

Production and Operation Management
Professor Rajat Agrawal
Department of Management Studies
Indian Institute of Technology, Roorkee
Lecture 29

Aggregate Sales and Operation Planning I (Intermediate and Aggregate Planning)

Welcome friends and we have discussed in detail about various inventory management issues, we discussed dependent independent demand management and in last few session we discussed in detail about material requirement planning where we discussed that how different types of dependent demand issues are handled, we discussed various inputs to material requirement planning and in our last session we discussed in detail that the material requirement planning is actually leading you to manufacturing resource planning and that finally leads you to ERP that is Enterprise Resource Planning.

Now, one of the very important point which we need to understand that organizations are making different types of products. When I am saying that Hero Moto Corp so, Hero Moto Corp is making Motorcycles. Now, it is a single product motorcycle but, in the motorcycle itself there are different types of motorcycles CD-100 is there, Splendor is there, Splendor Plus is there. So, all these are the different types of motorcycles then, each type of motorcycle different types of colors are there, black motorcycles are there, red motorcycles are there, blue motorcycles are there, green motorcycles are there.

So, same is happening with your televisions Samsung is making televisions that is a single product but in that television itself there are different sizes of televisions whether it is a 32 inch, 24 inches, 42 inches, 55 inch and then there are different types of specifications whether it is HD or Non-HD. So, whatever company you take the name of the product may be one but, there may be large number of variations in that product.

So, for purpose of our planning activities, propose of our resource allocations we do the complete planning at two levels, one at the macro level and another at the micro level. So, the planning which we do at the macro level is known as aggregate planning. So, in this particular session we are going to discuss the concept of this aggregate planning where we are not going to discuss the individual item rather we are going to discuss the macro or the aggregate values.

So, how are we going to do this and what are the important things we need to keep in mind while developing the aggregate plans for our organization. So, that will be the subject matter of this particular session.

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Intermediate Planning in Perspective

Organizations make capacity decisions on three levels: long term, intermediate term, and short term.

- **Long-term decisions** relate to product and service selection (i.e., determining which products or services to offer), facility size and location equipment decisions, and layout of facilities. *SCM*
- **Intermediate decisions** relate to general levels of employment, output, and inventories, which in turn establish boundaries within which short-range capacity decisions must be made. *Inventory*
- **Short-term decisions** involve scheduling jobs, workers and equipment, and the like.

Now, for this purpose first we need to understand the intermediate planning in our perceptive. Now, what is the intermediate planning in perceptive that is organizations need to make capacity decisions on three levels, one in long term, intermediate, and the short term. The long term decisions are like you have to select the which product or service to offer.

The government of India is thinking that by 2030 in our country we should have complete adoption of electric vehicles and many Auto companies must have started thinking that how to offer those envies by 2030. So, that they can take the advantage of this newly developing market in our country so, these types of decisions are long term decisions which are related to which products or services to offer and slowly these companies need to face out their models which are running on fossil fuels.

So, that is a kind of long term decisions for that purpose you have to decide about the facility size and location where you are going to make envies what should be the size of those facilities all these things are the important part of your long term decisions. Then the second is intermediate decisions which are for not that long term 5 years, 10 years rather for 1, 2, 3 years or sometimes even less than one year also.

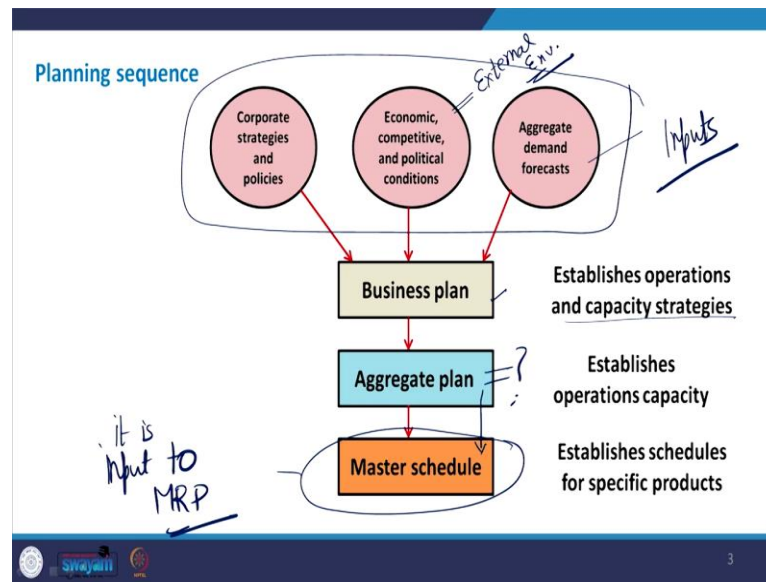
So, now it is about general levels of employments you know that in most of our colleges, in our universities, institutes we get same type of companies every year if, Microsoft is coming for placement so, almost every year we want that Microsoft will be coming if, we have Hero coming to my college so every year Hero is coming for the placement. So, because every year you are going to have some new engineers, some new techno-creates so, that is a general level of employment is an intermediate decisions.

The output inventories, how much inventory you are going to maintain and then establish boundaries within which short-range capacity decisions must be made so, what will be the boundaries for making short term decisions that also is a part of your intermediate and then the short term decisions which are taken on a regular basis and these are like scheduling jobs on machine today if my teacher is absent I am going to send another teacher to engage the class of my absent teacher.

So, that of type of scheduling activities of jobs, workers and equipment, etcetera these are the examples short term decisions. So, planning is required at different level long term, intermediate and at short term decisions so we many a time this is a part of our strategic management also and we also discuss this in our marketing management classes because, these are related to development or offerings of new products of services.

We sometimes discuss with respect to facility size and location in our supply chain management, where to locate new facility? What should be the size of new facility? Lot of quantitative and qualitative inputs are required for taking decisions with respect to size and location. So, you have a long terms issues also, you have intermediate terms issues also and you have short terms issues also with respect to your planning activities. Now, the sequence of the planning activity let us see that how this sequence is developed for our organizations.

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The most important thing is these 3 factors, these are the input for our planning activities and what are these the corporate strategies and policies? What is the corporate strategies of your organization? Then the external environment, this is the external environment which is economic environment, competitive and political conditions etcetera, these are very important fluctuating things in present markets.

The aggregate demand and the forecast, the forecast is one very important input for developing our various activities of aggregate plan. So, these are the 3 important inputs and then based on that input we develop our aggregate plan, first business plan is prepared and then business plan will be translated into the aggregate plan and that aggregate plan will be translated into the master schedule and we have already discuss that it is input to MRP so that we have already discuss.

So, today we are discussing this aggregate plan. So, this business plan establishes operations and capacity strategies that how much you are able to fulfil and what are the strategies to increased or reduced or to have flexible capacities in your system, then aggregate plan establishes the operations capacity that if there is a mismatch in demand and supply how you are going to achieve that match.

So, that is the part of this aggregate planning and this is basically, the establishment of operations capacity and then finally, the master schedule we already know that it establishes schedule for

specific products that I want 300 A in week 4 for and 300 A in week 6 so that type of final decision that in which particular week how many A's? How many B's? How many C's are required that is your master scheduling.

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Aggregate Planning

- Aggregate planning begins with a forecast of aggregate demand for the intermediate range. (upto 1 year) TV {42, 55, 60, 32, 24}
- This is followed by a general plan to meet demand requirements by setting output, employment, and finished-goods inventory levels or service capacities. Managers might consider a number of plans, each of which must be examined in light of feasibility and cost.
- If a plan is reasonably good but has minor difficulties, it may be reworked. Conversely, a poor plan should be discarded and alternative plans considered until an acceptable one is uncovered.
- The production plan is essentially the output of aggregate planning.
- Aggregate plans are updated periodically, often monthly, to take into account updated forecasts and other changes. This results in a rolling planning horizon (i.e., the aggregate plan always covers the next 12 to 18 months).

Now, some important points with respect to aggregate planning. The aggregate planning begins with a forecast of aggregate demand for the intermediate range that is for up to one year. So, the aggregate demand not we are discussing of individual products so if it is TV so it includes all 42 inches, 55 inches, 60 inches, 32 inches, 24 inches and many more others they are maybe different types of models of TV's.

So, if I am talking of forecast of TV's for Samsung so, I am going to include all the models which Samsung is offering this is followed by a general plan to meet demand requirements by setting output employment and finishing goods inventory levels or service capacities. Managers might consider a number of plans, each of which must be examined in light of feasibility and cost, these are the two important criteria on the basis of which we examine different types of aggregate plan.

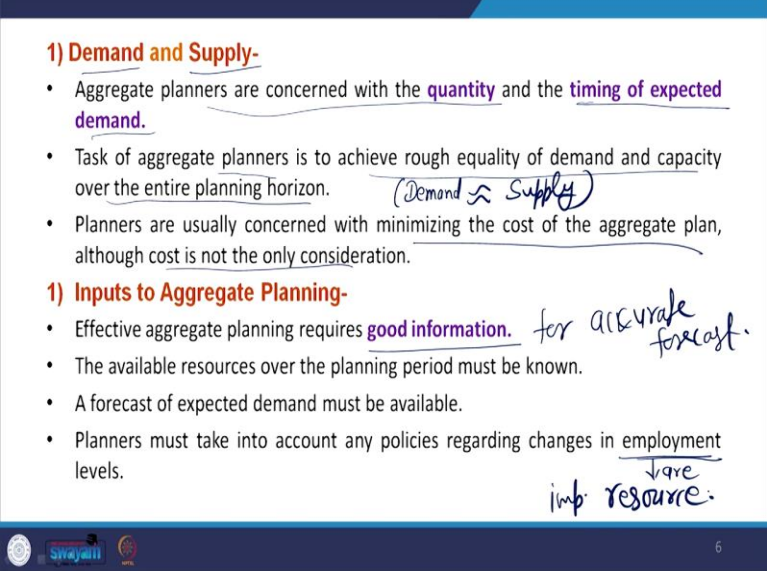
Feasibility and cost, so the parameters you must remember that what are the important parameters on which we are going to examine our these different plans. If a plan is reasonably good but has minor difficulties, it may be reworked. Conversely, a poor plan should be discarded and alternative plans considered until an unacceptable one, until an acceptable one is finally

available to us. The production plan is essentially the output of aggregate planning so, the master schedule is the output of your aggregate planning.

The aggregate plans are updated periodically, often monthly, to take into account updated forecasts and other changes because, forecast is also dynamic as we are moving close to a particular period, we can do right now we are in the month of January 2020 and I can forecast for January 2025 but that January 2025's forecast will not be a good forecast, I am also forecasting in January 2020 for January 2021 that is more accurate forecast.

So, as I will move to January 2024 I will revise the forecast for January 2025 so, that I have more accurate forecast so, closer I am better forecast, more accurate forecast. So, I continuously update, periodically I update my forecast and that will affect my aggregate plan and the effect of aggregate plan I need to transfer to the master production schedule also.

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1) Demand and Supply-

- Aggregate planners are concerned with the quantity and the timing of expected demand.
- Task of aggregate planners is to achieve rough equality of demand and capacity over the entire planning horizon. *(Demand ≈ Supply)*
- Planners are usually concerned with minimizing the cost of the aggregate plan, although cost is not the only consideration.

1) Inputs to Aggregate Planning-

- Effective aggregate planning requires good information. *for accurate forecast.*
- The available resources over the planning period must be known.
- A forecast of expected demand must be available.
- Planners must take into account any policies regarding changes in employment levels. *imp. resource.*

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Now, in this aggregate plan, these two terms are very important demand and supply. Aggregate planner are concerned with the quantity and the timing of expected demand that how much expected demand is and when it is? So, these are the two important issues we are trying to solve. Now, task is to achieve rough equality of demand and capacity over the entire planning horizon, you in simple words can understand that it is a possibility of matching demand with supply, how we can match demand and supply? So, that is the actual requirement of this aggregate plan.

Planners are usually concerned with minimizing the cost of plan of the aggregate plan, although cost is not the only consideration. Sometime, why cost is not the only consideration, sometime the factors like customers satisfaction, the factors like market competitiveness also become very important and at that time cost maybe at the second priority though, cost is important but, sometime in some products cost may not be that important also. Now, what are the important inputs for the aggregate planning.

Now, for aggregate planning one important inputs is good information so, that you can do accurate forecast without good information accurate forecast, the forecast which are very correct, which are very reliable will not be possible. So, one important thing is for accurate forecast. The second important input is, the available resources over the planning period must be known, how the resources will be available?

Resources means, machine timings, the manpower availability, the availability of the power, availability of the tools so, all these resources are there and as a planner I should be aware of the availability of various tools, techniques, raw material, machine, etcetera for my job that whether it is available or not available.

A forecast of expected demand must be available so, already discussed. Planners must take into account any policies regarding changes in employment level because, your employees, your employees are important resource and many of your production abilities are dependent on your level of employment so, it is an important resource. So, you should know that how the level of that important resources is changing. So, therefore this is also an very important input.

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Aggregate Planning and the Supply Chain

It is essential to take supply chain capabilities into account when doing aggregate planning, to assure that there are no quantity or timing issues that need to be resolved.

Demand and Supply Options-

- Aggregate planning strategies can be described as **proactive, reactive, or mixed.**

- ① **Proactive strategies** involve demand options: They attempt to alter demand so that it matches capacity.
- ② **Reactive strategies** involve capacity options: They attempt to alter capacity so that it matches demand.
- ③ **Mixed strategies** involve an element of each of these approaches

Now, with respect to aggregate planning and the supply chain it is essential to take supply chain capabilities into account when doing the aggregate planning, to assure that there are no quantity or timing issues that need to be resolved. So, you need to see that when we are doing this particular activity of aggregate planning which is more concerned with the shop floor environment but, it is also equally important in present circumstances that we take into account our entire supply chain capabilities.

Now, supply chain capabilities are largely dependent on our supply side understanding of the supply side and understanding of the demand side if we are able to understand both supply and demand then we have a very good supply chain capabilities. Now, with respect to aggregate planning our supply chain and related strategies can be described either as proactive, reactive or mixed.

First one is proactive, the proactive strategies are which involve demand options, what does it mean? They attempt to alter demand so, that it matches capacity, here in the proactive strategies you cannot alter the capacity, you cannot change the capacity so, what you are trying to do, that you tried to alter the demand, you are trying to distribute the demand, if all demand is coming to a particular time period so, you will have very high demand during that period but, you do not have that much capacity to serve so, you try to distribute the demand to some other of big periods.

The concept of happy hours in various restaurants is an example of this proactive strategies because in most of the restaurants you find that evening 4 to 7 you will not find much rush it is a very lean period in the restaurant, up to 3, 3 30 4 those who are taking lunch will be there and after it people who want to have their dinner they will come to restaurant between that period restaurant is almost empty.

So, various restaurants have started the concept of happy hours where they offer some good discount so, those customers who are cost sensitive, those customers who are cost sensitive they will like to visit the restaurant during the period of that happy hours and therefore, this becomes an example of proactive strategy.

The second is reactive strategy, in reactive strategy it is the capacity option, it was demand now it is capacity now, the capacity option says because, demand has changed so, I am following the demand and accordingly I am going to change my capacity, they attempt to alter capacity so, that it matches the demand.

So, I can either increase the availability of the resources for an example, when in a stadium, in a stadium regularly you see that your stadium is 100 percent occupied so maybe you can think of over a period of time to increase one more stunt so that you can accommodate more number of customers, that will increase your revenue and that will reduce your opportunity cost. So, that is the reactive strategies, that it is more related to capacity issues in the organization.

The third is mixed strategy, in the mixed strategies we take care of demand and capacity, we try to distribute the demand, we try to alter the demand and at the same time we see that how we can use capacity, how we can use flexible capacity solutions for, meeting our demand. So, it takes both proactive and reactive into a count. Now, let us see what are the different demand options, we discussed that you can have demand and supply issues which can help you in aggregate planning.

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Demand Options

Demand options include –

- Pricing, *Differential Pricing (Dynamic)* ✓
- Promotions,
- Using back orders (*delaying order filling*),
- Creating new demand.

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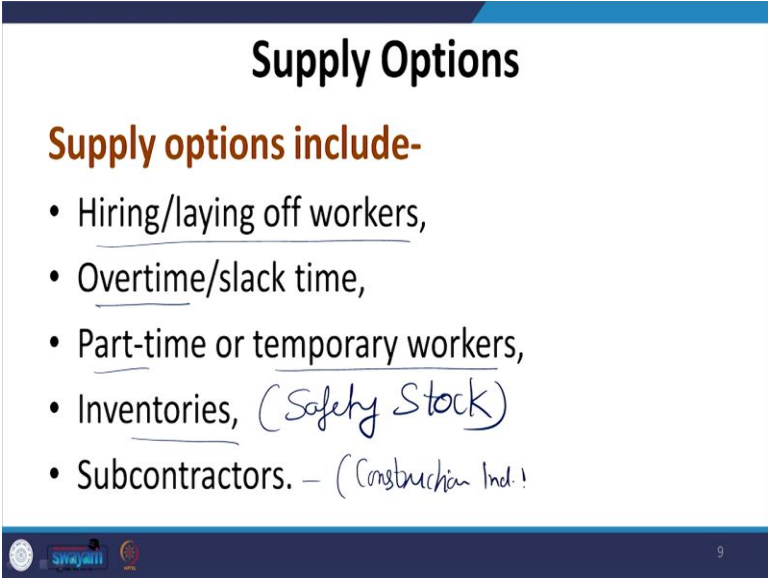
So, what are the different demand options. So, pricing is one and particularly differential pricing, which is a very much being differential or you can say in another term dynamic pricing, airlines a very good example, whenever demand increases airlines also increase their fares so, the simple reason is that now they want to make more profit that is from one point of view but, from our point of view at this moment we may say that by increasing the price they will reduced the demand.

So, that now demand comes to that level according to which they have the capacity if, more demand is there they are not going to buy a new areoplane overnight. So, what they are doing that, they are increasing the price so, that only those customers which are genuine customers, which are having sufficient paying capacity, they can travel in this aircraft so, pricing at many places is a very good demand distribution option.

The promotions, this is another very important P of marketing mix so, by promotion also you are trying to create demand for the product in many situations it is possible the pricing we discuss, when demand is more and capacity is less but, promotion we use where capacity is also there and demand is not up to that capacity. Now, we want to increase the demand and for that purpose promotion is very-very useful tool, using back orders, back order is that you have not fulfill the order on the right time so now you are supplying order as a late supply.

So, it a delayed supply and here you may incur some penalty also if, you are supplying in the global market, so if you are coming late then they are certain penalty clauses also in our agreements, then creating new demand, you have developed a product or a product is already available but, you are founding a new application of that product, you are finding a new application of that product. So, that is creating new demand or you reach physically to another market where low such product is available so, and these places you are creating new demand so, these are the demand options available to us.

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Supply Options

Supply options include-

- Hiring/laying off workers,
- Overtime/slack time,
- Part-time or temporary workers,
- Inventories, (Safety Stock)
- Subcontractors. – (Construction Ind.)

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Now, let us see what are the supply options available to us. In the supply options, the hiring, laying off the worker if, you more demand you can hire more contractual workers, if demand is less you can lay off some contractual workers, by doing the overtime, slack time you can ask your workers to stay extra time and you will pay them at the rate of overtime rates.

So, that is going to help your employees in earning extra amounts then, part time or temporary workers you may hire some daily ways workers which may help you in increasing the output or they may actually create some kind of environment where everybody becomes very-very competitive.

So, that is a part time or temporary employment so, you hire people only for some time on a project basis and then once the work is done they will go to their place but, since they are in the

part time nature and they want regular appointment. So, it is basically going to help you in improving the productivity of your organization.

The inventories is another very good supply option, people keep inventory so, that whenever there is a fluctuation in the demand they are able to fulfill that requirement from the inventory so, you maintain some safety stock and that safety stock helps you in realizing the importance of supply related issues then, sub-contracting this is also a very possible supply solution.

In sub-contracting because, you do not have enough capacity so, what you do, you sublet your work to some other person so for each bigger organization there are large number of sub-contractors and particularly, if you see this is very common in construction industry, any big firm takes the contract of making a huge building but, then that firm further sublets that contract into smaller pieces to various contractors.

So, in our contraction industry this sub-contracting is a very popular way of enhancing your supply side, enhancing supply side means the use of some tools so, that you can create additional, you can create extra temporary capacities that is the idea of supply side option. So, we discuss that what are the demand side option and what are the supply side option?

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And in many situations you may combine, you may combine because there are three types of strategies proactive which deals with the demand, reactive which deals with the capacity and then the third mixed where we use a combination of both these, where we use promotion also, we do differential pricing also and we then can go with hiring of more people overtime or subcontracting etcetera. So, we in this particular session discuss some important terminologies and some important strategies with respect to demand and supply side or you can say proactive and reactive and the mixed strategies for our aggregate planning with this we come to end this session. Thank you very much.