

TECHNOLOGY AND THE DESIGN OF WORK PROCESSES

Introduction

Technological change is one of the most important sources of change in the economy. The capacity for science and technology in some countries is not been adequately translated into innovative and dynamic business organization or enterprise, especially Cambodia. The economy remains largely dependent on natural resources, primary processing and manufacturing and, for the most part, on imported technologies. A sound scientific and technological base, from which wealth-creating technological innovations and applications can develop, is essential to economic growth in a competitive international environment. This knowledge base should address the full spectrum of economic accumulation, from mobilizing resources, to effective production to knowledge-based marketing, sales, services and distribution of manufactured products. This is particularly important in the knowledge era, as boundaries disappear between knowledge and its various applications.

With the increasing impact of globalization on business, the scope for competition is no longer limited by national boundaries or by the definition of a particular industrial sector. This implies, among other things, that it has become imperative to develop and maintain knowledge and skills as assets that can lead to the development and successful commercialization of a wide variety of products and services that meet the demands of international markets

Competitiveness at the level of the enterprise is of utmost importance. *In the industrial economy, access to cheap raw materials, access to cheap unskilled labor, access to proprietary production technology and privileged access to markets were driving competitiveness.* New drivers that are related to customer value have emerged in the knowledge era. These include the ownership of designs and brands, the excellence of marketing skills and a focus on consumer demands. Smart production processes are vital. Management of technology, innovation and information have also emerged as key requirements for success in the 21st century enterprise.

Economic growth and international competitiveness are increasingly dependent on the generation and transfer of knowledge and technology. Research underpins economic growth and competitiveness by advancing knowledge and skills that sustain innovation and help solve problems for industry and business.

I. Objective

In this chapter, it focus on how operations and information technologies are influencing management and work processes, the effect of technology on worker obsolescence, and how managers can design jobs and work schedules to maximize employee performance. The following objectives of this topic will describe briefly about the impact of technology on business operation and changing the human workers.

1. Explain how technology can improve productivity.
2. Describe the advantages of Computer Aided Design.
3. Identify why management might consider introducing flexible manufacturing systems
4. Explain how Information Technology is providing managers with decision support.
5. Design individual jobs to maximize employee performance.

6. Explain how flextime, job sharing and telecommunicating increase organizational flexibility.

II. Technology and Productivity

Technology is the technical means people use to improve their surroundings. It is also a knowledge of using tools and machines to do tasks efficiently. (<http://www.bergen.org/technology/Techdefinition.html>)

We use technology to control the world in which we live. Technology is people using knowledge, tools, and systems to make their lives easier and better.

People use technology to improve their ability to do work. Through technology, people communicate better. Technology allows them to make more and better products and service. Our buildings are better through the use of technology. We travel in more comfort and speed as a result of technology. Yes, technology is everywhere and can make life better.

The common theme among new technologies in the workplace is that they substitute machinery for human labor in transforming inputs into outputs. This substitution of capital for labor has been going on essentially nonstop since the industrial revolution began in the mid-1800s. For instance, the introduction of electricity allowed textile factories to introduce mechanical looms that could produce cloth far faster and more cheaply than was previously possible when the looms were power by individuals. But it has been the computerization of equipment and machinery in the past 30 years that has reshaped the current workplace. Automated teller machines, for example, have replaced ten of thousands of human tellers in banks. Ninety-eight percent of the spot welds on new Ford Taurus are performed by robots, not by people. Today many small and large companies use multimedia and interactive technology for employee training.

Productivity can be applied at three levels-the individual, the group, and the total organization. Word processing software, fax machines, and email have made secretaries more productive by allowing them to generate more output during their workdays.

In conclusion, Technology is the means by which inputs are turned into outputs, it is the primary focus on any management's effort to improve productivity.

III. Operations Technology

High tech manufacturing is going global. Satyan Pitroda, for instance, believes that developing countries such as India and Mexico can leapfrog into upper ranks of high tech manufacturing. By using technology developed else where, these countries can bypass stage of development. For example, by using chips invented by Motorola, Intel and Texas Instruments, India can create telephone switch and export to other countries.

In this section, we look at key issues related to operations technology-design, production, customer service, distribution and reengineering work process.

A. Design

Technology is redefining how the design of products is done. For example, computer aided design is generating substantial improvements in design productivity. And sophisticated computer networks are allowing designers to collaborate as never before.

Computer Aided Design (CAD) enables engineers to develop new designs in as little as a third of the time required for manual drafting. The best CAD software lets engineers plan products, test them on screen, and even design tools to make them. For instance, Engle Engine Manufacturing used its CAD system to design a new race car engine in 9 months instead of the transitional 2 years. Boeing used CAD to design its 777 jets. Engineers were able to design and preassemble the entire plane and its more than 3 million parts on-screen. Ford Motor co. has developed an international network that allows its designers around the world to work together as if they were in the same room.

B. Production - New technologies

Technological advances over the past 20 years have completely reinvented the way products are manufactured. They were robotics, just in time system, cycle time reduction effort.

Computer-aided manufacturing (CAM)-The use of computers in automating the fabrication, assembly, and control aspects of manufacturing. CAM applies to the manufacture of products ranging from small-scale production to the use of robotics in full-scale assembly lines. CAM relates more to the use of specialized programs and equipment than it does to the use of microcomputers in a manufacturing environment.

With a new technology human can produce many type of products with low cost and quality.

1. **Robotics** - computer controlled machines that manipulate materials and perform complex functions. Robots can work 3 hours that the previous worker spend 24 hours. The leaders in this move to industrial robotics have been the Japanese.
2. **Just-In-Time Inventory (Production !!) Systems** - parts arrive as needed in the production process instead of being warehoused; reduced work-in-process inventory as well. Large companies such as Boeing, Toyota, and General Electric have literally billion of dollars wrapped up in inventories. It's not unusual for even small firms to have a million dollar s or more tied up inventories. So anything management can do to reduce the size of its inventory will improve its organization's productivity.
 - a. Advantages: reduced inventory and set-up times, better work-flow, shorter manufacturing time, less space consumption, higher quality.
 - b. Reliable suppliers are essential -- no slack in the system to absorb defective materials or delays in shipments
3. **Flexible manufacturing system** – A single machine can makes hundreds of different parts in any order that management chooses.
 - a. The unique characteristic of flexible manufacturing system is that by integrate computer-aided design, engineering, and

manufacturing to produce low-volume products at a cost comparable to mass-produced products.

- b. Repeals the laws of economies of scale- It is mean that management no longer has to mass produce thousands of identical products to achieve low per unit production cost. With flexible manufacturing system, when management want to produce a new part, it doesn't change machine-it just change the computer program.

C. Customer Service - technology used to provide better customer service by tracking customers, monitoring levels of customers service, and assisting customers to specify, acquire, fix, or return products. There are three mains benefit that technology affect the customer service operation:

1. Technology can *personalize* service that was previously standardized. For instance, if you are a previous customer of Domino's Pizza, when you call to give an order, their computer system already has data about your personal preferences. So they will offer you with a satisfied one.
2. Technology can *augment* service by providing additional assistance. Some companies provide their customers with a modern communication technology. For example if you buy tour from Japan Tour you will get GPS system that can identify where are you now? They can broadcast and call you via that system.
3. Technology can *transform* business by allowing organizations to reinvent fundamental business practices (Example: ATM machines).

D. Distribution

Traditional distribution technology relies heavily on sales agents, brokers, wholesalers, and retailers. It wasn't unusual for a product to go through two or three intermediaries before getting into the consumer's hands. New technologies are increasingly cutting out those intermediaries. Today, some organizations use new distribution technology or we called **Electronic Commercial**. The most distribution technologies are home shopping through television and electronic shopping via Internet. Each of the technologies allows manufacturers to reach customers directly. Thus, without crossing some intermediaries the price of product is lower then previous. For example, Dell Computer is selling more than \$1.5 million worth of computer everyday through its Web Site. You can see why many people go to amazon.com. And why the price of amazon.com is so expensive.

E. Re-engineering Work Processes

The term reengineering comes from the historical process of taking apart an electronic and designing a better version. So in an organization, reengineering means that management should start with a clean sheet of paper, rethinking and redesigning the processes used to create value or complete work, eliminates redundant operations.

Key Element Three key elements of reengineering are:

1. Identifying distinctive competencies - uncovers the core processes that determine a firm's competitive weapons

2. Assessing core competencies -- uncovers activities whose only justification is "because we've always done it that way."
3. Reorganizing horizontally by processes - using cross-functional or self-managed teams, focusing on processes instead of functions, and cutting levels of middle management

IV. Information Technology

With a computer technology or Information Technology there are many change in the world. IT can improve our life from the entertainment process to the task process. In this section, will highlight how technology is reshaping office work flows, changing the way internal communications are handled, and providing high tech support for organization decision making.

A. Office Work Flow

In the typical office, information spends most of its life moving from desk to desk. For instance, consider the creation of marketing plan. The marketing director approves the creation of the plan. A product manager oversees the development of plan. Staff researchers gather the important data. A senior researcher then writes a first draft and sends it to the product manager for interview. This process can take weeks or even months because the document can sit on someone's desk for days. Gathering and transferring paper documents takes up almost 90% of the time needed to finish.

- **Workflow automation** can solve much of this delay. It greatly improves the process of creating and transferring the documents by automating the flow of information. Workflow automation begins by:
 - analyzes how information flows through a company
 - eliminates bottlenecks
 - reroutes information
 - installs workflow software to convey information instantly to the right desk.

B. Internal Communications and Information Technology

Information technology is reshaping communications within organizations by, for example, significantly improving management's ability to:

- monitor employees by using IT to scan or identify their performance.
- empower for employees to bypass hierarchical levels
- Digitization and wireless communication allow workers to be accessible at all times.

C. Decision-Making Support

Information technology is providing managers with a wealth of decision support systems. These include expert systems, neural networks, groupware, and specific problem solving software.

- **Expert systems** - software programmed with the experience of human experts to analyze and solve unstructured problems.
- **Neural networks** - software that imitates the structure of the brain to discern patterns and trends that are too subtle for human beings
- **Groupware** - software that facilitates group interaction and decision-making. Video Conference and Online meeting is the example of Groupware.
- **Problem solving software** - helps managers do their jobs more effectively.

D. Technology and Worker Obsolescence

With a rapid growth of technology it will affect to the workforce with the following points:

1. New technologies are **changing** the knowledge, skills, and abilities that employees need to succeed.
2. **Repetitive tasks** will be **computerized** and many jobs will be upgraded.
3. **Re-engineered** jobs will require self-motivated, computer-literate employees with excellent communications skills
4. **Managers** will have to adept at coaching, negotiating, and building teams.
5. **Software will change** the jobs of professionals, such accountants, attorneys, and professors.

V. Work Design

Chiat/Day's office virtual, staffed by mobile employees, is just one way that business firms can redesign work to meet changing demands. Job design is the specification of the contents, method and relationships of jobs to satisfy technological and organizational requirements as well as the personal needs of job holders.

In this section, will identify the primary dimensions of jobs, describe how these dimensions can be mixed and matched to maximize employee performance, and review innovative work scheduling options that managers might consider to further improve employee performance.

Work design focuses on the way in which organizations assign tasks and responsibilities to their members. It also has a critical impact on the motivation, productivity, and satisfaction of organization members.

A. Defining Key Dimensions in a Job

What differentiates one job from another? Intuitively we know that a traveling salesperson's job is different from that of an emergency room nurse. According to the researchers who develop the JCM (Job Characteristics Model), any job can be described in terms of five core job dimensions, or characteristics, defined as follows:

1. **Skill variety** - Number of different skills and abilities in job
2. **Task identity** - identifiable pieces of work in a job
3. **Task significance** - importance of job to society
4. **Autonomy** - freedom, discretion, and independence in a job
5. **Feedback** - clear performance information about job
 - a. Core dimensions are useable for a wide variety of jobs
 - b. Jobs that score high on key dimensions have employees that are more satisfied, motivated, and productive than those that score low.
 - c. Influence through psychology not performance issues.

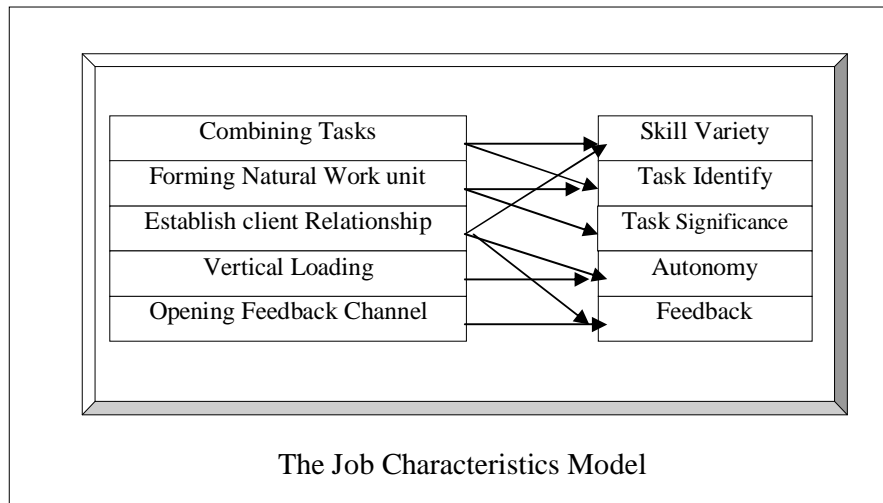
B. Job Dimensions: Perception or Reality?

1. People respond to their jobs according to their perception of them rather than to the objective characteristics of the job.
2. Social cues provide perceptions
3. Managers should pay attention to job perceptions since they are important to motivation

C. Designing Individual Jobs to Maximize Employee Performance

As a manager, how can you design jobs so as to maximize your employees' performance?

- Combine tasks
- Create natural work units - tasks that form a meaningful whole for which employees have "ownership."
- Establish client relationships - direct contact with customers
- Expand jobs vertically - empowerment
- Open feedback channels - systematic feedback about job performance



D. Group-Based Work Design - best performance when:

- the task requires workers to use relatively high-level skills
- the task is a whole piece of work, with an identifiable outcome
- the team's outcomes have significant consequences for others
- membership is moderately diverse in terms of talents and perspectives

E. Work Schedule Options

Most people work an 8 hour a day, 5 or 6 days a week. They are full-time employees who report to a fixed organizational location and start leave at a fixed time. But consistent with managers' attempting to increase their organizations' flexibility, a number of new scheduling options are being introduced.

1. **Flextime** – is a schedule option that allows employees, within specific parameters, to decide when go to work or leave. Flextime has become an extremely popular schedule option. For instance, a recent study of firms with more than 1000 employees found that 53 percent offered employee the option of flextime.
2. **Job sharing** - a special type of part-time job; allows two or more individuals to split a traditional 40-hour-a week job.
3. **Telecommunication**, allow staff working in their pace. Today, between 9 million and 14 million people work at home in the United States doing things such as taking orders over the phone, filling out reports and other forms, and processing or analyzing information.

Reference:

- 1-Managing Today, Stephen P. Robbins, International Edition
- 2-Management of Technology, Tarek M. Khalil, 2000`

Questions

Discuss the effect of the fast pace of technological change on present human resource.

Answer the following question:

- a) Explain how just in time systems improve productivity.*
- b) Describe how technology can improve an organization's customer service.*
- c) How might the Internet change organizations, management practice and business environment?*
- d) Why some people said increasing the technologies will cut down human job? Explain.*