MANUFACTURING AND SERVICE TECHNOLOGIE

Technology refers to the tools, techniques, machines, and actions used to transform inputs (materials, information, ideas) into outputs (products and services).

Technology includes such things as machinery, employee education, and work procedures.

Organization's core technology is the work process that is directly related to the mission.

Department work process that is important to the organization but is not directly related to its primary mission is a non-core technology.

Manufacturing Firms

Joan Woodward's classic study, based on **technical complexity** (extent of mechanization and predictability of manufacturing process) classified manufacturing firms into 3 groups:

1. Small-batch and unit production (relies heavily on the human operator and is not highly mechanized)
2. Large-batch and mass production
3. Continuous process production (production represents mechanization and standardization one step beyond those in an assembly line)

Mass production firms were formalized, centralized, mechanistic, had larger span of control and less-educated workers than small batch or continuous process technologies.

The result of Woodward studies is: Successful firms had complimentary structures and technologies.

Successful small-batch and continuous process

organizations had organic structures, Successful mass production organizations had mechanistic structures.

Flexible Manufacturing Systems (FMS

Computer-Integrated Manufacturing is also called **flexible manufacturing systems (FMS).**
Flexible Manufacturing Systems links together manufacturing components that previously stood alone and is the result of three subcomponents.

- ***Computer-aided design*** **(CAD**) uses computers to assist in the drafting, design, and engineering of new parts.

- ***Computer-aided manufacturing*** **(CAM)** increases the speed of manufacturing and changing production setups by computer-controlled machines.
- ***Integrated information network*** links all aspects of the firm with a common data base.

The awesome advantage of FMS is that products of different sizes, types, and customer requirements freely intermingle on the assembly line.

Lean Manufacturing

Lean manufacturing uses highly trained employees at every stage of the production process, which take a painstaking approach to details and problem solving to cut waste and improve quality.
Lean and flexible manufacturing systems have led to **mass customization**, the use of mass-production technology to quickly and cost-effectively assemble goods that are designed to fit the demands of individual customers.
Customized output means providing the service each customer wants and needs

The heart of lean manufacturing is not machines or software, but people.

Lean manufacturing require changes in organizational systems, such as decision making processes and management processes, as well as an organizational culture, and focus on the customer.

Comparison of Organizational Characteristics Associated whit Mass Production and Flexible Manufacturing Systems

CHARACTERISTIC	MASS PRODUCTION	FMS
Structure:		
Span of Control	Wide	Narrow
Hierarchical levels	Many	Few
Tasks	Routine, repetitive	Adaptive, craft-like
Specialization	High	Low
Decision making	Centralized	Decentralized
Overall	Bureaucratic, mechanistic	Self-regulating, organic
Human Resources:		
Interaction	Standalone	Teamwork
Training	Narrow, one time	Broad, frequent
Expertise	Manual, technical	Cognitive, social Solve problems
Interorganizational:		

Customer demand	Stable	Changing
Suppliers	Many, arm's length	Few, close relations

Noncore Departmental Technology.

Each department in an organization has a production process that consists of a distinct technology.

Perrow's Model

Perrow specified two dimensions of departmental activities that where relevant to organization structure and process.

Variety refers to the number of exceptions, problems or novel events that occur in the department's work. Variety ranges from repeating a single act as on a traditional assembly line, to working on unrelated problems as in a hospital emergency room.
Analyzability refers to the extent to which the work is mechanical, clear cut, and follows an objective, computational procedure.
When problem arise, it is difficult to identify the correct solution.
Work that requires intuition and judgment is not analyzable.

Framework. The dimensions of variety and analyzability form the basis for four mayor categories of technology:

ROUTINE High analyzability – Low variety
Example include an automobile assembly line and a bank teller department.

CRAFT Low analyzability – Low variety
Examples: fine goods manufacturing, trades, performing arts, pattern makers at fashion houses such as Vuitton, Zara

ENGINEERING High analyzability – High variety

Examples: Engineering and accounting tasks usually fall in this category.

NONROUTINE Low analyzability – High variety
Examples: Basic research, strategic planning, and other work that involves new projects and unexpected problems.

Workflow Interdependence among Departments

Interdependence refers to the extent to which departments depend on each other for resources or materials to accomplish their tasks. Low interdependence means that departments work independently and have little need for interaction, consultation, or exchange of materials. High interdependence means departments must constantly exchange resources.

Thompson defined three types of technology interdependence that influence structure.

Pooled interdependence means that all departments contribute to the organization but do not interact directly with each other. In this form, does not flow between units. Subway, restaurants or Bank branches are example of pooled interdependence. Pooled interdependence is associated with mediating technology, that which mediates or links clients from the external environment and, in so doing, allows each department to work independently (banks, real estate offices).
The management implications associated with pooled interdependence are quite simple. Thompson argued that managers should use rules and procedures to standardize activities across departments. Each department should use the same procedures and financial statements so the outcomes of all departments can be measured and pooled. Very little day-to-day coordination is required among units.

Sequential interdependence. When interdependence is of serial form, with parts produced in one department becoming

inputs to another department, it is called **sequential interdependence**. The first department must perform correctly for the second department to perform correctly. This is a higher level of interdependence than pooled interdependence, because departments exchange resources and depend on others to perform well.

Sequential interdependence creates a greater need for horizontal mechanisms such as integrators or task forces.

Sequential interdependence occurs in what Thompson called **long-linked technology**, which refers to the combination in one organization of successive stages of production; each stage of production uses as its inputs the production of the preceding stage and produces inputs for the following stage (assembly lines).

The management requirements for sequential interdependence are more demanding than those for pooled interdependence. Coordination among the linked plants or departments is required. Since the interdependence implies a one-way flow of materials, extensive planning and scheduling are generally needed. Department B needs to know what to expect from Department A so both can perform effectively. Some day-to-day communication among plants or departments is also needed to handle unexpected problems and exceptions that arise.

Reciprocal interdependence. The highest level of interdependence is **reciprocal interdependence**. This exists when the output of operation A is the input to operation B, and the output of operation B is the input back again to operation A. The outputs of departments influence those departments in reciprocal fashion.

Reciprocal interdependence tends to occur in organizations with what Thompson

called intensive technologies, which provide a variety of products or services in combination to a client. A firm developing new products provides an example of reciprocal interdependence. Intense coordination is needed between design, engineering, manufacturing, and marketing to

combine all their resources to suit the customer's product need. Hospitals are also an excellent example because they provide coordinated services to patients, as illustrated by the following story.

Reciprocal interdependence requires that departments work together intimately and be tightly coordinated. A recent study of top management teams confirms that effective performance of teams characterized by high interdependence depends on good communication and close coordination.

With reciprocal interdependence, the structure must allow for frequent horizontal communication and adjustment, perhaps using cross-functional teams or a horizontal structure. Extensive planning is required, but plans will not anticipate or solve all problems. Daily interaction and mutual adjustment among departments are required. Managers from several departments are jointly involved in face-to-face coordination, teamwork, and decision making. Reciprocal interdependence is the most complex interdependence for organizations to handle and the most challenging for managers in designing the organization.

Structural Priority

Reciprocal interdependence should receive first priority in organization structure because decision making, communication, and coordination problems are the greatest. If reciprocally interdependent units are not located close together, the organization should design mechanisms for coordination, such as daily meetings between departments or an intranet to facilitate communication.

Structural Implications

Most organizations experience various levels of interdependence, and structure can be designed to fit these needs. In a manufacturing firm, new product development entails reciprocal interdependence among the design,

engineering, purchasing, manufacturing, and sales departments. Once a product is designed, its actual manufacture is sequential interdependence, with a flow of goods from one department to another. The actual ordering and delivery of products is pooled interdependence, with warehouses working independently.

Impact of Technology on Job Design

Job Design

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. Managers should understand how the introduction of a new technology may affect employees' jobs.

The impact of technology on job design includes that jobs requiring higher level skills.

Job simplification reduces the variety and difficulty of tasks performed by a single individual. The consequence is boring, repetitive jobs that generally provide little satisfaction.

Job rotation involves moving employees from job to job for variety**.**

Job enrichment means that the job provides greater responsibility, recognition, and opportunity for growth and development.

The impact of advanced technologies on job design has been job enrichment

Job enlargement is an expansion of the number of different tasks performed by an employee, made possible by technology that demands fewer workers on a given task. Fewer workers are needed with the new technology, and each employee has to be able to perform a greater number and variety of tasks.

With advanced technology, workers have to keep learning new skills because technology changes so rapidly.
Advanced technology does not always have a positive effect on employees, but research findings in general are encouraging, suggesting that jobs for workers are enriched rather than simplified, engaging their higher mental capacities, offering opportunities for learning and growth, and providing greater job satisfaction.