Manufacturing Systems Technology

Prof. Shantanu Bhattacharya

Department of Mechanical Engineering and

Department of Industrial and Production Engineering

Indian Institute of Technology, Kanpur

Module – 01

Lecture - 01

Hello and welcome to this course on manufacturing systems technology. I am Shatanu Bhattacharya again. And, I am going to be teaching most of this course to you. Today is the day for module one of this particular course. And, I think I had told in the introductory lecture or introductory session that this course is really about learning the various tools of systems level tools, which are available for doing a flexible – completely flexible computer-integrated manufacturing setup. And so, basically, let us look into what are really – what is really manufacturing systems.

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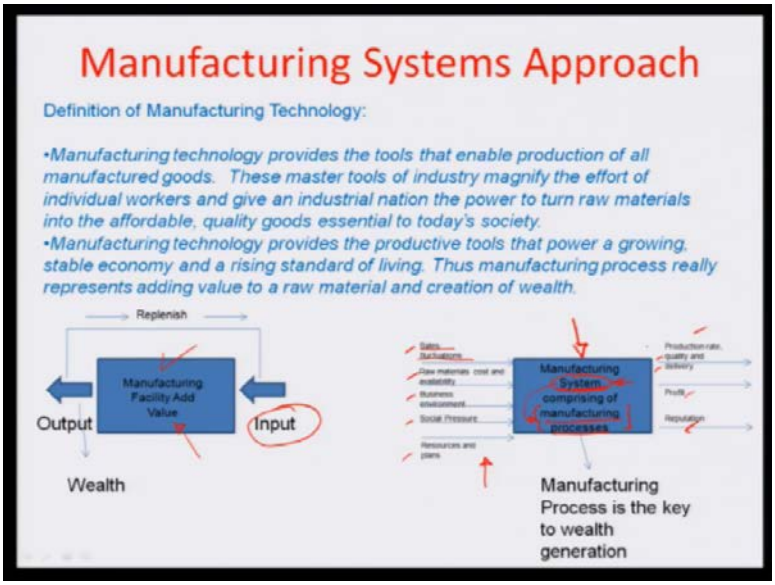

And definitionally, if you look at manufacturing technology – manufacturing systems technology, it really provides the tools that enable production of all manufactured goods. These master tools of the industry magnify the effort of individual workers and give an industrial nation the power to turn raw materials into affordable quality goods essential

in today's society. So, basically, what it really means is that, these set of tools are important for magnifying any effort, which is manual and putting that or coupling that raw material, so that you can produce something useful and important. Further, manufacturing technology provides the tools that power a growing stable economy and a rising standard of living. These manufacturing processes really add representation of value addition to a material and creation of wealth. So, the main important aspect of the manufacturing really is hidden within this central block somewhere here, which talks about the manufacturing processes. So, heart of any manufacturing is really related to these manufacturing processes.

And, what we are studying, that is, the systems technology level is really how to handle these processes in unison; add a certain sequence, so that you can actually optimize the output from a system – a manufacturing system given different inputs to the system. So, if you really look at a manufacturing facility, it really adds value to raw materials. This has been illustrated in the definition earlier. There are inputs to the manufacturing facility. Some of the inputs are for example, the raw material cost and availability, the business environment; sales fluctuation is a very very big input to the manufacturing system. It really determines what is the level of production that you need to maintain, so that you can supply whatever is demanded in the business environment. There are also resources and plans and social pressure – these are some of the inputs to the manufacturing system. And, the outputs are things like production rate, quality, delivery lead time, profits, reputation of the organization, so on, so forth. So, what we are going to study is really – this system right here, which would be able to optimize all the inputs added together to a set of manufacturing processes, so that the output can be in a very optimum manner, maximized output can be recorded from such a system.

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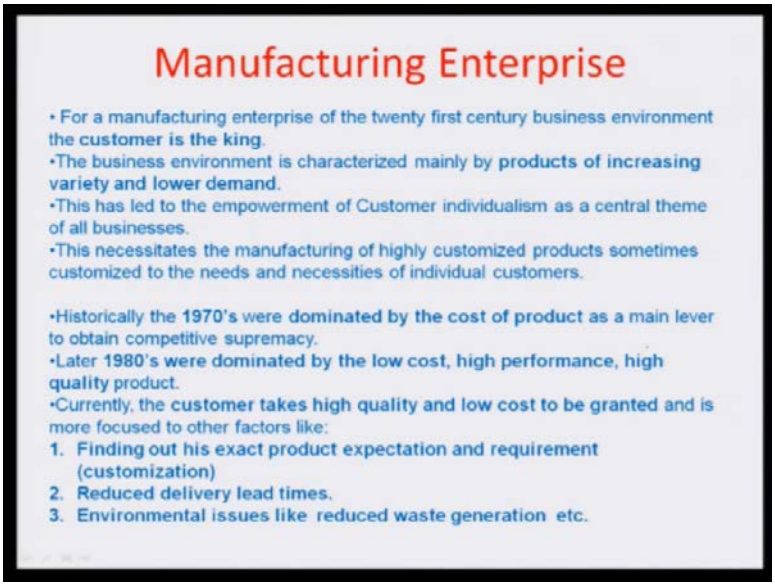

So, let us look at the modern day manufacturing enterprise. As we all know and we are all aware that, the manufacturing really is about the customer; in today's manufacturing, it is really the demand of the customer, the exact type and specification of the demand, which matters. And, there is a huge fluctuation in the aspiration of the customers also, because of the availability of a variety of products in the market and fierce competitiveness. So, one of the goals of all the industries – manufacturing enterprises really is to address that issue that, if on a real-time basis, the customer is aspiring to have a particular specification, a particular type of a product, how quickly it can be made available, so that you are the lead in the business or environment in which you are operating. So, really, in the modern context, manufacturing is basically treats the customer as the main determining factor behind its system as well as processes and whole set up.

So, the business environment is characterized mostly by different kind of products of increasing varieties and lower demand. Today, for example, if you look at car making, there may be something like thousands of variants of a single model, which is available, because the customer really on the cost versus benefit ratio available to him has a lot of aspirations and lot of variability in his aspirations. So, a person may for example, want a certain kind of specification of a output car like maybe one... a person – a customer may obtain an automatic transmission system and another may go for just a manual transmission system; one person may be wanting to have let us say power windows in a

particular vehicle; another may be wanting to have just a normal manual window operation, because his cost is the main criteria for determining, choosing his product. So, this way there are a lot of variants, which are available.

And, there are lower demands in those variant sectors, which are also available. So, the enterprise has to be in – little tailored in a manner, so that it addresses these issues and are able to quickly and flexibly change its own local environment, so that it can map the demand on a very realistic basis and be able to make supplies of whatever is being demanded. So, it has led to the empowerment of the customer individualism as we can say. And, it is nowadays a central theme of all businesses. So, if you look at the history of how the organizations ((Refer Slide Time: 06:15)) 70s probably were dominated by mainly the cost of the product; and the lower the cost, the better was the sellability. Then came the mid 80s or so, where the domination mostly was not only on the cost, but also on the high performance and the high quality of the product. And so, people really wanted the very best in the lowest price.

Currently, the concept has altogether changed; it does not really talk about quality and cost; low cost has main issues, because cost performance is sort of obviously taken as a basis for going to a particular product domain itself for doing the selection. So, cost performance does not matter anymore; people know that companies are going to strive hard to have a high quality and low cost. But, what is more important now is to find out what is the expectation of a customer from a particular product that he so wishes. So, what is his really requirement and what is the expectation, is the main focus now on the modern day scenario of the manufacturing road map. Also, there are certain other very perennial issues like let us say reduced delivery lead times; a person who is going to go for buying a particular model of a car would be very happy if he so just walks into the dealership and gets whatever his requirements are within a matter of hours or within the matter of maybe not more than let us say a few minutes; if it were minutes, he would be very very happy. So, all the companies nowadays are striving to make products off-shelf, so that there is almost a zero delivery lead time and there is no wait period as such for the customer for that for getting a particular product that he so wishes to buy.

And then, there are very perennial issues or very important issues, which have – which were not there in the probably the 70s or 80s; but, which is of significant concern in today's environment. For example, one of them would be how environmentally friendly

the product is or how much waste generation would be reduced by the manufacturing organization in order to make that product. So, these are so-called esteem value that the customer couples to himself on the modern day manufacturing roadmap thinking that these are more important in comparison to let us say just the quality or just the cost as were the aspects in the previous two decades. So, definitely, manufacturing has changed quite a big now in the current scenario.

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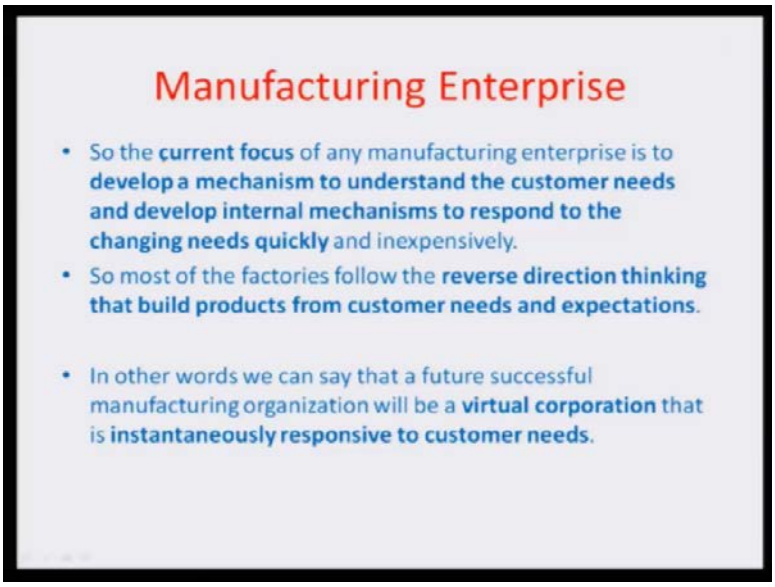

And therefore, the current focus of any manufacturing enterprise as on date is really to develop a mechanism to understand the need. And, this is actually also at a design stage that many of the people do need finding in order to map a product or introduce a new product to the market. So, the customer needs are the most perennial most important aspects of the modern day product development or product manufacturing process. And then, of course, the other job is to develop an internal mechanism, so that you can respond quickly to the change in needs and that too respond very inexpensively. So, you not only want to have an extremely flexible setup, you want an inexpensive flexible setup, so that you would be able to operate profitably in a business environment. So, most of the factories now follow the so-called reverse direction thinking that builds products or prototypes and that maps the customer needs and expectations. So, the goal really is to have a sort of a virtual corporation or a virtual sort of an organization, which can respond to the changing needs and immediately be able to tailor itself in a manner, so

that it can be highly responsive with short periods of time to the customers' thinking or customers' way of looking at products.

The modern day concept is really to build some kind of a desktop factory, which can be amenable to almost the real time product line. So, things like for example, bio implants, which are highly variable based on the different aspects of features of human bodies, which come for getting these implants medically administered or therapeutically administered. So, this kind of a flexible – the factory nowadays is envisioned, which can actually take various shapes or designs and be able to – in a matter of minutes be able to fabricate it flexibly. So, that is the level of flexibility that people are really thinking as of date. And, for that, the organizational changes that need to be addressed or the organizational requirements that need to be addressed are diverse and many.

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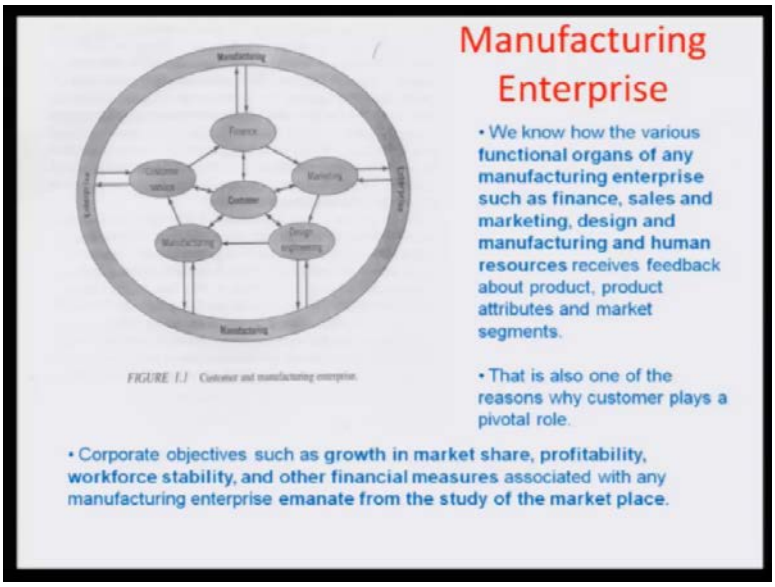

For example, let us look at the modern day roadmap of how the manufacturing enterprises can be split up. And, as you can see here in this figure here that, how the correspondence goes between the customer and the manufacturing enterprise; so, this whole circle right about here is actually the manufacturing enterprise. And, there are different wings of this enterprise; there can be a finance wing; there can be a customer service; there can be let us say the marketing; there can be a design engineering; and, there can be a manufacturing. So, as you are seeing here, the communication or the information level is more or less between all these different centers and they are in turn

centrally interacting with the customer. And, you can see that, the customer is interacting in a bi-directional manner to all these different wings of manufacturing enterprise like design engineering, manufacturing, customer service, finance, marketing, so on, so forth.

So, the whole enterprise – it is like really a systems idea that everywhere, it is the customer who is really determining the efforts at various levels of manufacturing. So, that is one of the reasons why in modern day manufacturing, the customer would really play a pivotal role in the proper product line; or, not only in determining the product line, but determining almost every aspect of the enterprise. And, some of the corporate objectives, which are achieved by such an integrated structure as really fundamentally growth in the market share; obviously, if you are very flexible; if you have a mapping – exact mapping of the customer thinking, you are going to snatch away most of the market of that particular product line of business; obviously, profitability. If you are inexpensive in flexibly controlling yourself for your manufacturing process to the various aspirations and needs of the customer, you are a profitable body – profitable organization. Obviously, if you have good profits; if you have good incentive schemes, you can have a stability of the quality of the workforce; you could not need to spend more on training again and again and hiring again and again. And then, of course, there are other financial measures which are also associated with any manufacturing enterprise, which emanates from the study of the market place. So, these are some of the benefits or so-called the corporate objectives when such an organization comes into picture.

So, now, the question is that, various wings of the manufacturing organizations are enabled to do different purposes or different operations. The major aspect for example, marketing – the major question that modern day marketing would face is that, what can marketing identify, which would be able to help the customers' manufacturing enterprise? So, I am going to actually talk over these different concepts for on a different system level, different organizational wings level and the various objectives that are sort of streamlined and set for the various wings of such an enterprise in the following lecture.

Thank you.