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CHAPTER 10 CAPACITY MANAGEMENT

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CHAPTER 4 OPERATIONS STRATEGY

1) Explain the concept of capacity. Capacity is the capability of a manufacturing or service resource such as a facility, process, workstation, or piece of equipment to accomplish its purpose over a specified time period. Key Capacity Issues Capacity is determined by the resources available to the organization—facilities, equipment, and labor—how they are organized, and their efficiency as determined by specific work methods. Capacity can be viewed in one of two ways: 1. As the maximum rate of output per unit of time, or 2. As units of resource availability. - Can the facility, process, or equipment accommodate new goods and services and adapt to changing demand for existing goods and services? - How large should facility, process, or equipment capacity be? - When should capacity changes take place? 2) Describe how to compute and use capacity measures. Capacity An automobile transmission-assembly factory normally operates two shifts per day, five days per week. During each shift, 400 transmissions can be completed under ideal conditions. What is the capacity of this factory? Capacity = (2 shifts/day) (5 days/week) (400 transmissions/shift) (4 weeks/month) = 16,000 transmissions/month Safety capacity Safety capacity (often called the capacity cushion) is an amount of capacity reserved for unanticipated events, such as demand surges, materials shortages, and equipment breakdowns. Average safety capacity (%) = 100% − Average resource utilization % Job Shop Capacity In a job shop, setup time can be a substantial part of total system capacity. Capacity Required (Ci) = Setup Time (Si) + [Processing Time (Pi) x Order Size (Qi)] = Si + [(Pi) (Qi)] 3) Describe long-term capacity expansion strategies. Long-Term Capacity Strategies Complementary goods and services can be produced or delivered using the same resources available to the firm, but whose seasonal demand patterns are out of phase with each other.

Complementary goods or services balance seasonal demand cycles and therefore use the excess capacity available Capacity expansion strategies require determining • Amount • Timing • Form of capacity changes 1. One large capacity increase (Exhibit 10.6a). 2. Small capacity increases that match average demand (Exhibit 10.6b). 3. Small capacity increases that lead demand (Exhibit 10.6c). 4. Small capacity increases that lag demand (Exhibit 10.6d). 4) Describe short-term capacity adjustment strategies. Adjust Short-Term Capacity Levels • Add or share equipment: lease equipment as needed or set up a partnership arrangement with capacity sharing. Examples: mainframe computers, CAT scanner, farm equipment. • Sell unused capacity: sell idle capacity to outside buyers and even competitors. Examples: computing capacity, perishable hotel rooms. • Change labor capacity and schedules: short term changes in work force levels. Examples: overtime, extra shifts, temporary employees, outsourcing. • Change labor skill mix: hire the right people, cross-training. • Shift work to slack periods: Example: build up inventory during slack times and hold for peak demand times. Shift and Stimulate Demand • Vary the price of goods or services: Examples: cheaper hotel rates on weekends; sales of overstocks • Provide customers with information: Example: automated messages with best times to call or visit • Advertising and promotion: Examples: after-holiday sales, manufacturer or service coupons • Add peripheral goods and/or services: Examples: movie theater rentals at off-peak times, extended service hours. • Provide reservations: a promise to provide a good or service at some future time and place. Examples: hotels, airlines, surgeries Revenue Management Systems • A revenue management system (RMS) consists of dynamic methods to forecast demand, allocate perishable assets across market segments, decide when to overbook and by how much, and

determine what price to charge different customer (price) classes. • Examples: Managing overbooking in airlines, hotels, and cruise lines (yield management). 5) Explain the principles and logic of the Theory of Constraints. The Theory of Constraints (TOC) is a set of principles that focuses on increasing total process throughput by maximizing the utilization of all bottleneck work activities and workstations. • Throughput: amount of money generated per time period through actual sales. • Constraint: anything that limits an organization from moving toward or achieving its goal. • A physical constraint is associated with the capacity of a resource (e.g., machine, employee). • A bottleneck work activity is one that effectively limits capacity of the entire process. • A nonbottleneck work activity is one in which idle capacity exists. • A nonphysical constraint is environmental or organizational (e.g., low productivity and or an inefficient management policy or procedure).

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CHAPTER 3 MEASURING PERFORMANCE IN OPERATIONS

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CHAPTER 9 SUPPLY CHAIN DESIGN

1 Explain how organizations seek to gain competitive advantage • Competitive advantage denotes a firm's ability to achieve market and financial superiority over its competitors • Creating competitive advantage requires: o Understanding customer needs and expectations o Building and leveraging operational capabilities to support desired competitive priorities. 2 Explain approaches for understanding customer wants and needs • Order qualifiers are basic customer expectations, generally considered the minimum performance level required to stay in business • Order winners are goods and service features and performance characteristics that differentiate one customer benefit package from another and win the customer's business. 3 Describe how customers evaluate goods and services • Search attributes are those that a customer can determine prior to purchasing the goods and/or services o Color, price, freshness, style, fit, feel, hardness, and smell. • Experience attributes are those that can be discerned only after purchase or during consumption or use. o Friendliness, taste, wear ability, safety, fun, and customer satisfaction. • Credence attributes are any aspects of a good or service that the customer must believe in, but cannot personally evaluate even after purchase and consumption. o Expertise of a surgeon or mechanic, the knowledge of a tax advisor. Customers evaluate services in ways that are often different from goods, such as: o Customers seek and rely more on information from personal sources when evaluating services 4 Explain the five key competitive priorities Represent the strategic emphasis that a firm places on certain performance measures and operational capabilities within a value chain. o Cost o Almost every industry has a low price market segment. Examples include Southwest Airlines, and Walmart. o Quality o Time o Flexibility o Manifest in mass customization strategies o Mass customization is being able to make whatever goods and

1 Describe the types of measures used for decision making Financial Measures Quality Sustainability Customer and Market Measures o Measures of customer satisfaction reveal areas that need improvement and show whether changes actually result in improvement o It racks trend and reveals patterns of customer behavior from which the company can predict future customer needs and wants o Tracks and analyze complains Service Quality o Every service encounter provides an opportunity for error o Errors in service creation and delivery are sometimes called services upsets or service failures. Time o Two types of performance measures o Speed of doing something Speed can lead to a significant competitive advantage. o Variability of the process Variability is what often leads to an unhappy customer experience o Processing time = time it takes to perform some task o Queue time = wait time – the time spent waiting Flexibility The ability to adapt quickly and effectively to changing requirements. o Goods and service design flexibility is the ability to develop a wide range of customised goods and services to meet different or changing customer needs. o Measures include the rate of new product development or percent or product mix developed over the past three years o Volume flexibility is the ability to respond quickly to changes in the volume and type of demand o Measures include the time change machine setups or time required to "ramp up" to an increased production volume. Innovation and Learning o Measures of innovation and learning include patent applications, new product development, employee training and skills development, satisfaction, work system performance, etc. Productivity and Operational Efficiency o Is the ratio of the output of a process to the input o Productivity increases when output increases or amount of input increases o Describes how well the resources of an organisation are being used to produce output. 2

services the customer wants, at any volume, at any time for anybody, and for a global organization, from any place in the world. o Innovation

Explain the use of analytics in OM and how internal and external measures are related Analytics in Operations Management – Interlinking o Interlinking: quantitative modelling of such relationships between external and internal performance criteria o With interlinking models, managers can objectively make internal decisions that impact external outcomes. o i.e., determining the effects of adding resources or changing the operating system to reduce waiting time, and thereby increase customer satisfaction Linking internal and external performance measures o The value of a loyal customer (VLC) quantifies the total revenue or profit each target market customer generates over the buyer's life cycle o By multiplying the VLC times the absolute number of customer gained or lost, the total market value can be found Value of a Loyal Customer (VLC) customer defection rate =1 − customer retention rate Buying life-cycle (BLC) = 1/ Defection rate VLC=(P)(RF)(CM)(BLC) where P=the revenue per unit RF=re-purchase frequency CM=contribution margin BLC= Buying life-cycle 3 Describe four models of organizational performance Baldrige Performance Excellence Framework • Provide a framework for performance excellence through Self-assessment to understand an organization's strengths and weaknesses, thereby setting priorities for improvement • Organizations in manufacturing, small business, service, education, healthcare, and non-profit sectors may receive the Malcolm Baldrige Award. The Balanced Scorecard Model • Translate strategy into measures that uniquely communicate an organization's vision • Perspectives • Financial - Value to shareholders • Customer - Customer satisfaction and market growth • Innovation and learning - People and infrastructure • Internal - Processes that drive the business The Value Chain Model • Evaluates performance throughout the value chain by identifying measures associated with: • Suppliers • Inputs • Value creation

processes • Goods and service outputs and outcomes • Customers and market segments • Supporting management processes The value chain model is probably the dominant performance measurement model, especially for operations managers. Service-profit Chain Model • Focuses on employees or service environments • Based on a set of cause and effect linkages between internal and external performance • Defines the key performance measurements on which service-based firms should focus • Theory - Employees driven through the service delivery system, create customer value and drive profitability

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CHAPTER 6 GOODS AND SERVICE DESIGN

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CHAPTER 8 FACILITY AND WORK DESIGN

1 Explain the concept of supply chain management Supply Chain o Key subsystem of a value chain that focuses on physical movement of goods and materials - Support information through the supply, production, and distribution processes o Coordinates the flow of materials, services, and information among the elements of the supply chain to maximize customer value o Key functions: purchasing and procurement of materials and supplies, sales and order processing, operations, inventory and materials management, transportation and distribution, information management, finance, and customer service Supply Chain Management (SCM) o Management of all activities that facilitate the fulfilment of a customer order for manufactured goods - To achieve satisfied customers at a reasonable cost o Includes managing: materials within supply chain, flows of information and money that are necessary to coordinate activities within the supply chain 2 Describe the key issues in designing supply chains Designing the Supply Chain o A contract manufacturer is a firm that specialises in certain types of goods-producing activities, such as customised design, manufacturing, assembly, and packaging. o Advantages: access to advanced manufacturing technologies, faster product time-to-market, customization of goods in regional markets, lower total costs resulting from economies of scale o A third-party logistics (3PL) providers provide integrated services that might include: packaging, warehousing, inventory management, and inbound or outbound transportation o Leverage business intelligence to create efficiencies and economies of scale in the supply chain Designing the Supply Chain: Two Strategic perspectives o Efficient supply chains: designed for efficiency and low cost by minimising inventory and maximizing efficiencies in process flow o Responsive supply chains focus on flexibility and responsive service. Has the ability to react

1 Describe the steps involved in designing goods and services • Strategic mission and vision • Strategic and market analysis, and understanding competitive priorities • Customer benefit package design and configuration • Detailed goods, service, and process design • For manufactured goods - Manufactured design and development - Process selection and design • For services - Service and service delivery design - Service encounter design • Market introduction/deployment • Marketplace evaluation 2 Explain the concept and application of quality function deployment Customer requirements - Wants and needs are reflected through the design of good or service • Voice of the customer: Customer requirements, as expressed in the customer's own terms • Quality function deployment(QFD): Approach to guide the design, creation, and marketing of goods and services by: - Integrating the voice of the customer into all decisions • Determine customer requirements through the voice of the customer (VOC) • Define technical requirements of the product • Determine interrelationships between the technical requirements • Relationship matrix defines what technical requirements satisfy VOC needs • Customer priorities and competitive evaluation help select which VOC requirements the product should focus on 3 Describe how the Taguchi loss function, reliability, design for manufacturability, and design for sustainability are used for designing manufactured goods Tolerance Design and the Taguchi Loss Function o Determining the acceptable tolerance o "goal post model" o For most manufactured goods, design blueprints specify a target dimension (called the nominal), along with a range of permissible variation (called the tolerance) o Narrow tolerances vs. Wide tolerances Improved product functionality & performance vs. increased manufacturing cost o Taguchi Loss Function o Argued that the smaller the variation about

quickly to changing market demand and requirements Designing the Supply Chain: Efficient supply chains o Seek to balance capacity and demand, resulting in low levels of inventory o Might use only a few large distribution centres to generate economies of scale o Use optimisation models that minimise costs of routing products from factory through distribution centres o Example: Walmart Designing the Supply Chain: Responsive Supply Chains o Have the ability to quickly respond to market changes and conditions faster than traditional supply chains o Are supported by information technology that provides real-time, accurate information to managers across the supply chain o Use information to identify market changes and redirect resources to address these changes o Example: Apple Push and Pull Systems o A push system produces goods in advance of customer demand using a forecast of sales and moves them through supply chain to points of sale where they are stored as finished goods inventory o A pull system produces only what is needed at upstream stages in the supply chain in response to customer demand signals from downstream stages o Push-pull boundary: point in the supply chain that separates the push system from the pull system o Postponement: process of delaying product customization until the product is closer to the customer at the end of the supply chain Green Sustainable supply chain o Purpose – reduce costs while helping the environment o The process of using environmentally friendly inputs and transforming these inputs through change agents – whose by-products can improve or be recycled within the existing environment Manufactured Good Recovery o Developing options to recover manufactured goods that will be discarded or stable o Reuse or resell, repair, refurbish, remanufacture, cannibalize parts, recycle goods, incineration or landfill disposal o Reverse Logistics: managing the flow of nominal specification, the better is the quality o In turn, products are more consistent, would fail less frequently, and thus, be less costly in the long run. o L(x) = k(x – T)2 o Where L(x) - Monetary value of the loss associated with deviating from the target, T x - Actual value of the dimension k - Constant that translates the deviation into dollars 4 Explain the five elements of service delivery system design Facility location and layout o Location creates customers' convenience o Great store layout, process design, and service encounter design are meaningless if the store is in the wrong location. o The internet is making physical locations less important for some information-intensive services Servicescape o All of the physical evidence a customer might use to form an impression o Provides the behavioural setting where service encounters take place o Standardization – enhances efficiency, especially for multiple site organizations o For eg, McDonald's Restaurants, Subway o Types of Servicescapes o Lean servicescape environments: provide service using simple designs Eg, FedEx drop-off kioks o Elaborate servicescape environments: provide service using more complicated designs and service systems Eg, Hospitals, airports, universities Process and job design, technology and information support systems, organizational structure 5 Describe the four elements of service encounter design Service Encounter Design o Focuses on the interaction, directly or indirectly, between the service provider(s) and the customer. o Principle elements: o Customer contact behaviour and skills Physical or virtual presence of the customer in the service delivery system during service experience Measured by the percentage of time the customer must be in the system relative to the total time it takes to provide the service High-contact system vs. low-contact systems o Service Provider Selection, Development and Empowerment Recruit and train employees to exceed

finished goods, materials, or components that can be unusable or discarded o Through supply chain from customers toward either suppliers, distributors, or manufacturers o For the purpose of reuse, resale, or disposal o 3 Define metrics used in evaluating supply chain performance Measuring Supply Chain Performance o Delivery reliability, responsiveness, customer-related measures, supply chain efficiency measures, sustainability measures, financial measures 4 Describe the role of transportation, supplier evaluation, technology, and inventory in supply chain management Managing Supply Chains o Requires numerous operational decisions o Global sourcing, selecting transportation services, incorporating technology, managing inventory (vendor managed inventory VMI) o Vendor-managed inventory (VMI) o Advantages: optimize production operations, better control on inventory and capacity, reduce total supply chain costs o Disadvantages: results in higher than necessary customer inventories Selecting transportation services o A complex decision, as varied services are available – rail, motor carrier, air, water, and pipeline. o Most consumer items are shipped via rail, motor, carrier, and air. 5 Explain important factors and decisions in locating facilities Location Decisions in Value Chains o Profound effect on supply chain performance and a firm's competitive advantage o Type of facility and its location affect the supply chain structure o Service organizations operate large numbers of similar facilities - Multisite management: process of managing geographically dispersed service-providing facilities Critical Factors in Location Decisions o Economic factors - Facility costs – construction, utilities, insurance, taxes, depreciation, and maintenance - Operating costs – fuel, direct labour, and administrative personnel - Transportation costs - associated with moving goods and services from the origins to the final customer expectations Empowerment: giving people authority to make decisions based on what they feel is right, to have control over their work, to take risks and learn from mistakes, and to promote change. o Recognition and reward o Service recovery and guarantees

destinations o Noneconomic factors - Availability of labour, transportation services and utilities - Climate, community environment, and quality of life o State and local legal and political factors Center of Gravity Method o Determines the X and Y coordinates (location) for a single facility - Takes into account locations, demand, and transportation costs to arrive at the best location - Cx= ΣXiWi/ΣWi - Cy= Σ YiWi/ΣWi o Where Cx = x coordinate of the center of gravity Cy = y coordinate of the center of gravity Xi = x coordinate of location i Yi = y coordinate of location i Wi = Volume of goods and service moved to or from location i

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CHAPTER 2 VALUE CHAINS

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CHAPTER 7 PROCESS SELECTION, DESIGN & ANALYSIS

CHAPTER 7 PROCESS SELECTION, DESIGN & ANALYSIS

1 Describe four layout patterns and when they should be used Facility Layout is the Specific arrangement of physical facilities • Layout studies are necessary whenever: - New facility is constructed - Significant change in demand or throughput volume - New good or service is introduced to the customer benefit package - Different processes, equipment, and/or technology are installed Product Layout An arrangement based on the sequence of operations that are performed during the manufacturing of a good or delivery of a service. Smooth and logical flow where all goods or services move in a continuous path from one process stage to the next using the same sequence of work tasks and activities. Examples: Winemaking industry, credit card processing, Subway sandwich shops, etc. Advantages: Lower work-in-process inventories, less Material handling, lower labor skills, and simple Planning and control systems. Disadvantages: A breakdown at one workstation can Cause the entire process to shut down; a change in Product design or the introduction of new products May require major changes in the layout, limiting flexibility. Process Layout Consists of a functional grouping of equipment or activities that do similar work. Depending on the processing they require, tasks may be moved in different sequences among departments Examples: Job Shops, Legal offices, shoe manufacturing, and hospitals Advantages: Compared to product layouts, process layouts provide more flexibility and require a lower investment in equipment. If a piece of equipment fails, it generally does not affect the entire system. Also, the diversity of jobs inherent in a process layout can lead to increased worker satisfaction. Disadvantages: High material handling costs, more complicated planning and control systems, low equipment utilization, higher in-process inventory, and higher worker-skill requirements. Fixed-Position Layout Consolidates the resources necessary to manufacture a good or deliver a service, such as

1 Explain the concept of value and how it can be increased • The underlying purpose of every organization is to provide value to its customer and stakeholders • Value is the perception of the benefits associated with a good, service, or bundle of goods and services in relation to what buyers are willing to pay for them. 2 Describe a value chain and the two major perspectives that characterize it Value Chain Network of facilities and processes that describes the flow of goods, services, information, and financial transactions from suppliers through the facilities and process that o Create goods and services and deliver them to customers o Views an organization from the customer’s perspective Pre-and Postproduction Services o Preproduction services “gaining a customer” include customized and team-oriented product design, consulting services, contract negotiations, product and service guarantees o Postproduction services “keeping the customer” include on-site installation or application services, maintenance and repair Value Chain Decisions o The operational structure of a value chain is the configuration of resources such as suppliers, factories, warehouses, distributors, technical support centers, engineering design and sales offices, and communication links. o Centralized vs. Decentralized (decision making) 3 Explain outsourcing and vertical integration in value chains o Vertical integration refers to the process of acquiring and consolidating elements of a value chain to achieve more control. o Backward integration: acquiring capabilities toward suppliers o Forward integration: acquiring capabilities toward customers o Outsourcing is the process of having suppliers provide goods and services that were previously provided internally. (not the core function of the business) The Economics of Outsourcing VC1= Variable cost/unit if produced VC2 = Variable cost/unit if outsourced FC = Fixed costs associated with producing the part Q = Quantity

people, materials, and equipment, in one physical location. Examples: The production of large items such as heavy machine tools, airplanes, buildings, locomotives, and ships. Service-providing examples include major hardware and software installations, sporting events, and concerts. Advantages: Work remains stationary, reducing movement. Disadvantages: High level of planning and control required. Cellular Layout The design is not according to the functional characteristics of equipment, but rather self-contained groups of equipment (called cells), needed for producing a particular set of goods or services. First developed by Toyota. Cellular layouts facilitate the processing of families of parts with similar processing requirements. Examples: Legal services such as labor law, bankruptcy, divorce; medical specialties such as maternity, oncology, surgery. Advantages: Reduced materials-handling requirements, quicker response to quality problems, more efficient use of floor space, more worker responsibility increasing morale. Disadvantages: Duplication of equipment among cells, greater worker skills requirements. 2 Explain how to design product layouts using assembly line balancing Flow-blocking delay occurs when a work center completes a unit but cannot release it because the in-process storage at the next stage is full. The worker must remain idle until storage space becomes available. Lack-of-work delay occurs whenever one stage completes work and no units from the previous stage area waiting processing. These sources of delay can be minimized by attempting to “balance” the process by designing the appropriate level of capacity at each workstation. This is often done by adding additional workstations in parallel. Assembly line balancing is a technique to group tasks among workstations so that each workstation has, in the ideal case, the same amount of work. Cycle Time • Interval between successive outputs coming off the assembly

produced (volume) Total cost of production = (VC1) Q + FC Total cost of outsourcing = (VC2) Q Find the breakeven point: (VC2) Q = (VC1) Q + FC Q*= FC/ VC2− VC1 4 Explain offshoring and reshoring, and issues that managers must consider in making these decisions Offshoring is the building, acquiring, or moving of process capabilities from a domestic location to another country location while maintaining ownership and control. Reshoring is the process of moving operations back to company’s domestic location Things to Consider When Making Offshore Decisions • Low labor costs • Lower import duties and fees • Lower capital costs • Grow global market share • Avoid national currency fluctuations • Preempt competitors from entering global market • Hire worldwide skills and knowledge workers • Build robust value chain networks for global markets • Build relationships with government officials • Negative impact and media attention on remaining employees • Potential loss of intellectual property • Loss control of key processes • Develop secure sources of supply and reduce risks • Build relationships with suppliers • Avoid environmental regulations and laws • Possible political instability in offshore country • Lack of communication and/or technical skills • Learn foreign markets and cultures 5 Identify important issues associated with value chains in a global business environment Issues for Managing Global Value Chains • Global value chains face higher levels of risk and uncertainty, requiring more inventory and day-to-day monitoring to prevent product shortages. o Workforce disruptions, such as labor strikes and government turmoil in foreign countries, can create inventory shortages and disrupting surges in orders. • Transportation is more complex in global value chains o For example, tracing global shipments normally involves more than one mode of transportation and foreign company. • The transportation infrastructure may vary considerably in foreign

line • Cycle time (CT) is related to the output (R) by the following equation: - CT = A/R - A - Available time to produce the output - Output (R) - Demand forecast in units, adjusted for on-hand inventory, or orders released to the factory - Both A and R must have the same time units of measure If the required cycle time is smaller than the larger task time Then, the work content must be redefined by splitting some tasks into smaller elements Minimum number of workstations required= Sum of task times/Cycle time = Σt/CT Total time available = (Number of work stations) × (Cycle Time) = (N)(CT) Total idle time = (N)(CT) - Σt Assembly-line efficiency = Σt/(N ×CT) Balance delay = 1 - Assembly-line efficiency Designing Process Layouts • Arrangement of departments or work centers relative to each other • Approaches • Focuses on the cost associated with moving materials • Used when it is difficult to obtain data on costs or volumes moved between departments Workplace Design • Well-designed workplace allows for maximum efficiency and effectiveness as the work task or activity is performed • Needs to facilitate service management skills in high-contact, front-office environments The Human Side of Work • Job: Set of tasks an individual performs • Job design involves: - Determining the specific job tasks and responsibilities - Work environment - Methods by which the tasks will be carried out to meet the goals of operations • Two broad objectives in job design: i. To meet the firm's competitive priorities—cost, efficiency, flexibility, quality, and so on ii. To make the job safe, satisfying, and motivating for the worker. • Job enlargement: Horizontal expansion of the job to give the worker more variety although not necessarily more responsibility. For example, giving a production-line worker the task of building an entire product rather than a small subassembly, or rotating nurses among hospital wards or flight crews on different airline routes. • Job enrichment: Vertical expansion of job duties to

countries • Global purchasing can be a difficult process to manage when sources of supply, regional economies, and even governments change o Daily changes in international currencies necessitate careful planning and in the case of commodities, consideration of future contracts. • The pre-planning, response, and recovery from natural or man-made disasters is another important part of value chain management. Challenges facing Multinational Enterprises 1. How to design a value chain to meet the slower growth of industrialized countries and more rapid growth of emerging economies. 2. Where to locate manufacturing and distribution facilities around the globe to capitalize on value chain efficiencies and improve customer value 3. What performance metrics to use in making critical value chain decisions 4. How to decide if partnerships should be developed with competitors to share engineering, manufacturing, or distribution technology and knowledge. 6 Describe how sustainability plays an important role in value chains Sustainable Value Chains o The terms green operations, green manufacturing, and green practices are often used to describe sustainability activities that involve operations and the value chain. o Sustainability improves the organizations' perception among consumers, and improves the bottom line through reduced costs. o Many customers favor products and services that are designed and produced in a sustainable way.

give the worker more responsibility - Highly effective approach to job enrichment is to use teams • Natural work teams • Virtual teams • Self-managed teams (SMTs) For example, an assembly worker may be given the added responsibility of testing a completed assembly, so that he or she acts also as a quality inspector.

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Types of Goods and Services Custom, or make-to-order, goods and services are generally produced and delivered as one-of-a-kind or in small quantities, and are designed to meet specific customers' specifications. Option, or assemble-to-order, goods and services are configurations of standard parts, subassemblies, or services that can be selected by customers from a limited set. Standard, or make-to-stock, goods and services are made according to a fixed design, and the customer has no options from which to choose. 1 Describe the FOUR TYPES OF PROCESSES used to produce goods and services PROJECTS are large-scale, customized initiatives that consist of many smaller tasks and activities that must be coordinated and completed to finish on time and within budget. Often used for custom goods and services. – Characteristics: One-of-a-kind, large scale, complex, resources brought to site; wide variation in specs and tasks. – Examples: Legal defense preparation, construction, customer jewelry, consulting, and software development. JOB SHOP PROCESSES are organized around particular types of general-purpose equipment that are flexible and capable of customizing work for individual customers. Often used for custom of option types of products. Produce a wide variety of goods and services, often in small quantities. – Characteristics: Significant setup and/or changeover time, batching, low to moderate volume, many routes, many different products, high work-force skills, and customized to customer's specs. – Examples: Many small manufacturing companies are setup as job shops, as are hospitals, and some restaurants. FLOW SHOP PROCESSES are organized around a fixed sequence of activities and process steps, such as an assembly line, to produce a limited variety of similar goods or services. – Characteristics: Little or no setup time, dedicated to small range of goods or services that are similar, similar sequence of process steps, moderate to high volume. – Examples: Assembly lines that produce automobiles and appliances, production of insurance policies and checking account statements, and hospital laboratory work. A CONTINUOUS FLOW PROCESS creates highly standardized goods or services, usually around the clock in very high volumes. – Characteristics: Very high volumes in a fixed processing sequence, high investment in system,24-hour/7-day continuous operation, automated, dedicated to a small range of goods or services. – Examples: Chemical, gasoline, paint, steel factories; electronic funds transfer, and credit card authorizations. 2 Explain the logic and use of the PRODUCT-PROCESS MATRIX A model that describes the alignment of process choice with the characteristics of the manufactured good. 3 Explain the logic and use of the SERVICE-POSITIONING MATRIX • Customer-routed services: Offer customers extensive freedom to select the pathways that are best suited for themselves Customer's immediate needs and wants from pathways through the service delivery system • Provider-routed services: Limited number of predefined pathways through the service system that customers can follow 4 Describe how to apply process and value stream mapping for process design Process map (flowchart) describes the sequence of all process activities and tasks necessary to create and deliver a desired output or

outcome. - Documents how work is accomplished, and how the transformation process creates value. Process boundary: the beginning or end of a process. -Makes it easier to obtain management support, assign process ownership, and identify where performance measures should be taken. Value stream: all value-added activities involved in designing, producing, and delivering goods and services to customers. A value stream map(VSM) shows the process flows in a manner similar to an ordinary process map; however, the difference lies in that value stream maps: - Highlight value-added versus non-value-added activities - Include costs associated with work activities 5 Explain how to improve process designs and analyze process maps Process design activities involve redesigning an existing process to improve performance Strategies to improve process designs usually focus on increasing: • Revenue • Agility • Product and/or service quality • Strategies to improve process designs usually focus on decreasing: • Costs • Process flow time • Carbon footprint • Reengineering: Fundamental rethinking and radical redesign of business processes to: • Achieve dramatic improvements in critical, contemporary measures of performance 6 Describe how to compute resource utilization and apply Little's Law Utilization • Fraction of time a workstation or individual is busy over the long run. Utilization (U) = Resources Used/ Resources Available or Utilization (U) = Demand Rate/ [Service Rate ×Number of Servers] Little's Law • Flow time, or cycle time: Average time it takes to complete one cycle of a process • Simple formula that explains: • Relationship among flow time (T) • Throughput (R) • Work-in-process (WIP) - Work-in-process = Throughput × Flow Time ▸ WIP = R × T Throughput • Average number of entities completed per unit time from a process • Measured as parts per day, transactions per minute, or customers per hour, depending on the context Bottleneck • Work activity that effectively limits throughput of the entire process • Identifying and breaking process bottlenecks is an important part of process design and improvement - Increase the speed of the process - Reduces waiting and work-in-process inventory - Uses resources more efficiently