PRODUCTION

STRATEGY

CONCEPTS

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Module Outline

PRODUCTION STRATEGY CONCEPTS

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Learning Objectives

When you have successfully completed this module, you will be able to:

- identify the key differences between manufacturing and service businesses and the management issues that arise from these differences
- apply a framework for design of a service concept and a delivery system for a service business
- analyze and plan capacity of components of a production or service delivery system
- identify and apply strategies for managing supply and demand in a production or service delivery system

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Manufacturing versus Service Business

Key Differences:

- **Simultaneous production and consumption**

  In service businesses, you typically have simultaneous production and consumption of the service. (for example in a restaurant, the production and consumption of the service is taking place simultaneously). This is very unlike a manufacturing situation. In most manufacturing operations, there are typically inventories between each stage of production and a finished goods inventory which can be increased or decreased as demand fluctuates.Take, for example, a production process that involves three stages. We start with our raw materials, begin our production process and when we get to the end of stage one we have semi-finished goods that go into an inventory.
  Then we would do some more production of these semi-finished goods (or sub-assemblies) and at the end of this stage, they would become finished goods and would go into the finished goods inventory. They would then go to a retail inventory and onto a shelf in a retail outlet and finally on to the consumer. The semi processed goods and finished goods might sit in inventories for a considerable amount of time so we would have a considerable lag between the time that the product was produced and the time that the product was consumed by the consumer.

  That is the fundamental difference between manufacturing and service business.

- **Critical aspects of services are intangible**

  When we buy something that is manufactured, it has a size, it has a shape, we can touch it, we can see it, and it is very physical in nature. Whereas in a service business the atmosphere, the attitude and the feelings that are a part of the whole experience are intangible, but are critical aspects of the service. How you are reated in a restaurant, how you are treated on an airline - these are all important parts of the service delivery that are a part of the product.

- **There are no inventories or buffers**

  If we manufacture electronic products, they may go to a retail outlet inventory. If the demand suddenly decreases, then that inventory is the buffer between production and the demand. The goods will stay in inventory and can be sold later. If you have too many seats on an airline or if the airplane is too large for the demand for traveling to point A to Point B then you cannot save those seats for later on. When that flight takes off without passengers, those seats are gone, or unutilized.

- **There can be considerable variability in service delivery**

  This has a lot o do with the fact that many of the important aspects of service are intangible. How does that person waiting the tables serve you today? How does the lawyer or accountant serve you today versus how they served you yesterday? There can be considerable variability due to human nature and how people are feeling at different points in time, the pressure they are under or how they are treated by their boss. It is much more difficult to get consistency in delivering a service than if you are producing a physical product in a manufacturing system where there is tight quality control and detailed specifications.

- **Service usually consists of "substantive" and "peripheral" components**

  In the service business, for the product that is being offered, it is important to recognize that there are both substantive components, like the food in a restaurant, and peripheral components of the service which could include the comfort and the ambiance of the restaurant. When we consider the service business, we have to take into account both substantive and peripheral aspects.

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Manufacturing versus Service Businesses

Management Issues

- **Marketing = Operations**

  In service businesses, marketing and operations are very closely linked because of the fact that production and consumption takes place at the same time. The people that are involved in the production of the service are actually marketing the service while they are delivering it. Many employees are both production workers and sales/marketing staff as they are performing their duties.

- **The consumer has to come to the service delivery location**

  The customer has to come to the service delivery location. If you want a haircut you have to go where they cut hair. You want a restaurant meal, you have to go to the restaurant. With electronic service, there is a whole new world of service businesses that we will be able to access or are already accessing services that are different from the traditional services that we use right in our homes. This is going to make a whole new set of challenges for the managers of service businesses.

- **Intangible aspects are difficult to quantify/measure**

  Because there are so many different intangible aspects of a service, it is difficult to quantify and measure service. With a physical product like a stereo system that comes off the production line, we can look at it, we can subject it to testing, we can examine it for defects, and we can easily measure if that product meets the specifications. How do we measure whether a person had a positive experience in a restaurant or a service business? It is difficult to measure whether we got it right. From a manager's point of view, clearly you want to get it right in the delivery of your service, but unlike the manufacturing business, it is much more difficult to understand if you are meeting customer expectations.

- **Quality control is a major challenge**

  As a consequence, quality control is a much greater challenge because of our inability to measure accurately what we are accomplishing in the delivery of our service. With the tremendous emphasis on quality in business today, many businesses are being certified under international standards. In service businesses, it is much more difficult to achieve quality control and maintain consistency because of the measurement problems that exist.

- **"Emphasis" on key service aspects is important**

  What is it that you are trying to achieve in the service business? Depending on what kind of service package you are trying to offer the consumer, there are certain things that are really important to the service and they have to be emphasized in the delivery of the service. For example, Federal Express emphasizes speed and reliability.

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Service Business Design

In the design of a service business, there are three components that your business plan should address:

- what your **Service Concept** is;
- the details of your **Service Delivery System;**
- the **Service Levels** that you are trying to offer with your business.

The service concept has to be clearly defined. A system for delivering the service has to be designed and the desired minimum levels of service that will be offered have to be defined in a meaningful way.

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The Service Concept

The bundle of goods and services sold to the consumer and the relative importance of each.

- The "substantive" service
- The "peripheral" service

When we talked about product planning in marketing, we said that a product was a package of benefits as perceived by the consumer. When we move into the service concept, we are really talking about the same thing. The service concept is the bundle of goods and services that are sold to the consumer and their relative importance. We have to put ourselves in the minds of the consumer, how the consumer perceives the importance of each.

There is both the substantive package of benefits, in other words the food that we are going to eat in the restaurant, and the peripheral aspect of the service. The peripheral aspect is where we get into the soft intangible things like what was the atmosphere or ambience in that restaurant like? was it pleasant? was the décor nice? did it fit the theme of the restaurant?

When we look at the package of benefits for a service, we have to take into account both the substantive component and the peripheral component package of benefits.

Example: The service concept of McDonald's:

- Relatively inexpensive;
- Fast and courteous service;
- Consistency;
- A clean environment.

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The Service Delivery System

When we are talking about our service delivery system and when doing the business plan, we have to identify how the service is going to be delivered. What processes are we going to use to deliver the service? What is the work force going to be like? What kind of equipment facilities are we going to use, recognizing that we are going to produce the service and deliver it simultaneously.

Using the McDonald’s example, it could be that McDonald’s restaurants have the philosophy that "discretion is the enemy of order". In simple words: do not let too many people have discretion or decision making authority. If there were too many people with decision making authority, there would be no speed and consistency.

The majority of employees at McDonald’s are very young and most of them would not have yet finished high school. How does this fit with the service concept? It fits in a sense that McDonald’s serves cheap food and in order to have cheap food, you have to have cheap labour. By employing young people and probably giving them their first job in life, they are achieving a low cost of production. McDonald's would logically have a high turnover of staff as they are going to move on to university or higher paying jobs. Consequently they do not give these young people a lot of high level decision making authority because no sooner would you get someone trained to do some specific job, then they are going to leave.

That is why there is only effectively one or two people in a McDonald’s that make decisions. Everybody else reacts - the buzzer goes to take the burgers out, put french fries in a package with a scoop that is designed to give you just so many French fries in a package, mix something up according to a recipe. Everyone there is controlled by equipment, standards and timers. The decision making authority is centralized within one or two experienced senior people.

The service delivery system in a McDonald’s Restaurant is a comprehensive design that includes an efficient lay out of facilities and equipment and clearly defined procedures, roles, responsibilities and standards. Collectively all of these factors produce an efficient system that has predictable outcomes. That is a key aspect to the service delivery system that ties in with the service concept. You cannot have speed, consistency and low cost without designing that into the service delivery system.

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Service Delivery System - Key Management Considerations

- **Intangibility of Services**

  - ***Product life cycles can be short*** - Unlike manufactured items which tend to a have relatively long product life cycle, service delivery systems often change frequently in many cases driven by technological change.

  - ***Difficult to build brand loyalty*** - This is because in service businesses, copying is very easy. If an airline decides to offer some new feature during flights, movies for example. Then all airlines bring in movies. If one airline introduces frequent flyer miles then they all must have frequent flyer miles to be competitive. That is why it is necessary to to be innovative again and again and come out with new service features. This is why some services can have a very short life cycle.

  - ***Company reputation crucial*** - Company reputation is crucial in service businesses because consumers are unable to measure with any accuracy the quality of service they are getting. For example, you have a small business and you want to hire an accountant. You don't know anything about accounting yourself. How do you know that the person you want to hire is good at what they do? One way that you can do this is to ask others. You quickly get to know those with the best reputations.

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- **Perishability of Services**

    - ***There is no buffer from fluctuations in demand -*** Due to the characteristics of services, there are no inventories to buffer fluctuations in demand. If there is an airplane with a 100 seats on it leaving at 5 o'clock to fly 1000 kilometers, the output of that plane is 1000 seat kilometers. If only half of those seats are filled tonight, the sale for the other half of those seats perishes. Unlike if there were 100 stereo systems in stock today and a sale was held with only 75 were sold, the other 25 still have a potential to be sold tomorrow. The airline seats sales perish once the airplane takes off, and those same seats for that particular flight can never be sold again. Services do not have inventories that can be used to buffer the imbalances between the supply of products and the demand for products.

    - ***Because there is no decoupling of the various stages of production, planning and control can be complex -*** To use the airline example again, airlines have yield management systems. They actually try to forecast based on past experience how many empty seats there are going to be on every flight. That is why they have seat sales going on, trying to fill those empty seats. The other thing that they do not know is how many people are going to make reservations and not show up. What they do is overbook every flight based on the past experience of no-shows. If they are wrong then they are going to have some unhappy customers that are going to show up and find out that there are not enough seats even though they made a reservation. That is a perfect example of how planning and control are so complex when you don't have an inventory to buffer the demand. You cannot say to the customer that there are no seats and we are going to put you in an inventory box and keep you there until tomorrow when the flight arrives.

    - ***The challenge is to fit capacity to demand as best as possible -*** The challenge then, in a service business as well as in a manufacturing business, from a management point of view and from a business planning point of view, is to try to fit your capacity to the demand as best as possible. To the extent you are successful in doing that then the business will be much more successful.

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- **Heterogeneity of Services**

    - ***Difficult to establish standards especially with respect to psychological aspects of service* -** It is very easy to say that some commercial goods have to be of a certain dimension, to be a certain weight, a certain colour, a certain taste. It is very easy to set specifications for those kinds of physical products, but how are standards set so that a restaurant customer will be highly satisfied when they leave. First of all what is meant by highly satisfied? How is that measured? Some attempts can be made at this, but the challenge is much more difficult in setting the standards and finding out whether or not your specifications have been met. Just establishing the specifications is much more difficult than it is with a physical product.

    - ***Hard to ensure standards are being met* -** For the same reason it is much more difficult to measure that set standards are being met. On each airline flight that you take, you can be treated very differently. Within the same flight you might be treated well at one moment and terribly in another moment. As management, how do you know, other than customer's letters that your customers got the level of service you want to deliver?

    - ***Quality control in recruiting and training is crucial* -** Quality control in this context, comes in large part from recruiting and training. If you have a certain part of your service or aspect of your service concept that you are trying to deliver, then you have to recruit the right kind of people. If personality is important then you have to get people who have good personalities. If you are an accounting firm then you have to have specialists in tax and specialists in mergers and acquisitions and that kind of thing and you have to recruit people that have that kind of detailed expertise.

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- **Simultaneity of Services**

    - ***Staff must have both service delivery and marketing skills* -** The staff must not only be skillful at delivering the service, but they must also have marketing skills. Marketing a service concept and the service delivery system are really closely linked because both are happening on at the same time. While you are delivering to the customer, you are actually marketing for future business. When the accountant is giving tax advice, he or she is hoping that the client is going to get them to do their taxes in the next year. For example, if they can find the client some good tax shelters and give them good advice showing how certain actions might help lower the tax burden, then the client would consider that even though he/she might have paid the accountant $500, the accountant saved him/her $5000. That client would likely go back to the accountant the following year.

    - ***Since customers must come to the place where the service is provided, each service facility has a limited geographic area it can serve* -** A restaurant in Montreal would obviously not draw too many people from New York unless they are tourists. This is a reality of the service business, unlike a manufacturing business where you can produce a product and ship it around the world. In a service business, unless you are involved in electronic service, which is becoming more pervasive in the economy, it is very difficult to deliver a service over a distance. Technology is helping in that regard, certainly in the education field. The traditional sense of education is that many students go to a university of close geographic proximity or at least most students will stay in close proximity to their home. That is why the majority of students that go to UNB are from New Brunswick. With technology, delivering education over a greater distance is becoming easier.

    - ***The capacity offering must fit the market, otherwise the service will be unprofitable* -** Another key thing about simultaneous production and consumption is that balancing capacity with demand is absolutely crucial to profitability. As difficult as it is to balance the demand for air services with the offering of air services, once an airline has a schedule in place, it has committed itself to so many flights per day in each market and so many seats per flight and each flight having to cover so much distance. Once the capacity is committed, the airline has to try and create business or it is going to be under-utilized. In any business if you have a lot of excess capacity you may not go be profitable. Any kind of service business is worried about that. With a law firm that has so many lawyers, they have so many hours per week to serve clients. The firm would worry about how many of its lawyer's hours are billable hours. The same with consulting firms or any professional firm. They always have to think about their worker's billable hours in relation to the total available hours for work. The lower that ratio is, the greater the risk that the business is not going to be profitable.

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Service Levels

The level of explicit and implicit benefits provided to the consumer from the substantive and peripheral services.

This is where the measurement problems come in. What is level of service? How can we define that in terms of substantive benefits? In McDonald’s they will throw the food out after so many minutes because it is not hot enough. That is a service level. The peripheral aspect - the atmosphere, the attitude of the employees, their demeanor - are all a part of the service level that they are offering.

The challenge is getting a match between management and consumer perceptions of what the service concept and service levels should be. Following is a formula that is very important in relation to satisfying customer expectations.

Satisfaction = Perception - Expectation

What did the consumer perceive about the service experience versus what was their expectation of the service experience.
"I expected very high quality food. I expected it to be hot when it was served. I expected it to be served in a friendly manner". Now what was the customers perception? "Well, my meal was cold. They dropped things on my table. The atmosphere was terrible. The waiter was in a bad mood". In that case, the perception of the experience was less than the expectation. So you are going to have negative satisfaction (or dissatisfaction).

Consider this other scenario of coming into a service firm, getting your taxes done and your expectation is that it is going to cost you $500 and you also expect that you are going to owe $1000 in additional taxes. All of a sudden you find out that you are going to get a tax refund because the accountant pointed out to you a tax shelter or which you were not aware. Now your perception is much higher than your expectation and you are highly satisfied with the advice that your accountant gave you.

If a customer perceives that the service received was better than what was expected, the customer will be highly satisfied and vice versa. The expectations of customers can be raised or lowered through effective marketing communications.

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Service Levels - Management and Control

- ***Recruiting the right kind of people* -** It comes back fundamentally to setting out what your design of the service concept is and what kind of people skills you need in implementing that service concept. McDonald's Restaurants use low cost young labor to keep the cost of their food products as low as possible. The service delivery system is designed such that young workers can function effectively despite their lack of experience in providing service.

- ***Training on what good service is and how to deliver it* -** Then you have to train your people to deliver good service based on your service concept. What is it that you want to emphasize and how do you want them to deliver it?

- ***Incentives and rewards to encourage the right kind of behavior* -** People behave and feel differently from one hour to the next. Given the right kind of incentives and rewards, an organization can encourage the right kind of employee behaviour. These incentives could be monetary or they could be some other kind of incentives. Another incentive is perhaps using positive reinforcement, "Mary, I saw the way that you delivered the service to that customer and that was excellent". This would be positive reinforcement, when you see employees act exactly the way that you want. If it is not proper service to a customer, you would take them aside in a calm moment and bring the deficiency to their attention. You give them specific feedback that is fair and objective and feedback that they can do something about (you coach them).

- ***Monitoring quality of service* -** Another important aspect of managing service level is monitoring the quality of service. In spite of all the measurement difficulties, most service businesses ask customers to fill out questionnaires to rate their service in different categories. You want to find out whether the customer is getting what they expected.

- ***Appropriate use of technology* -** Appropriate use of technology is another important way to control service levels. Remember the day when we stood in line at the bank on payday to wait ten-fifteen minutes to try and deposit our pay check. The bank then introduced automated teller technology and later online banking. An appropriate use of technology to redistribute the demand. Instead of everybody showing up at the bank on payday, you can do your own banking any time of day, any day of the week. This is an example of appropriate use of technology to deliver a higher level of service.

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Capacity Planning

Capacity planning is focused on the level of capacity that we provide at each stage of the production or service delivery system.

Capacity Planning Process

- **Assess company situation**

  - What triggered the decision to alter capacity?
  - Are we expecting rapid growth?
  - Are we introducing new products?
  - Is more efficient/productive technology available?
  - Are we expanding into new market segments?

  In assessing the company situation, think about what it is that triggered the decision to alter capacity. If this is a start-up business then that is your situation for choosing that capacity, but if you have an established business, what caused you to say we need to change the capacity levels that are in our business? Are you responding to a competitor move? All of a sudden your competitor has done something and you think that you better decrease your capacity in that niche or that you have to increase capacity.

  For example, one of the things that airlines compete with is frequency of flights between two destinations. How many flights per day does the competition offer on a given market? If the competition comes in and increases their frequency of service, then more frequent service is likely going to draw passengers from your airline to their airline. It is more convenient if you can fly several times during the day. You might have to respond to that and offer the same service or else you might lose market share. In doing so you might risk under-utilization of your capacity. You have to assess your capacity, on the one hand you don't want to add any more capacity if the present demand levels don't warrant it. On the other hand you might have to do it anyway simply to preserve your market share. It is important to understand why it is that you are making a change in your capacity levels.

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- **Determine Existing Capacity**

Defining the appropriate measures of capacity is critical. Failure to define capacity and production and outputs of production processes properly could lead to erroneous conclusions.

- What are the appropriate measures of capacity?
- What is the capacity of each component of the production system?
- Where are the bottlenecks?

Fundamental capacity planning is understanding how much capacity you have now in your production or service delivery system. This is not always easy to quantify.

One of the things that you have to decide is what are the appropriate measures of capacity.

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- **Determine Required Capacity**

  You have to determine how much capacity you need at each stage in the production system. These are the planning details, the things that you have to address in your business plan. Forecasting future capacity requirements is a difficult process.

  - ***Forecast volume -*** For a restaurant, how many customers do you expect to serve at different points in time. There are probably some peaking factors. You probably expect some peaking on Fridays, Saturdays and Sundays, but very little in the beginning of the week. Maybe there are seasonal factors to consider.

  - ***Assess uncertainty of capacity requirements -*** The uncertainty of capacity requirements is especially critical in service businesses. How do you know what the demand is going to be? How do you know how many people are going to show up? We can try to control this variability with a reservation system but there may be a fair amount of uncertainty in our capacity requirements. That is why airlines and hotels do things like overbook because there is uncertainty about people honouring the reservations that they made. You try to manage the problem and alleviate any damage that may be caused in relation to your customer.

  - ***Forecast timing of capacity requirements -*** The timing of capacity requirements can be important, whether by hour of the day or day of the month or month of the year. You not only have to determine how much capacity you need but what capacity you need at certain points in time. Restaurants know that they need more capacity, more workers at certain times of the day, and they probably need more workers on Saturdays and Sundays than they do on Mondays. The timing of capacity requirements is another detail that has to be addressed in your business plan..

  Scenario or "what-if" analysis should be used to assess the sensitivity of key assumptions in your analysis.

  Lead times to introduce additional capacity are also important. The longer the lead time to put the capacity in place, the more critical the timing of new capacity.

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- **Identify Alternatives**

Capacity can be provided in many ways. It can be provided through labour, or employees; it can be provided with equipment or technology. There are several alternatives to capacity planning:

  - ***Do nothing.***
    One of the alternatives to capacity planning is to do nothing. We see some demand coming that we are not going to be able to meet, the economics do not favour us increasing our capacity to meet that demand. For example, hotels experience at certain times of the year, events such as where there are festivals on or conventions where there are too many people for the number of rooms in the city. You are not going to build a new hotel because there is going to be surplus demand six or seven times a year. The investment does not warrant the capacity offering. Do nothing is always an alternative, depending on what the economics are and what the implications are to your business.

  - ***Contract out.***
    Contracting out is often used by businesses when there is surplus demand. Professional firms do this a lot. They associate themselves with freelancers. Contracting out is often used by firms to meet the peaks. Instead of meeting the peaks internally, they will contract out to meet the peak or for some other unusual demand.

  - ***Increase labour or labour productivity***.
    You are always going to want to closely monitor employee productivity. In the first instance, is there any way to help your employees become more productive? Can you improve the training? Can you improve the equipment that your workers are using? Are some of your labour practices deficient in that you are burning people out or there is bad morale because of a poor manager? Do you replace the manager to get the morale up to increase labour productivity? There is always the issue of how you can make your workers more productive. Then there is always the option of more labour. If you have more demand then maybe you need more workers at certain times. This becomes a business planning detail, if you need to add more workers, what kind, when and where.

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- ***Introduce change in technology.***
  Do you want to introduce a change in technology? Think of the example of banks introducing ATMs and later online banking. There was a change of technology that enabled them to substitute capital or technology for labour. Rather than hire more tellers to meet peaks, they introduced technology and redistributed the peak, so people can do their banking anytime during the day or night during the week. There is an example of introducing technology to affect the capacity of your business to serve the customer. In a manufacturing sense, an example would be introducing a new machine that can increase the productivity of your production process. It would have the capacity to produce more units per hour.

- ***Alter demand.***
  When demand exceeds capacity, one strategy is to try and change the capacity to meet the demand. The other is to try and shift the demand to another period where you have under-utilization. That is what airlines do in part with seat sales. They try to get people to use their airline when the capacity is under-utilized. Most discount fares require having to stay over on Saturday, to force you to make your return trip on a day where they normally have a lot of empty seats. That is an example to trying to alter demand patterns through restrictions that you impose through pricing initiatives.

- ***Eliminate bottlenecks.***
  You do not always have to add more capacity to your production system, if you can eliminate bottle necks. For example, maybe you move two people from one stage of the process to where a bottleneck is located, you may get a much more efficient production system without adding more labour. You have just increased the capacity of the bottle neck. You may have under-utilization in the other stages of the process anyway, so by adding labour at the bottleneck you have corrected the problem and increased the output of the production line.

These alternatives are not mutually exclusive. Combinations of these strategies might be adopted.

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Capacity Planning Process (cont'd)

Once you have identified the alternatives, you have to evaluate them. There are both qualitative and quantitative dimensions to your evaluation.

- **Quantitative Evaluation**
  - ***Evaluate potential economies of scale.* -** In the quantitative evaluation, you are going to want to look at whether economies of scale exist. When you have fixed costs in a business, the more units that you sell and produce, the lower your average cost per unit. If you sell more units and produce more units you are going to achieve economies of scale by spreading fixed costs over more and more units. You want to find out what are the available economies of scale in your business and there are usually limits to that.

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- ***Evaluate economies of technology -*** If you intend to introduce new technology, perhaps to replace labour in some instances, the technology is going to involve a certain capital investment over its expected life. If it is a computer system then maybe we are going to spread that cost over a very short period because we know that the computer technology is going to be obsolete in three years. We have to look at what the amortized cost of that capital investment is versus the cost of the best alternative.

- ***Evaluate capital versus operating costs. -*** You have to understand the economics of each of your alternatives. What are the capital costs? What are the operating costs? What are the life cycles? Am I looking at a three year time horizon to evaluate this capacity investment and if so what is the total life cycle cost for each alternative? Once I understand that then I can start to look at the qualitative issues to bring into the decision making process.

Proper economic evaluation of alternatives is critical to the financial viability of the business. All relevant costs throughout the life cycle of each alternative must be considered including capital and operating costs, periodic upgrades, disposal costs and salvage values.

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- **Qualitative Evaluation**

  - ***Short versus long term considerations* -** A business might need some increase in capacity in the short-run for a product line and maybe the plan is to divest this product line in the long run. That might influence how much they would be willing to invest in the increase of capacity on this product line. You have to look at short-term pressures that your business is under, versus your long-term strategy for the business.

  - ***Fit with corporate strategy* -** The corporate strategy should have a bearing on your evaluation. Even though the short–term economics may favour a particular alternative it may not fit with your long-run strategies and you have to think about those as well.

  - ***Impact on employees* -** Determine for each of the alternatives, how it is going to affect the employees? If it is going to include elimination of jobs, how is it going to affect the attitude of the employees that remain? Is it going to affect their morale, their productivity, if so how should that be dealt with? How do you handle the transition?

  - ***Fit with competitive environment* -** The fit with the competitive environment, may be that you have no choice but to make an investment just to stay remain competitive. If all of a sudden other Banks introduce ATMs, your bank would not ask its customers to line up for the traditional way for service. In this case the dominant qualitative factor is that your competitor has innovated. They have an innovation that has increased the capacity of their system. If you do not respond to it then you are going to almost certainly lose market share.

The qualitative or "soft" factors in evaluation of alternatives are as important as the quantitative/economic factors. When the qualitative evaluation reinforces the quantitative evaluation, the decision is easy. However this is not always the case.

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Key Capacity Planning Decisions

- **How Much?**

  - ***What are the limits of economies of scale?***
    How much capacity do you need? This ties back to your marketing plan because your marketing plans says that you are forecasting a certain volume of sales. That is going to drive your production capacity requirements. This is also where you address what are the practical limits of economies of scale. You want to grow your business so that you are achieving the economies of scale that are available. If there is a certain volume that you can serve with the production capacity that you have and there are economies of scale in your business then, ultimately you have to get to that volume. At that volume you are going to minimize your unit cost of production.

  - ***How do peak and off-peak requirements vary?***
    Most businesses face variability of demand i.e. peaking by time of day, day of week, month of year. How much variability is there? The more fluctuations you have in demand, the greater the risk you are going to have under-utilization of capacity and situations of having your capacity strained under the peaks.

  - ***What is the cost of "overage" versus "underage"?***
    What is the cost of overage versus the cost of underage? This is a very important concept in production planning. When you are looking at your business plan and trying to decide how much capacity you are going to provide. You need to evaluate the cost of "overage" in relation to the cost of "underage". What is the cost of being over equipped or having too much capacity, versus what would the cost be of having too little capacity. What if I don't have enough workers, or if I don't have enough equipment or technology to meet the peak? What are the cost consequences of that? Am I going to severely damage the reputation of my business? There could be both quantitative and qualitative implications here.

    Do the economics favour me erring on the side of having less capacity or does it favour me having too much capacity? In aquaculture, if you have a production system that is geared to feeding the fish, you have to meet the peaks if you want to maximize the productivity of your system and get the most pounds of fish in the shortest amount of time. If you were an airline and you are deciding on your fleet, knowing that there is a peak a few days from Christmas, are you going to equip your fleet and tie in to your long-term investment of airplanes for a peak that is only going to last a few days before Christmas? The likelihood there is that the economics favour you being under capacity during those peaks. That is what is meant by the cost of overage versus the cost of underage.

*Click on the play button to hear the audio
Audio Transcript

- **When?**

  - ***Capacity gap analysis over time.***
    Capacity gap analysis is essentially determining when demand will exceed capacity and by how much. You have to look at the capacity gap analysis over time. You forecast the demand and the variation of the demand over time, by time of day, day of week, month of year and into the future. What capacity do you have in place at those points in time? What is needed given those projections of demand? What are the gaps? That gap analysis is going to tell us what kind of capacity you are going to need at given points in time. The temporal dimension of capacity analysis is important. It is one thing to say how much capacity, but it is another to say when.

  - ***What competitive opportunities require additional capacity?***
    In every aspect of your business, whether it is in finance, marketing, production, you can gain competitive advantage through strategies in each area. Perhaps there is something that you can do in the capacity offerings that will yield competitive advantage. You have to look at that in your business planning process, and decide whether at a particular point in time if you introduce that kind of capacity, you may be able to gain a competitive advantage.

  - ***What are the expansion objectives of the company?***
    This is going to drive your systems capacity requirements. For example, in an aquaculture business you might have production targets for how many fish you want in your production system for each year of the business plan. The entire production capacity, whether it is fish feed, infrastructure etc., would be tied to the production goals.

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- **What Kind?**

What kind of capacity are you going to add? This comes back to our assessment of alternatives, or, the tradeoffs.

  - ***labor versus capital* -** Can you increase your capacity by introducing new technology as opposed to increasing labour?
  - ***what technology alternatives exist?* -** What technology alternatives exist? What kind of technology changes do you anticipate? Seeking out advice on technology is very important in business today.
  - ***what are the operational characteristics of alternatives?* -** This is part of your qualitative assessment of alternative sources of capacity.

More labor and/or more technology are not the only answers. Often, the productivity of existing labor and/or technology can be improved.

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- **Where?**

Where is it that you are going to introduce more or less capacity?

- ***What is the appropriate geographic coverage of facility?***
  This is where you get into things like the geographic coverage of your production capacity. What geographic area can you realistically service? Do you have to start to think about adding another store, or another plant because of economics or demand or capacity? That is why in most cities you will find more than one McDonald's, you are going to find more than one location for particular franchise outlets. This is driven by the consideration of geographic coverage. If you want to have intensive distribution then the number of facilities that you have in a particular geographical location is very important.

- ***Is access to raw materials a consideration?***
  This is often an important factor in the location of businesses. When you are processing, if one of your resources is a natural resource like a mineral, then you want to locate your operation close to that source of raw material. In the aquaculture business, in the initial stages of production process the salmon are raised in fresh water. Hatcheries, the incubation of the egg and the whole first stage life cycle of the fish is done in fresh water so hatcheries have to be built where there is an abundance of fresh water.

- ***Is labour costs and/or skills a consideration?***
  Within Canada, there are regions that have taken advantage of an abundant supply of bilingual workers. If you need to have bilingual workers then that becomes a factor in deciding the location of your business capacity. If you are going to set up a call centre in North America to serve the rest of the world and you know that you are going to serve a lot of people speaking French, then why not locate in an area where you can get employees that can speak both French and English.

- ***Are government regulations a consideration?***
  This can be an important factor, things like tax regulations, environmental regulations or various other kinds of government policies and regulations. There may be a more favourable investment climate in a particular geographical region.

Bear in mind that conditions can change in time. For example, while labor costs may be low in a certain geographic location now, this will change if the demand for labor grows significantly.

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Managing Supply and Demand

Providing more capacity in a service delivery system or production system is always an alternative. However we must not forget that one of our options is to manage supply and demand, to try and get better utilization of capacity. When we are talking about "managing supply" we are focused on optimizing the supply of capacity that we have in our business. When managing demand, we are trying to influence the demand pattern that is interacting with our business. The challenge in production planning is to match supply and demand to the greatest extent possible.

It is important to recognize that both supply and demand can be influenced by business managers.

- **Managing Supply**

    - ***"Chase" Strategy***
      A chase strategy, is often employed when the demand fluctuates up and down due to the cyclicality of your business, whether by the time of day, day of week, month of year. In a "chase" strategy, you would adjust the capacity up and down to match the demand as close as possible. In restaurants and bars, on Friday and Saturday nights you will bring on more workers. If you've guessed wrong then you might send the extra workers back home after a few hours because the demand hasn't materialized as expected. This is called "***chasing demand";*** adjusting capacity to the demand that is there and doing it as dynamically and quickly as you can.

    - ***"Level" Strategy***
      In a "level" strategy, your capacity is maintained at a constant level over a period of time, irrespective of fluctuations in demand. An example would be a law firm or a professional engineering consultant firm. Over the short-run, they have so many professionals that can work so many hours per week and they have so many available billable hours. If there is some extra accounting needed on Friday, they don't go out and hire some part-time accountants for a few hours like they do in a restaurant. The skill level required, the training required, the cost of hiring people and terminating them is very different with that kind of service than it would be for a restaurant or bar service. The ability to adjust capacity to the fluctuations is constrained.

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- **Supply Management Alternatives**
  - ***Use part-time employees. -*** Having part-time employees available when needed is one way to chase demand.

  - ***Maximize efficiency through training, work scheduling, cross-training, use of technology, etc. -*** e.g. work scheduling to ensure that employees are fresher when they are at work or cross-training to enable employees to do more than one job. If there is an unexpected shift in demand they can do a different job.

  - ***Increase involvement of consumer in delivery of service -*** Increase the involvement of the consumer in the delivery of the service (e.g. the ATM). Let the consumer deposit the check or make account payments instead of the teller. Give them the technology, show them how to do it and let them perform the service themselves.

  - ***Sharing of capacity with other divisions/firms -*** Sharing capacity with other divisions or firms. Companies increasingly are forming strategic alliances to share maintenance facilities. A company might have maintenance facilities that are under-utilized. They might form an alliance with another company to avoid duplication and having two underutilized facilities. Such alliances can reduce investment requirements and increase productivity of assets.

  - ***Plan for future expansion in initial construction of facilities -*** Perhaps if you are building a business and you know that you are going to expand in the future but you only need a certain area for your building now. When you build that building, build it so you can easily expand it. In the structural design of the building or in the layout of the equipment, contemplate future expansions so you can make that expansion at minimal costs. This is an important factor in planning for the future of the business, anticipating future expansions and building that into your current plans.

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Managing Demand

In managing demand we are attempting to influence demand so that it will match up better or fit with capacity offerings to maximize cost and maximize efficiency.

- **Demand Management Alternatives**

  - ***Differential pricing schemes designed to shift demand from peak to off-peak or stimulate off-peak demand to obtain better utilization of capacity.***
    One commonly used strategy in business is differential pricing schemes designed to shift demand from peak to off-peak or to stimulate off-peak demand to obtain better utilization of capacity. Airlines do this with seat sales, Highway too. The pricing structure of highway tolls is geared towards getting you to use the highway during the off peak periods. In a congested urban area, pricing incentives might be used in a transit facility to try and influence demand pattern.

  - ***Develop complimentary services that address imbalances between capacity and demand.***
    Airlines often overbook. You arrive at the airport and they have overbooked the flight. What do they do? They ask for volunteers to give up their seats. How do they get volunteers? They offer them incentives like free tickets or financial rewards. Instead of directing who is going to give up their seats, they have a complimentary program for people on the flight for whom it is not time critical to go right away. This is a complimentary service that deals with those inevitable conflicts between demand and capacity. If we are under capacity, we have to manage it so that it doesn't affect the relationship between the customer and the company.

  - ***Use of reservation systems to slot demand in accordance with available capacity.***
    You want a haircut, what do you do? You call ahead and make a reservation. That is how the hair salon manages demand. They slot you into time slots and that is how they control their capacity. Other kinds of businesses use reservations systems to manage their demand.

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SUMMARY - PRODUCTION STRATEGY CONCEPTS

Critical Issues

Manufacturing versus Service Businesses

Key Differences	
Service Businesses	**Manufacturing Businesses**
simultaneous production and consumption	consumption and production at different stages
many critical aspects are intangible	many critical aspects are tangible
no inventories or buffers	usually has inventory and buffers
considerable variability in service delivery	minimal variation
substantive and peripheral benefits	mainly substantive product benefits

Management Issues

The differences between service and manufacturing businesses raise different management issues:

- integration of marketing and operation
- delivery location
- performance measurement/assessment
- quality control

Service Business Design

Service Concept: the bundle of goods and services sold to the consumer and the relative importance of each.

- "substantive" service
- "peripheral" service

Service Delivery System: the process, workforce, equipment, and facilities that create the service and simultaneously deliver it to the customer.

Service Levels: the levels of explicit and implicit benefits provided to the consumer from the substantive and peripheral service.

The Service Delivery System is tied back to the package of benefits you are trying to offer (Service Concept).

The intangibility, perishability, heterogeneity, and simultaneity of services raise key management considerations.

Capacity Planning

A typical capacity planning process follows these steps:

- assess company situation
- determine existing capacity
- determine required capacity
- determine the gap
- identify alternatives
- quantitative evaluation of the alternatives
- qualitative evaluation of the alternatives

Key Capacity Planning Decisions:

How much?

When?

What kind?

Where?

Managing Supply and Demand

Managing Supply and Demand is a way of maximizing the utilization of assets and consequently minimizing the cost of production.

Managing Supply: adjustment of capacity offerings to meet demand

- Chase Strategy (match capacity to demand)
- Level Strategy (relatively constant capacity regardless of demand)

Supply Management Alternatives:

- the use of part-time workforce
- maximize efficiency
- increasing consumer involvement in delivery of services
- sharing of capacity

Managing Demand: adjustment of demand so that it fits better with capacity offerings.

Demand Management Alternatives:

- - differential pricing schemes
- - develop complementary services
- - use of reservation systems

The intangibility, perishability, heterogeneity, and simultaneity of services raise key management considerations.

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