Washington University of Virginia
BUS 510E ORGANIZATION THEORY
Lecture Notes #8
Organization and Supply-Chain Management

Primary References

Jacobs, F. Robert and Richard B. Chase. *Operations and Supply Chain Management*, 13th ed. New York: McGraw Hill/Irwin, 2011.
Kotler, Philip and Kevin Keller. *Marketing Management*, 14th ed. Prentice Hall, 2011.

I. Strategy and Sustainability

Operations and Supply Chain Management (OSCM) is defined as the design, operation, and improvement of the systems that create and deliver the firm's primary products and services.

A. Operations and Supply Chain Processes

1. **Planning** consists of the processes needed to operate an existing supply chain strategically. Here a firm must determine how anticipated demand will be met with available resources. A major aspect of planning is developing a set of metrics to monitor the supply chain so that it is efficient and delivers high quality and value to customers.
2. **Sourcing** involves the selection of suppliers that will deliver the goods and services needed to create the firm's product. A set of pricing, delivery, and payment processes is needed together with metrics for monitoring and improving the relationships between partners of the firm.
3. **Making** is where the major product is produced or the service provided. The step requires scheduling processes for workers and the coordination of material and other critical resources such as equipment to support producing or providing the service.
4. **Delivering i**s also referred to as logistics processes. Carriers are picked to move products to warehouses and customers, coordinate and schedule the movement of goods and information through the supply network, develop and operate a network of warehouses, and run the information systems managing the receipt of orders, and invoicing systems to collect payments from customers.
5. **Returning** involves the processes for receiving worn-out, defective, and excess products back from customers and support for customers who have problems with delivered products. In the case of services, this may involve all types of follow-up activities that are required for after-sales support.

B. The Triple Bottom Line - A Sustainable Strategy

1. **Social:** Pertains to fair and beneficial business practices toward labor, the community, and the region in which a firm conducts its business. A triple bottom line company seeks to benefit its employees, the community, and other social entities that are impacted by the firm's existence.
2. **Economic**: The firm is obligated to compensate shareholders who provide capital through stock purchases and other financial instruments via a competitive return on investment. Company strategies should promote growth and grow long-term value to this group in the form of profit.
3. **Environmental:** This refers to the firm's impact on the environment. The company should protect the environment as much as possible - or at least cause no harm. Managers should move to reduce a company's ecological footprint by carefully managing its consumption of natural resources and by reducing waste, and ensuring that the waste is less toxic before disposing of it in a safe/legal manner.

Operations and supply chain strategy should be focused on *operations effectiveness* subject to two constraints - social benefits and environment preservation.

II. Product and Service Design

Product development is a major challenge that directly impacts the long-range success of a firm. Effectively managing the process requires an integrated effort involving all the functional areas of the firm.

Exhibit: The Product Development Process

Phase 0 to 5	***Design***	***Manufacturing***	***Marketing***
Phase 0 *Planning*	*Consider product platform and architecture *Assess new technologies	*Identify production constraints *Set supply chain strategy	*Articulate market opportunity *Define market segments
Phase 1 *Concept Development*	*Investigate feasibility of product concepts *Develop industrial design concepts *Build and test experimental prototypes	*Estimate manufacturing cost *Assess production feasibility	*Collect customer needs *Identify lead users *Identify competitive products
Phase 2 *System-level Design*	*Generate alternative product architectures *Define major subsystems and interfaces *Refine industrial design	*Identify suppliers for key components *Perform make-buy analysis *Define final assembly scheme *Set target costs	*Develop plan for product options and extended product family *Set target sales price point(s)
Phase 3 *Detail Design*	*Define part geometry *Choose materials *Assign tolerances *Complete industrial design control documentation	Define piece-part production processes *Design tooling *Define quality assurance processes *Begin procurement of long-lead tooling	*Develop marketing plan
Phase 4 *Testing and Refinement*	*Reliability testing *Life testing *Performance testing *Obtain regulatory approvals *Implement design changes	*Facilitate supplier ramp-up *Refine fabrication and assembly processes *Train workforce *Refine quality assurance processes	*Develop promotion and launch materials *Facilitate field testing
Phase 5 *Production Ramp-up*	*Evaluate early production output	*Begin operation of entire production system	*Place early production with key consumers

Variant of Generic Product Development Process:
Generic (market-pull production), technology-push, platform, process-intensive, customized, high-risk, quick-built, complex systems products.

III. Designing a Manufacturing System

In designing a manufacturing system, **p**rocess selection refers to the strategic decision of selecting which kind of production processes to use to produce a product or provide a service. Many techniques are available to determine the actual layouts of the production process.

Exhibit: The Layouts of the Production Process

Production Process Layout	***Explanation***
1. Project Layout	The product remains in a fixed location. Manufacturing equipment is moved to teh product rather than vice versa.
2. Work-centers	It refers to as a job shop, is where similar equipment or functions are grouped together, such as all drilling machines in one area and all stamping machines in another. A part being worked on travels, according to the established sequence of operations, from work center to work center.
3. Manufacturing cell	It is a dedicated area where products that are similar in processing requirements are produced. These sells are designed to perform a specific set of processes, and the cells are dedicated to a limited range of products. A firm may have many different cells in a production area, each set up to produce a single product or a similar group of products efficiently.
4. Assembly Line	It is where work processes are arranged according to the progressive steps by which the product is made. The path for each part is, in effect, a straight line. Discrete products are made by moving from workstation to workstation at a controlled rate, following the sequence needed to build the product.
5. Continuous process	It is similar to an assembly line in that production follows a pre-determined sequence of steps, but the flow is continuous such as with liquids, rather than discrete. Such structures are usually highly automated and, in effect, constitute one integrated machine that may operate 24 hours a day to avoid expensive shutdowns and start-ups.

Contemporary Application

1. The Digital Factory - Computer-integrated manufacturing: Digital factories link manufacturing components that previously stood alone: robots, machines, product design, and engineering analysis are coordinated by a single computer system. The digital factory is typically the result of subcomponents such as computer-aided design, computer-aided manufacturing, manufacturing process management, integrated information network, and product life-cycle management.

2. Lean Manufacturing uses highly trained employees at every stage of the production process, who take a painstaking approach to details and problem solving to cut waste and improve quality. Lean manufacturing incorporate technological elements, but heart of lean manufacturing is not machines or software, but people - essentially centered on preserving value with less work. Lean manufacturing requires changes in organizational systems, such as decision-making processes and management processes, as well as an organizational culture supporting active employee participation, a quality perspective, and focus on the customers. Employees are trained to attack waste and strive for continuous improvement in all areas.

IV. Designing a Service Organization

Exhibit: Differences between Manufacturing and Service Technologies

Service Technology	Manufacturing technology
1. Intangible output 2. Production & consumption take place simultaneously 3. Labor- and Knowledge-intensive 4. Customer interaction generally high 5. Human element very important 6. Quality is perceived and difficult to measure 7. Rapid response time is usually necessary 8. Site of facility is extremely important	1. Tangible product 2. Products can be inventoried for later consumption 3. Capital asset-intensive 4. Little direct customer interaction 5. Human element may be less important 6. Quality is directly measured 7. Longer response time is acceptable 8. Site of facility is moderately important
Service Airlines, Hotels, Consultants, Health care, Law firms	**Product** Soft drink companies, Steel companies, Automobile manufacturers, Mining corporations, Food processing plants

Service organizations accomplish their primary purpose through the production and provision of services, such as education, healthcare, transportation, banking, and hospitality. The characteristics of service technology are compared to those of manufacturing technology in Exhibit above.

Designing the service organization: The impact of customer contact on organization design is reflected in the use of boundary roles and structural disaggregation. Boundary roles are used extensively in manufacturing firms to handle customers and to reduce disruptions for the technical core. They are used less in service firms because a service is intangible and cannot be passed along by boundary spanners, so service customers must interact directly with technical employees, such as doctors or brokers. A service firm deals in information and intangible outputs and does not need to be large. Its greatest economies are achieved through disaggregation into small units that can be located close to customers. Service technology also influence internal organization characteristics used to direct and control the organization, though the needed skills are higher. Employees need social and interpersonal skills as well as technical skills, and decision making often tends to be decentralized in service firms.

Exhibit: Configuration and Structural Characteristics of Service Organizations versus Product Organization

Characteristics	***Service***	***Product***
Structural Characteristic		
1 Separate boundary roles	Few	Many
2 Geographical dispersion	Much	Little
3 Decision making	Decentralized	Centralized
4 Formalization	Lower	Higher
Human Resources		
1 Employee skill level	Higher	Lower
2 Skill emphasis	Interpersonal	Technical

V. The Impact of Technology on Job Design

A. Job Design

1. Job design includes the assignment of goals and tasks to be accomplished by employees. Managers may consciously change job design to improve productivity or worker motivation. However, managers may also unconsciously influence job design through the introduction of new technologies, which can change who jobs are done and the very nature of jobs. Managers should understand how the introduction of a new technology may affect employees' jobs. The common theme of new technologies in the workplace is that they in some way substitute machinery for human labor in transforming inputs into outputs.

Exhibit: Job Design Decision

Factors	Explanation
Who	Mental and physical characteristics of the workforce
What	Task(s) to be performed
Where	Geographic locale of organization: location of work areas
When	Time of day: time of occurrence in the work flow
Why	Organizational rationale for the job: objectives and motivation of workers
How	Method of performance and motivation

2. In addition to replacing human workers, technology may have several different effects on the human jobs that remain. Mass-production technologies tend to produce ***job simplification***, which means that the variety and difficulty of tasks performed by a single person are reduced, and boring and repetitive jobs provide little satisfaction. Hence, managers introduced ***job rotation*** and ***job enrichment***. On the other hand, digital manufacturing and other advanced technology may contribute to ***job enlargement***, which is an expansion of the number of different tasks performed by an employee.

B. Socio-technical Systems

The socio-technical systems approach recognizes the interactions of technical and human needs for technical efficiency. The ***socio*** portion of the approach refers to the people and groups that work in organizations and how work is organized and coordinated. The ***technical*** portion refers to the materials, tools, machines, and processes used to transform organizational inputs into outputs. The goal of the socio-technical systems approach is to design the organization for ***joint optimization***, which means that an organization functions best when the social and technical systems are designed to fit the needs of one another. Joint Optimization = Social System + Technical System.

Exhibit: Socio-technical Systems Model

The Social System		The Technical System
*Individual and team behaviors *Organizational/team culture *Management practices *Leadership style *Degree of communication openness *Individual needs and desires	Design for Joint Optimization Work roles, tasks, Work flow Goals and values Skills and abilities	*Type of production technology *Level of interdependence *Physical work setting *Complexity of production process *Nature of raw materials *Time pressure

VI. Strategic Sourcing

A. Strategic sourcing is the development and management of global supplier relationship to acquire goods and services in a way that aids in achieving the immediate needs of the business.

The Bullwhip Effect is an observed phenomenon in forecast-driven distribution channels. It refers to a trend of larger and larger swings in inventory in response to changes in demand, as one looks at firms further back in the supply chain for a product. Moving up the supply chain from end-consumer to raw materials supplier, each supply chain participant has greater observed variation in demand and thus greater need for safety stock. In periods of rising demand, down-stream participants increase orders. In periods of falling demand, orders fall or stop, thereby not reducing inventory. The effect is that variations are amplified as one moves upstream in the supply chain (further from the customer).

B. Outsourcing is the act of moving some of a firm's internal activities and decision responsibility to outside providers. Outsourcing goes beyond the more common purchasing and consulting contracts because not only are the activities transferred, but resources that make the activities occur, including people, facilities, equipment, technology, and other assets, are also transferred.

C. Green Sourcing is to revamp their procurement policies to be more sustainable and efficient by finding new environmentally friendly technologies or increasing the use of recyclable materials.

1. Assess the opportunity
2. Engage internal supply chain sourcing agents
3. Assess the supply base
4. Develop the sourcing strategy
5. Implement the sourcing strategy
6. Institutionalize the sourcing strategy

VII. Location, Logistics, and Distribution

A. Logistic System Design

***Water, Rail, Highway, Airline, Pipeline, and Hand delivery.

- High volume (or Deliver cost) versus Speed of delivery

* **Cross-docking** is a practice in logistics of unloading materials from an incoming semi-trailer truck or railroad car and loading these materials directly into outbound trucks, trailers, or rail cars, with little or no storage in between. This may be done to change type of conveyance, to sort material intended for different destinations, or to combine material from different origins into transport vehicles (or containers) with the same, or similar destination. Advantages of retail cross-docking are:

- Streamlines the supply chain from point of origin to point of sale
- Reduces handling costs, operating costs, and the storage of inventory
- Products get to the distributor and consequently to the customer faster
- Reduces, or eliminates warehousing costs
- May increase available retail sales space.

B. Issues in Facility Location: Proximity to customers; business climate; total costs; infrastructure; quality of labor; suppliers; other facilities; free trade zones; political risk; government barriers; trading blocs; environmental regulations, host community, and competitive advantage.

VIII. Demand Management and Forecasting

A. Linear Regression Analysis is functional relationship between two or more correlated variables. It is used to predict one variable given the other. The relationship is usually developed from observed data, which should be plotted first to see if they appear linear or if at least parts of the data are linear.

B. Time Series Analysis: It can be defined as chronologically ordered data that may contain one or more components of demand: trend, seasonal, cyclical, auto-correlation, and random.

IX. Sales and Operations Planning

A. Sales and operations planning is a process that helps firms provide better customer service, lower inventory, shorten customer lead times, stabilize production rates, and give top management a handle on the business.

B. The Aggregate Operations Plan is concerned with setting production rate by product group or other broad categories for the intermediate term (3 to 18 months). The main purpose of the aggregate plan is to specify the optional combination of production rate, workforce level, and inventory on hand.

Production rate refers to the number of unites completed per unit of time.
Workforce level is the number of workers needed for production.
Inventory on hand is unused inventory carried over from the previous period.

C. Yield Management can be defined as the process of allocating the right type of capacity to the right type of customers at the right price and time to maximize revenue or yield.

D. Inventory Systems: An inventory system provides the organizational structure and the operating policies for maintaining and controlling goods to be stocked. The system is responsible for ordering and receipt of goods: timing the order placement and keeping track of what has been ordered, how much, and from whom.

*Fixed order quantity models; *Fixed - Time period models
*Inventory control and supply chain management; *Price-Break models

X. Material Requirements Planning and Scheduling

A. Master Production Scheduling: All production systems have limited capacity and limited resources. This presents a challenging job of the master scheduler. Although the aggregate plan provides the general range of operation, the master schedule must specify exactly what is to be produced. These decisions are made while responding to pressures from various functional areas such as the sales department (meet the customer's due date), finance (minimize inventory), management (maximize productivity and customer service, minimize resource needs), manufacturing (have level schedules and minimize setup time).

B. Manufacturing Execution Systems: A manufacturing execution system is an information system that links schedules, dispatches, tracks, monitors, and controls the customer's encounters with the service organization and its employees. The common features are a central database that contains all the relevant information on resource availability and customers and a management control function that integrates and oversees the process.

(End of Lecture Notes #8)