**Lecture I: Processes View & Strategy**

This talk is on process view and strategy. Products or services must meet customer expectations such as: physical expectations such as comfort, safety, convenience; psychological expectations such as relaxation, peace of mind; and social and spiritual expectations; and they must do so within a budget. Business processes provide products and services: a new car financing, producing an engine, making a hamburger, delivering a book from Amazon to a customer, teaching a course are examples of business processes. In this course we will learn how do organizations categorize customer expectations? How do they develop processes capable to fulfill customer expectations? What Metrics are used to measure, if they have, fulfilled the customer expectations?

In this course we adopt a process view. We look at everything as Input-Process-Output: Input-a transformation Process-and Output. Inputs can be tangible or intangible, natural or processed resources, parts and component**s**, energy, data, customers, cash, and so on. Outputs are tangible or intangible items that flow from the system back into the environment: products, byproduct, energy, information, served customers, cash, and so on. These are examples of some processes: so, in the manufacturing process, raw material are input among some other things, and finished goods are outputs among some other things. In an accounting process, data is input, financial statements are output. In a billing process, accounts receivable is input, cash is output. In a transformation process, unsatisfied customer demand is input, and satisfied customer demand is output.

We said we look at everything as a process, and a process has five components: inputs, outputs, human and capital resources, a network of value added and non-value added activities and buffers, and an information structure. Inputs come to the system and become outputs. Throughout this process we call them flow unit. A flow unit could be an item of inputs or it could be the output. So, flow unit could be input, could be output, could be combination of these two-it depends on the reasons why we are looking at this process. The process has a set of value added activities and a set of buffers (waiting lines). These inputs go into the system in form of flow units and become outputs. However, in order to run that process, to run those activities and buffers, we need human and capital resources, and we also need an information structure to get feedback from the system and see how things are going. In general, in a process, we show physical flow of items as solid lines and information flow as dotted (or dashed) lines.

Let's look a couple of processes and their flow units. An order fulfillment process starts from receipt of an order and ends at delivery of product. Flow units are orders here. In an outbound logistics process starts at the end of production and ends when the product is delivered to the customer. And flow units are products. In a supply cycle, flow units are supplies; the system boundaries, the border limits of the system starts from issuing a purchase order and ends at receipt of the supplies. In a customer service process, customers are flow units. They start from the point when an unsatisfied customer shows up until the point when the satisfied customer leaves the system. In a research and development process, flow units are projects. System starts from recognition of the need and ends at launching the project. In a cash cycle process, flow units is cash, the system boundary limits of the system start from the point that we have an expenditure until the point when we collect our revenue regarding the product or services that this expenditure went through. So, this expenditure went to a product or a service; we did the transformation process; we sent it to the customer, and now we collect the revenue from the customer, and that is from point when we put cash into the system until the point that we collect cash from the system.

At this course we look at everything as a system, and a system is defined by its components. The relationship among those components and the objective-the goal of existence of this system. We also define the boundary limits of the system. That is the boundary where out of that is environment, and inside of it is our system. Usually we do have control of variables and parameters inside the boundary limit, but we don't have that much control of variables and parameters out of the system. That is why we call variables and parameters here endogenous, and variables and parameters over there exogenous So, we have a system, and everything else, which is not inside the system, is indeed environment. A system is defined by its components, interrelationship between those components, and the objective of the system.

How systems can grow? Systems can grow by increasing the number of their components. This system is preferred to this system because it has one additional component. Or they can grow by increasing, by enhancing their relationship between components. This system is preferred to this system because it has more integrated relationship between its components. It can perform much better in a complex environment; it can benefit from synergy between the components. The whole system performs better than some of its components. In systems theory we say two is greater than one and one because of that plus relationship between one and one. Of course, this is not mathematically true, but this is what we say in systems theory. In systems approach we should think about what is a benefit of a total system, not what is a benefit of components of the system. Performance measures of sub-systems must be linked of the performance measure of the total system. Let me give you an example: suppose demand is cyclic. This is time; the horizontal axis is time, and the vertical axis is demand. Here demand is low, and it goes up. Of course, marketing department wants to have this much product here, this much product here, this much here... For marketing availability of product should follow this curve. But purchasing does not want to buy raw material at this point because at this point demand for final product is high, and therefore, the price of the raw material, the price of the components, and input of this product is high because demand for the product is high. Purchasing department wants to purchase here. Therefore, marketing department prefers this pattern while purchasing department wants to buy like this. Two contradictory views towards what is the benefit. This is the benefit for purchasing department because they will be evaluated based on the price that they have paid for the product, and marketing department will be evaluated based on availability of the product. Production department does not want to follow neither this pattern nor this pattern because in both of those cases production should hire and fire people. Production likes to produce smoothly, at the same level. So, for production the best issue is to produce at this level, but because demand is less, so we'll have some inventory here, and then this inventory can be consumed over. Three components of a system-marketing, purchasing, and manufacturing-three different types of defining what is the benefit, what is at the benefit of that sub-system. We shouldn't look at those sub-systems; we should look and see what is at the benefit of the total system, which may be one of these curves or may be a combination of them. Let me give you a second example. Suppose, we have two sequential stations. Input comes here; at this department it becomes this product, and at this department it becomes final product and will leave the system. Suppose last year production in this box was 100, production in this box was 100, and we produced 100 units of product. This year, production in this box is 200, 100 percent improvement. Should we reward them? We don't know; we need to look and see what is the production here. Here the production is 80, and total system had 80 units of production. We have not improved the situation, but our performance is 80 percent of last year. No one should be rewarded because performance of the sub-systems should be linked to the performance of the total system. We should avoid sub-optimization. Sub-optimization means we focus on improvement of sub-systems, which do not have impact on the improvement of the performance of the total system. Again, performance measure of sub-systems must be linked to the performance measure of the total system.

Customers define the attribute of the product in a four dimensional space of price of the product, the time that it will take to get that product, variety that is available to them, and quality of the product. These are attributes that are defined by our customers, and they are external. Our production managers should develop process competencies to match those product attributes, and these are internal. The competency that we are developing are cost-we want our processes to have low costs to be able to deliver low price to customers. We want flow time to be low to be able quickly response to the customers demand. We want our processes to be flexible to be able to deliver variety of a product to our customers. We'd like to have a process which has high quality to be able to produce high quality products or services.

Product attributes, which are external components and are defined by customers, are product price (how much price the customer is willing to pay for this product): purchase price, cost of service, cost of maintenance, repair, insurance, disposal-all are costs which define the product price, and we refer to it as total cost of ownership. How much a customer is willing to pay total cost of ownership to have our product. The second dimension of product attributes is delivery time, from the time the customer orders the product or register for the service until he actually gets that product or service. If the product is on the shelf, he can immediately take it. Is it in a distribution center or somewhere along the production line? Response time is important to customer, but besides average response time what is important is reliability in response time, standard deviation of response time. If someone is going to deliver a product to you in two days, but it may go from a half of a day to 30 days, you will not be happy with such response time because it may take 30 days. If you go to FedEx and they say that they deliver 95% of our packages within 24 hours, but for some of them it may take up to 60 days to deliver them, you would never go and give your package to a company like this. So, besides the average response time, what is also important is reliability in response time, and that means response time should have low standard deviation. And we have product variety. Customers may be happy with one single model, one single option if, for example, it is always available and if the price is very low. But besides that specific market segment, other customers want some sort of variety. Variety can be defined in the level that all you have is Mustang, and then you have different type of Mustang, different models, colors, or styles. Or a company may offer different product lines and product families. And finally, customers define one other dimensional product attribute as quality: the degree of excellence, how well the product works, features (what it can do), performance (how well it functions), reliability, serviceability, aesthetics, conformance to expectations. We said reliability and low response time means low standard deviation in response time. We also define reliability with respect to quality, and that is consistent quality, quality over time: a product or service which is good and remains good over time.

**Customer Value Proposition**

Customers define product attributes in four dimensional space of price quality response time and variety. Companies develop a customer value proposition to fulfill the expectations you have in the four dimensional space of price, quality response time and variety.

Products have two classes of characteristics. Order qualifiers are characteristics of a product that convince the customer to think about that product. Order winners: Order winners are characteristics that go beyond order qualifiers. Order winners convince the customer to buy the product. This is different for different market segments. Order qualifiers for a Wal-Mart customer and order winners for a Wal-Mart customer are different from order qualifiers and order winners for a Whole Foods market customer. Order qualifiers in the eyes of commercial airline flyers are entirely different from order qualifiers of a wealthy business man who wants to buy a private jet. In many industries order winners over time become order qualifiers. Customers purchase based on the value that they derive from a product. That value is the greatest amount that the customer is willing to pay. If this value is greater than the price they are willing to pay they will buy it. Otherwise they don't. If several products, several companies propose their products with different prices and the customers view different values in these different products than the customer will buy the product which has the maximum gap between the value that he derives compared to the process that the manufacturer or service provider offers. And we refer to the difference between that value which is in the eye of the customer and that price which is the market price of the product as consumer surplus. Zara is a well known name in the apparel industry. Zara's business is design/manufacture/distribution/retailing. Zara differentiates itself from competitors by timely fashion for the masses. CVP of Zara-timely yet limited variety at modest cost and quality. So it looks for a market segment that is willing to buy timely fashion, is not so anxious about the variety. The price should be average and buyers will expect average quality.

**Process Competencies Cost**

Customers define in four dimensional space of the process they are willing to pay, the quality they expect to get, the time that it takes to get the product and the variety of options they do have. So product is defined in this four dimensional space by the customer. Firms define their CVP to meet and exceed those expectations. In order to be able to deliver that customer value proposition firms should create process competencies in that 4 dimensional space of cost, quality, time and flexibility. They should produce low cost products to satisfy the customer expectation in price dimension. In the quality dimension, time and flexibility dimension they match that variety. They need to have process competencies in these four dimensions to reflect that CVP in the product that meets and exceed customer expectations. The first dimension is the cost dimension. That is the total cost of producing and delivering the products which are the outputs. We need to look at the process. Look at the production process and find out what portion of the production process are value adding are transferring the product from its original form to its final form and what parts are non value adding, they don't play a role in the transformation process of producing a product or delivering a service. We need to remove non-value adding portions of the production process to be able to reduce the production cost. We need to allocate appropriate resource to each activity. If resource is better than activity, activity cost goes up. If resource is lower than activity quality of process goes down. Quality of product goes down. Therefore we need to find out exactly the appropriate resource. We need to have high standardization and we need to have low variations in arrival time and low variation in processing time.

And last but not least we need to have high utilization. We need to fully utilize our human and capital resources in order to breakdown their costs on a larger number of products. Let's take a look at this Ford motors video. What Ford did, he really broke the barriers or poverty as long as it's related to the capabilities of production processes. And he brought many products which were in the hands of elites to the hands of average people. In those days competition was mainly defined as one dimensional space of the cost and price of the product because many products due to their high pricing were not available to average people. Therefore, if you could reduce the production cost you could make it available for a large number of people and you could benefit from that huge market.

**Video**: Hi this is Kelly from Car and Video. Today we're going to have the history lesson of all the automobiles that have ever been designed and built in the world. There's one that stands out as most significant among them all and that's the Model T Ford. The Model T introduced mass production and single handedly brought us from a horse and buggy level of tech to one where we have machines run by gas engines. Using a moving assembly line, Henry Ford was able to build these things at about 1/10 the time it took to build other vehicles by hand previous to the Model T. The Model T's were simple, they were rugged they were cheap and as Ford used to say you can have any color you want as long as it's black. When they were first introductory in 1909 they sold for 950 dollars which doesn’t sound like much to us today. Back then that was quite a lot of money. Ford cleverly paid his employees 5 dollars a day and was a huge amount compared to other jobs they could get. He also reduced their work day from 9 to 8 hours. But again by doing that he could have 3 production shifts working, and hence build cars around the clock. This was going on at time of economic transition and difficulty and as a result people would come from all over the world to get jobs working at the auto factories and of course their job of choice was with Ford. Production of the Model T's when for 19 years from 1908 to 1928, and the last ones that were built weren't very much different from the original ones that they produced. They had metal wheels with wooden spokes pressed on to them. You can see that they're hand filing the spokes to make them smooth so they can be painted. The assembly line was split so the frame and tires and everything were assembled at one point and then the bodies were assembled separately and then at one point the bodies would be dropped onto the frame Eventually the Model T was replaced with the Model A which was a modernized stylized version that looked quite the same. Highland plant was the first modern assembly plant where the models ts were produced. And just like today when their done being assembled their driven off the assembly line. Finally after 19 year of work Henry Ford had actually built 15.5 million Model T's. And they were by far the most popular and most plentiful of any vehicle. As you can see the assembly of the 15th millionth car is a four door convertible, and as you can see they've added some paint colors other than just black. And that actually is Henry Ford there driving off the assembly line and driving off in that 15th million Model T Ford. This particular one hadn't gone through final assembly quality control. You can see how Henry had to give it a little nudge there to get it shut properly.

Many companies have followed Ford's process of production line. For example Shouldice hospital in Canada has focused on hernia operations only. Standardized repeatable outpatient procedures at very high quality at very low price are done there. They have minimized variability by not accepting patients with risk factors such as blood pressure and so on. They have produced a production line where the required hernia operation is done at a very high quality and very low price. Another example is Avarind hospital in India. People of India are vulnerable to cataracts. Millions go blind in their 50s because they can't afford surgeries. Avarind eye hospital started by treating paying customers and using profits to treat the poor. But some people could not afford to come to the city and pay for transportation, and also they needed someone to be with them. To support these patients they created their own bus system and their own assistants which pick up people and bring them to the hospital. To keep costs low surgical equipment is used all day, and to each activity they allocate the appropriate resources. Doctors focus only on performing surgeries. Pre and post operative care is all handled by nurses. Avarind served 2.5 million outpatients and performed three hundred thousand cataract surgeries in less than 1 year. Despite providing 2/3 of the surgeries as outpatient visits and ¾ of the surgeries as free service to the poor, Avarind generated healthy profits that it used to fund its growth. The key concept in production cost is to allocate appropriate resources to each operation. Appropriate is not lower than what is needed and not higher than what is needed. Higher than what is needed increases the cost, lower than what is needed will lower the quality. Then we need to reduce variability in quality, reduce variability in arrival of patients reduce variability in operations. These are all elements of low cost. Then we need to increase utilization of all human and capital resources to close to 100% and reduction in variability allows that increase in utilization because as you will see later the presence of variability will never reach 100% utilization or even close to 100% utilization. Standardization, reducing variability, high utilization and allocating appropriate resources to each activity are key components of cost reduction.

The cataract surgery at Avarind, the hernia surgery at Shouldice are examples of implementing Ford's production line in healthcare. In Ford production line you design huge machine targeted towards producing a specific product with low variations at the minimal possible cost. And in that era competition was defined as mainly in one dimensional space of cost. Then competition went to 2 dimensional. General Motors came into the auto-market of US. They brought a second dimension of variety. And to deliver variety you need flexibility. So the second process competencies that we need are flexibility. The ability to produce and deliver a variety of products at high as well as low volume. In Ford production system you could produce extremely low cost products with low variability. But in the time of the product and the volume of the product. If the volume of production was going down in the production line of Ford, production cost of Ford was going sharply up because a huge fixed cost should have been broken on a smaller number of products. The key concept in flexible systems is you can produce at high volume and at low volume at a reasonable cost. In order to be able to create flexibility inside a production system you need cross-trained workers to be able to shift from one operation to another. General purpose equipment, equipment that can produce different types of equipment. Theoretically you can say all machines are general purpose but in order to transfer them from producing on product to another we may need to spend infinite time or infinite financial resources. A flexible machine has a short setup time. In US industries, in 60s if you wanted to go from producing one product to another you should have stopped your production system for one week. Japanese now go from one product to another in 30 min 20 min. Key components for flexibility are cross-trained workers, short setup time which means more general purpose machines, delayed differentiation. Delayed differentiation means you postpone the differences that you make in the product to the latest steps. An excellent example of delayed differentiation is when you go to buy paint in Home Depot. They offer you hundreds and hundreds of products. Different colors. Spectrum of colors. But if they wanted to have all those colors on their shelves the whole Home Depot should have been assigned to painting department. But they only have a few base colors and whatever you want they make it for you. They have delayed differentiation to the last possible step. For flexibility we need a job shop layout or a "U" shaped layout and we need a small batch size. Small batch size means each time you produce a small number of products. We don't produce a product for 6 months of demand. The 6 month customers may change their preferences. They might not want that product anymore. On the other hand, new technology may come and if I have already produced 6 months worth of products, we will need at least 6 months to implement that technology. Therefore, flexible systems are more responsive both to changes in customer preferences and also to changes in technology. In the 70s Japanese auto industries added one new dimension to the process competencies. It was due to the high quality of their product which they were able to take a large portion of world auto market from US industries and also US market auto market from US auto industries. Process quality means the ability to deliver and produce quality products. Quality at source, you produce and check at the same minute if there is a problem, you stop the production line. Effective design as well as production that conforms to design.

The fourth dimension of process competencies is process flow time, the total time to transform a flow unit from input into output and to the delivery to the customer. Effective layout and smooth material flow are main components of a short flow time. Less variability in arrival rate, processing rate, and quality are other requirements of smooth flow time. No starvation no blockage. **Starvation** means one station which is waiting for the output of the previous station. **Blockage** is the next station does not have space to get the output of the previous station, still is not done with the previous batch of previous batches. Smooth flow means no defect and no re-work.

If I am forced to define the Operations Management in one short single line, I will say operations management is to create smooth flow. **Smooth flow** means low production cost because the flow units should come into the processes and leave quickly. They do not have time to collect cost. Smooth flow means high quality because as soon as we observe quality problems, we have to stop the productions line. A stop production line doesn’t have smooth flow. So, we can only have smooth flow if we are producing high quality product. **Smooth flow** means a flexible system because we do not have too much inventory and we can easily respond to technological advances and changes in customer preferences and switch from one product to another.

All we say is correct for production systems and for service systems such as distribution systems, healthcare systems, entertainment systems and so on and so for. **Corolla** has flow shop, decentralized assembly plants close to market, short flow time and low cost. **Ferrari** has job shop, only a single plant in Italy, long flow time, high cost.

Which one is a better company? We really don’t know. It depends on the strategy and the market segment that they have focused on. If they are synchronized with those elements they are successful otherwise they are not. **McMaster-Carr** is a material, repair, and operations and what they usually call it (MRO) product distributor, a process with high flexibility, high quality, and short response time but high price. Whatever they provide for you? You can buy it in a market at a lower cost but in a longer time or perhaps not at the quality they provide. **Wal-Mart** is: Operational Strategy, is short flow time, low inventory. Operations Structure is Cross docking. Cross docking means for example, two trucks come: one has red products, and one has blue products and they go in a warehouse which is nothing but a little bit conveyor system and carts and then, there will be two other trucks which carry red and blue-red and blue product and they go to the Wal-Mart stores. So, a truck with red product comes and a truck with blue product comes from suppliers in a place with minimal storage using material handling systems. These two products are put into two trucks which no carry both the blue and red products and they go to the corresponding Wal-Mart stores. They have electronic data exchange, fast transportation system, focus locations which has enough market, and communication between the stores such that if inventorial product in one store is high and in another store is low and they can transfer products between these two stores. Inventory turns the times that inventory turns throughout the year in Wal-Mart is almost one and half times of the Target and Sales per square foot in Wal-Mart is more than $400 and in Target is less than at $300 per square feet. I said if people ask me that in one short line define Operations Management, I will say operation management should create a smooth flow: in a hospital, in a university, in a bank, in a production system, in an assembly line, in a distribution system. That is what operations management should do.

**Operations Management** structures the process competencies in the direction of the customer value proposition. It develops measures to evaluate the effectiveness and efficiency of the processes. So, operations management develops process competencies to meet with customer value proposition. It develops measures to evaluate the effectiveness of these processes and efficiency of these processes. I will go through efficiency and effectiveness later and operations management applies methods and techniques to improve process performance.

**Process competencies** are controllable. **Product attribute** which are defined by customers are not controllable, are not controllable by us. Remember, we said in a system view. We look at the system that’s what we have control on it; Process competencies, and then the environment and customer preferences. Customer preferences defines the product attribute and we need to prepare a customer value proposition which meets and exceeds product attribute and then we need to develop process competencies to be able to deliver that customer value propositions and that’s process competencies which are controllable, which we have control on them. We don’t have control on product attribute. There are three performance measures which help us to understand if the process competencies are the best fit for the product attribute: **Financial performance measures, External performance, and internal performance measure**.

**Lecture II. Process View & Strategy: Competitive Space and Strategy.**

Welcome to the second part of my talk on process view and strategy! In this talk, I mainly discuss competitive space and strategy. Competitive product space, customers define the product they want in four dimensional space of price, quality, variety and response time. Firm need to define **process competencies in four dimensional space of cost, quality, flexibility, and flow time**. To match these requirements, product attributes and process competencies are defined in the four dimensional space. It is not possible to visualize a four dimensional space. We can represent mathematically, using matrix notation or vector notation but graphically it cannot be represented.

We can graphically represent three-dimensional space, but grasping a concept in a three dimensional space is not as easy as grasping a concept and representing a concept in a two dimensional space. Therefore, throughout the rest of our discussions, while we are talking about four dimensional space, we only represent two of those dimensions. And we assume the other two dimensions at least for the time being are constant. I mean the attributes of the product or capabilities of process competencies in the other two dimensions at least for the time being is constant. For example here we are talking about two dimensional space of variety and quality. Company A has low variety and low quality. Company C has high variety and low quality. Of course Company C is better than company A. Because at least in dimensional variety, Company C is better than Company A. Company B has the same variety as Company A but quality of the product of company B or quality of the process of company B is better than that of A. So B dominates A and D dominates all of them. Therefore in this 2 dimensional space, when we move in this direction or when we move in this direction, we are getting better. Moving outside of the origin makes better products or process.

Now look at this situation: Here we represent quality, the same as before, but in the horizontal direction I have cost instead of variety. Here company A and C are the same as long as quality is concerned but C has higher cost compared to A, A dominates C. B and A have the same cost but quality of B is much higher than A. So B dominates A. D and B have the same quality but cost of B is much lower than D, so B dominates D. In this graph you see in this dimension, in quality-dimension, as I go outwards, I get better, but in the horizontal direction, this direction towards origin is better. In order to make my graphs consistent, instead of cost, I will use cost efficiency, which is one divided by cost. So if product C or process C has high cost, it has low cost efficiency, because the one over cost becomes small. If it has low cost, it has high cost efficiency, which is good, and therefore instead of cost and this dimension, I show cost efficient. Company B is more cost efficient compared to company C or product B is more cost efficient compared to product C or process B is more cost efficient compared to C. C and D have the same cost efficiencies, but D has higher quality. A and D have the same quality, but A is more cost efficient; its cost is lower than D. Now with this graph, as I move outward, I get better. The same is true for flow time. For example, in this graph, I am showing quality versus flow time. For quality, if I move in this direction, I get better. For flow time, if I move in this direction, it means flow time is longer. It takes more time to produce the product. Process requires more time, or customer will get the product in the longer period of time. So if I move in this direction, I will get worse. In this direction, I get better. Therefore, on this dimension, instead of flow time, I show one over flow time. And I call it, responsiveness. Therefore instead of flow time, I will show responsiveness. Company C or product C or process C has a higher responsiveness compared to company B or process B or product B. Product D or process D has high responsiveness, that means it is good, and high quality. Again, in this graph, moving outward makes me better. Therefore, on my graphs, I will show quality and in this direction I get better. I show variety and in this direction I get better. I use cost efficiency and in this direction I get better. And I use responsiveness and again, in this direction I get better. As I move outward, I get better. Let’s look at this situation. Here again I am showing a two dimensional space. I forget the other two for the time being, I see two products: Product A and product B. Product B has high variety, but it has high cost because its cost efficiency is low. Product A has low variety, but its cost efficiency is good: its cost is low. One firm, low cost and standardized product with a small variability; another firm, expensive product and customized product. Which firm is better? We don’t know. It depends on the strategy and the market segment that these companies are looking at and the customer value proposition they have prepared. This one, may be a company like Wal-Mart. This one, a company like a jet manufacturer for very wealthy people. Both may make good profit, or both may get broke in a couple of years.

**Strategy positioning** defines those position that the firm wants to occupy in the competitive product space. The current position and the direction.

Here, we show two firms in a two-dimensional space of responsiveness and price or cost efficiency. Firm B has higher responsiveness compared to firm A, but its cost efficiency or price efficiency is much lower. The direction of the firm is to even make its price higher and at the same time, increase its responsiveness. Company A has low responsiveness, it takes more time to put this product out of production and into the hands of the customer, but the price efficiency or cost efficiency is quite high. And the strategy of this firm is to even make its price lower, but increase improve its responsiveness. A firm must ensure that its competitors are not capable of imitating its position. **The strategy of a firm shouldn’t look like block** because all other firms can imitate a block. It should look like **a sculpture**, such that if another firm wants to imitate it, it takes a lot of time, energy, budget and so on and so forth. It is difficult for competitors to **imitate an array of interlocked activities**, interlocks processes. When Southwest Airline became successful, many companies tried to imitate what Southwest did. But Southwest created a sculpture; for other companies to become Southwest, they should destroy themselves first. What is the best strategy? We don’t know. There is no single solution.

**Zara**: its strategy is timely, yet limited variety at modest cost and quality. **Aravind and Souldice**: the strategy is low-cost, high quality, minimal variety, average to long response time. Corolla: flow shop, decentralized assembly plants close to market, short flow time, low cost. Ferrari: job shop, a single plant, longer flow time, high cost. **McMaster-Carr**: high flexibility, high quality, quick response time, high price. **Wal-Mart**: short flow time, low inventory, low cost, average quality. Six different enterprises with six different strategies, all are successful.

**Efficient Frontier**

These are different products or different processes or different firms. For example, these two processes have almost the same responsiveness, but this process is an expensive process, and this process is an inexpensive process. Since the responsiveness’ are the same this is a better company.

Look at these two companies. This one has higher responsiveness compared with the other and yet has lower cost. This process/product/company dominates this other process/product/company.

Efficient frontier is the minimal curve covering all the current positions in the industry. So if I want to find the minimal curve, this is the efficient frontier. These are world class organizations that are trying to push the efficient frontier outward. The organizations inside the curve are not world class organizations. However by improving itself in both dimensions, this organization can push itself to the frontier and become world class, without or with little trade-off. If world class organizations along the frontier want to become more responsive, then there is a trade-off, and they must increase their costs. Non-world class organizations inside the curve may improve their standing by improving responsiveness and costs without trade-off.

Focused Strategy

A focused process or a focussed organization occupies a small portion of the four-dimensional space of competitiveness. For example, in a two-dimensional representation, the focused process has small cost variations, and small responsiveness variations. So it can produce products at a given cost or lower cost products at another cost, fast operations in one area, and smaller operations in another.

This is a focused organization, yet not a world class focussed organization because it is not on the efficient frontier. Every organization is focused because everyone occupies some portion of the four dimensional space (or in this example two dimensional space), yet some are world class while others are not. World class organizations will fall on the efficient frontier. For example, as we move right along the graph we are demonstrating low cost and low responsiveness. A non-emergency hospital would be an example of a world class organization falling on the efficient frontier, near the bottom right of the curve, due to its low responsiveness. You can also have the opposite. An emergency room or emergency hospital is an example of a world class organization that would fall on the upper left side of the efficient frontier, due to its high cost and high responsiveness. Both of these examples are focused, because as long as responsiveness is concerned they fall on the upper left and bottom right of the efficient frontier, and as far as cost is concerned they are also placed respectfully along the curve. They do have operations, which do have small variations in cost and small variations in responsiveness. A general, unfocused organization will fall within the center of the graph. This is because it has some operations which are very inexpensive and require a long waiting time, and some operations which are very expensive that require fast responsiveness.

Within a focused strategy, if this graph reflects cost efficiency and quality, the cost of operations will be in the mid level, far right range as pictured below. Quality will also be in a similar small range. A quality focused organization will fall within a small range in the upper left portion of the curve with high cost. An organization within the center area of the graph will produce both high and low quality products. Companies that produce both high and low quality products at a similar cost cannot compete. A focused organization makes or has; all high, or average quality products; high cost, average cost, or low cost products; high, average, or low responsiveness products; high variety, low variety, or average variety in their products. It is impossible however to have a company that produces 1000 items ranging from high to low cost, or high to low quality all under the same management and operations.

A focused strategy is committed to a limited, congruent set of objectives, in terms of demand (product, market) and supply (inputs, technologies, and volumes). When we look at demand, this does not mean we produce 1000 types of products, for 100 different markets. We are committed to a limited number of products for a limited market(s). In terms of supply, we don’t use all types of input (low or high), all types of technologies (manual, or automated).

A focused process is not limited to a few products, but all the products should fall within a small region of the four dimensional product space. If they don’t all fall within that space then we require Plant-Within-Plant (PWP). This business strategy is diverse, but generally the entire business is divided into several mini plants, each with focused processes. One PWP may focus on low cost, while the other may focus on quick response. High and low volume products should be separated into different plants. High quality, high cost products should be produced in a separate plant than an average quality, low cost product. Different plants should also be under different management.

In a two dimensional space, with functions of cost efficiency horizontally and responsiveness vertically, unless world class organizations can push the boundary of the efficient frontier there is no way to increase or decrease cost without a trade off to responsiveness. Everything else within the curve is not world class unless it is along the frontier, yet it can move without a trade off by pushing simultaneously in multiple directions, on more than one dimension. One way to push the boundary of the efficient frontier is with new technologies.

Firms located on the same ray share strategic priorities. They all have the same cost efficiency, responsiveness, or tradeoffs. A trade off is simply the inability to increase one dimension or attribute, without decreasing, or without consequence to another. Firms on the frontier must trade off. Strategic positioning is the direction of the improvement from the previous position, or where the company wants to occupy along the efficient frontier. By not being able to move without tradeoffs, world class companies try and push the boundaries of the efficient frontier. As technology and management technologies advance, they help to push the frontier outward, yet this is not the same across all industries.

Different companies intentionally choose different processes to achieve the same goal, for instance, McDonalds vs. In’N’Out. These different processes lead to different advantages and disadvantages, so we are always facing tradeoffs. Delivering books at a low cost can be easy. Delivering books fast can be easy. Delivering books fast and at a low cost however is not easy. You also cannot work and study for exams at the same time. The more you work, the less time you will have to study, and therefore the worse you will do on exams. The more you study, the better you will do on your exams, yet you will have less money. There is therefore a trade off between doing work and studying. We are always facing tradeoffs.

Operations management is a set of tools, techniques, and philosophies to create smooth flow. Operations management is also the knowledge necessary to understand tradeoffs, and come out with optimal tradeoffs. To create smooth flow we are forced to have high quality products, with little inventory, because products are made and quickly leave. In such a system, if there is a change in customer preferences, or a change in technology, or a change in inputs, and requires variation, the system can immediately respond. Smooth flow means flexibility, short flow time, and high responsiveness. As soon as someone desires our product, we can quickly get it to them. Smooth flow also means low cost, because products have less time to absorb overhead costs. By creating smooth flow we can determine the optimal tradeoffs. Operations management allows us to produce efficiently and determine the optimal levels of trade off.

Operational Effectiveness

Operational effectiveness is developing an operations strategy (encompassing the resources, processes values, and competencies within the four dimensional space of cost, quality, flexibility, and time) that supports the strategic positioning (customer value proposition), better than competitors.

In management the general definition of effectiveness is doing the right things. If the thing you are doing is right then you are effective. Efficiency is doing things right. You can be efficient but not effective. You may be doing something wrong very well or quickly, this does not make you effective. To be both effective and efficient, you should do the right things while doing things right.

In operations management however, we define efficiency as cost efficiency. A process is efficient if we can produce output with minimal inputs and resources. Low cost operations. An effective process is a process that supports the execution of a company’s strategy in the four dimensions of cost, quality, flexibility, and time. A synchronized process does well in all four dimensions, while supporting the customer value proposition. We are efficient if we do well in the cost dimension. We are effective if we are doing well in all four dimensions.

**Efficient Frontier**

The small circles scattered around the graph are different products or different processes or different firms. For example, these two processes, highlighted in green, have almost the same responsiveness, but the left process is an expensive process, and the right process is an inexpensive process. Since the responsiveness’ are the same the one on the right is a better company.

These two companies, highlighted in red, demonstrate differences in responsiveness. The company on the right, along the efficient frontier, has higher responsiveness compared with the other and yet has lower cost. This process/product/company dominates this other process/product/company.

Efficient frontier is the minimal curve covering all the current positions in the industry. So if we want to find the minimal curve, it is on the efficient frontier. The processes/products/companies on the curve are world class organizations that are trying to push the efficient frontier outward. The organizations inside the curve are not world class organizations. However by improving themselves in both dimensions, these organizations, such as the one circled in blue, can push themselves onto the frontier and become world class, without or with little trade-off. If world class organizations along the frontier want to become more responsive, then there is a trade-off, and they must increase their costs. Non-world class organizations inside the curve may improve their standing by improving responsiveness and costs without trade-off.

**Focused Strategy**

A focused process or a focused organization occupies a small portion of the four-dimensional space of competitiveness. For example, in a two-dimensional representation, the focused process highlighted in yellow below, has small cost variations, and small responsiveness variations. Thus, it can produce products at a given cost or lower cost products at another cost, fast operations in one area, and smaller operations in another.

The yellow highlighted organization is a focused organization, yet not a world class focused organization because it is not on the efficient frontier. Every organization is focused because everyone occupies some portion of the four dimensional space (or in this example two dimensional space), yet some are world class while others are not. World class organizations will fall on the efficient frontier. For example, as we move right along the graph we are demonstrating low cost and low responsiveness. A non-emergency hospital (highlighted in red) would be an example of a world class organization falling on the efficient frontier, near the bottom right of the curve, due to its low responsiveness. You can also have the opposite. An emergency room or emergency hospital (highlighted in pink) is an example of a world class organization that would fall on the upper left side of the efficient frontier, due to its high cost and high responsiveness. Both of these examples are focused, because as long as responsiveness is concerned they fall on the upper left and bottom right of the efficient frontier, and as far as cost is concerned they are also placed respectfully along the curve. They do have operations, which do have small variations in cost and small variations in responsiveness. A general, unfocused organization will fall within the center of the graph. This is because it has some operations which are very inexpensive and require a long waiting time, and some operations which are very expensive that require fast responsiveness.

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