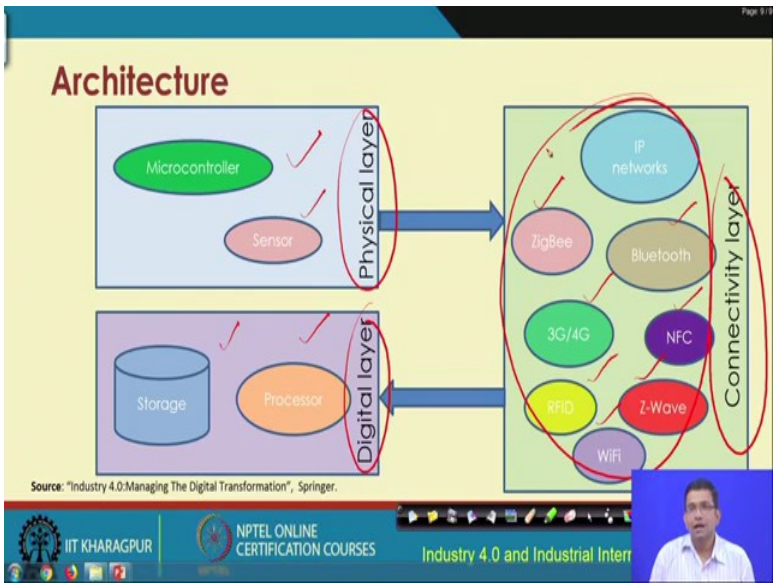

This is the overall architecture that can help in this thing and these are the different components in it; we have the physical layer, digital layer, and connectivity layer.

So, in each of these layers-we are talking about sensors, microcontrollers; digital layer we are talking about processors, which can help in execution of these different

algorithms the in the processes overall the functionalities, that will have to be implemented. So, all of these things are taken care of in the digital layer by the processor.

The storage means the storage of these data. And in terms of connectivity all these different technologies ZigBee, Bluetooth, 3G, 4G, NFC, RFID, Z-Wave, Wi-Fi; is the basic introduction component of this course, all of these are the constituents of the connectivity layer. These are the three layers in the overall architecture.

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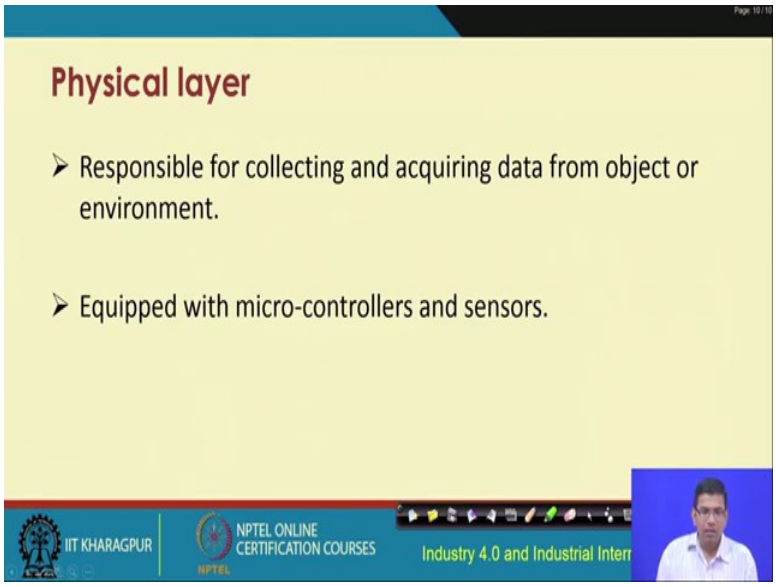

The physical layer is responsible for collecting and acquiring data with the help of sensors and are equipped with different microcontrollers and microprocessors.

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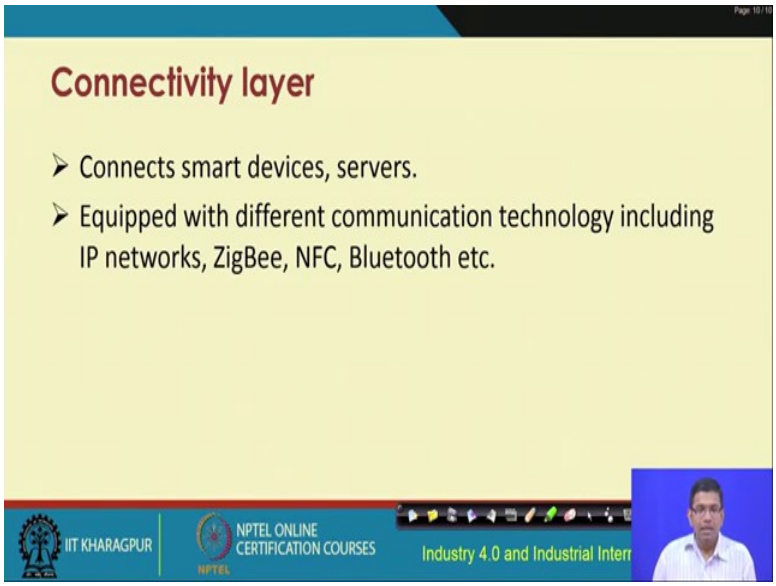

Connectivity layer talks about the overall connectivity, smart devices, smart services, using different connectivity technologies such as IP networks, ZigBee, NFC, and Bluetooth.

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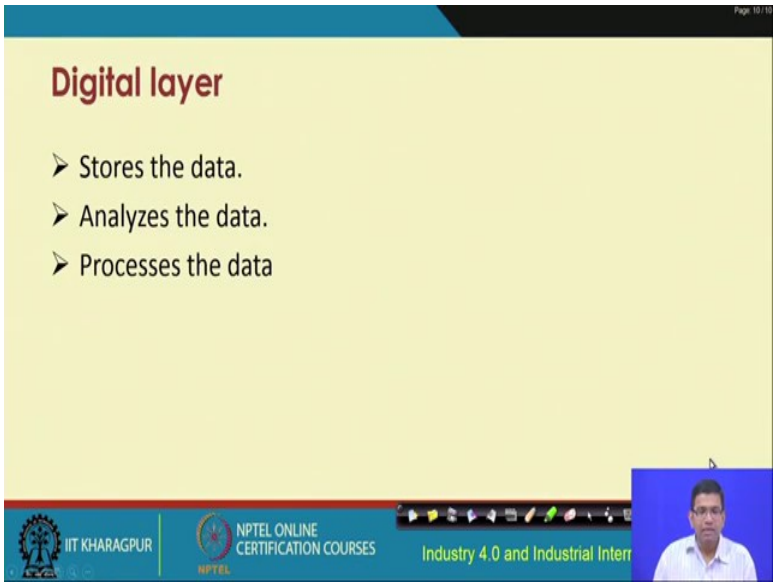

Digital layers talks about storing the data analyzing the data processing the data and so on.

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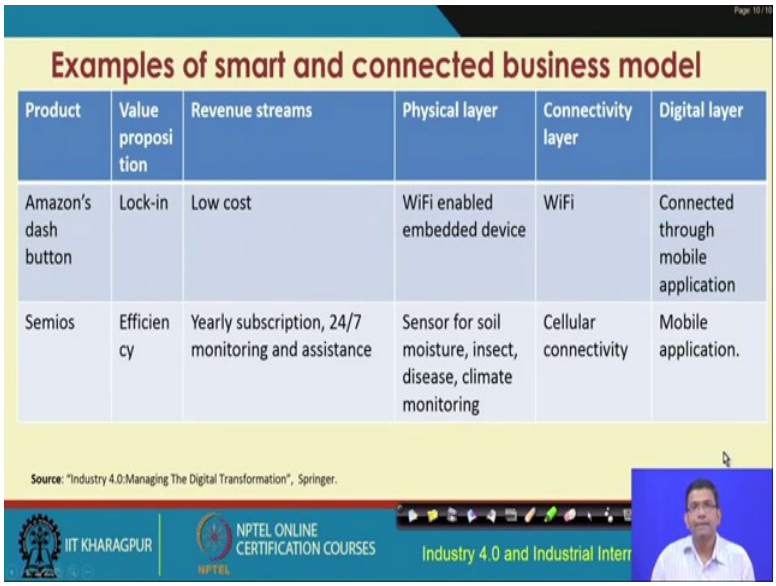

So, here are two examples of smart and connected business model; one is the Amazon's dash button, where the value proposition is the lock-in value proposition, the revenue streams are low cost revenue streams. Physical layer is equipped with Wi-Fi enabled embedded devices, connectivity layer is Wi-Fi enabled and the digital layer is connected through mobile applications.

Similarly, we have the other product the Semios, which talks about improving the efficiency overall, the value proposition is efficiency in improving the efficiency. The revenue streams are through yearly subscriptions 24X7 monitoring and assistance; the physical layer constitutes of sensors for soil moisture, insect, disease, climate monitoring and so on. The connectivity layer is cellular and the digital layer consists of different mobile applications. These are the two examples of smart and connected business models being implemented, in practice.

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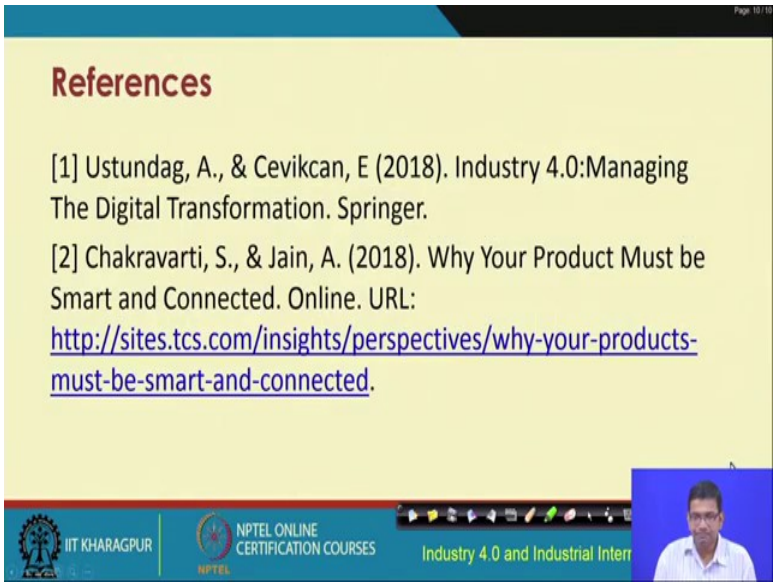

So, these are again some of the references.

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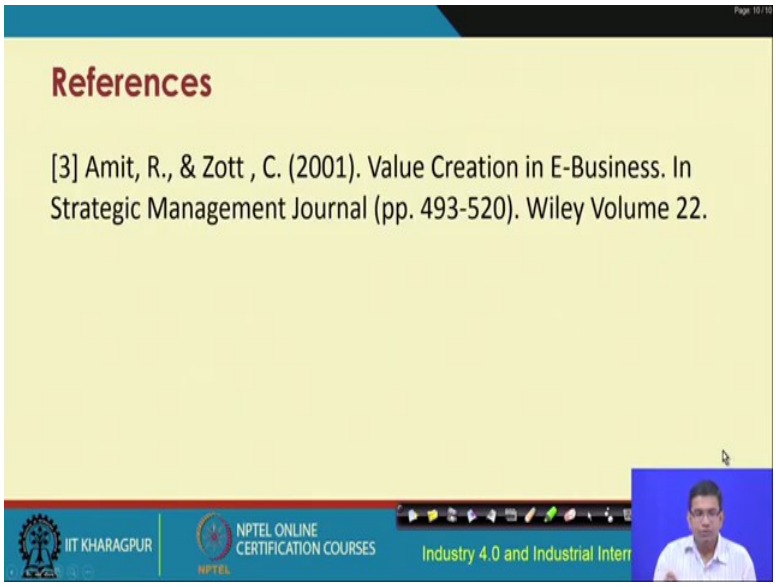

This lecture covers the concepts that are very important to understand the overall business perspective of why at all we need to do, whatever we intend to do; that means, transform towards industry 4.0.

We intend to transform towards industry 4.0, through the incorporation of all these smart devices and so on. We want to transition towards making everything smart by, but the question is that why at all we need to make smart? What is the value proposition? From a

business perspective; what are the the things that are going to be improved through this kind of adoption, transformation from the traditional to the smarter ones through a connected one, and this is what we have discussed in this particular lecture.

So, understanding these things are very essential for the building of the industry 4.0. And this needs to be also educated to the industry workforce, who needs to get into this transformation to industry 4.0. Because until this value proposition and the use of all of these things the transformation is understood by the workforce; they will not be able to do this transformation, they will not be able to appreciate this transformation, and because of which the entire exercise might fail.

With this we stop over here and these lectures will these the concepts, that we have covered in this lecture will help in further understanding of the later lectures, that we are going to cover in this course.

Thank you.