Social Implications of IT

Implications of IT in general

Any technology, and hence IT also, is the creation of man and it is meant for mankind. So there are implications to individual and the society as well. Those implications have both positive and negative impacts to both the technologists and general people also. The study of impact can be started with a look at the "Four Quadrants Impacts."

Four Quadrants Impacts

The total influences of IT are categorized into four areas indicated by four quadrants as shown in the figure.

The four areas where IT has direct impacts are: -

1. Individual
2. Social
3. Legal
4. Ethical

While studying the social impacts, we also could study the impact on individuals because society is made up of individuals.

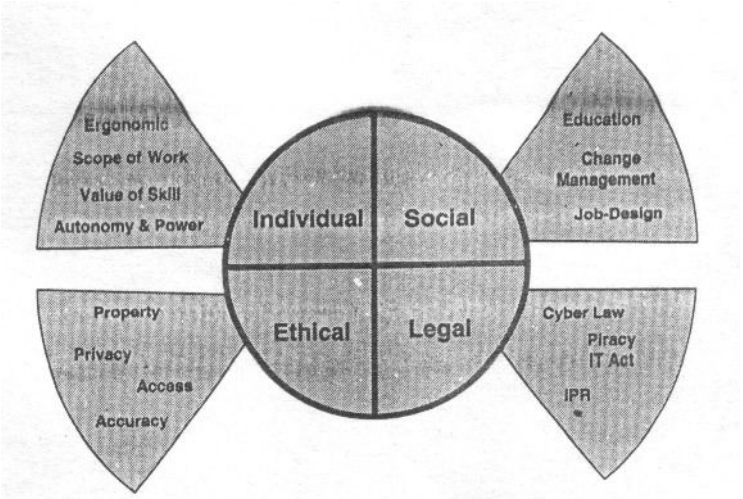
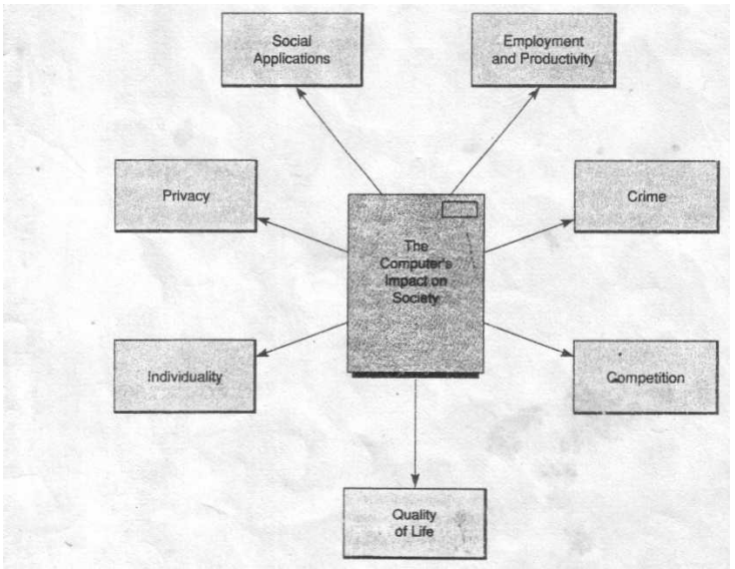


Fig. 13.1: Different aspects of Information Technology shown through four quadrants.

Social Implications

The implications of IT in the society can be studied under different headings like: -

- Social Applications
- Employment and Productivity
- Competition
- Quality of Life
- Privacy



Social Applications

Computers can have many direct beneficial effects on society when they are used to solve human and social problems through social applications such as medical diagnosis, computer assisted instructions, governmental program planning, environmental quality control and law enforcement. Computers can be used to help diagnose an illness, prescribe necessary treatment, and monitor the progress of hospital patients. Computer-assisted instruction (CAI) allows a computer to serve as "tutor" since it uses conversational computing to tailor instruction to the needs

of a particular student. This is a tremendous benefit to students, especially those with learning disabilities.

Computes can be used for crime control through various law enforcement applications that allow police to identify and respond quickly to evidences of criminal activity. Computers have been used to monitor the level of pollution in the air and in bodies of water, to detect the sources of pollution, and to issue early warnings when dangerous levels are reached, Computers are also used for the program planning of many government agencies in such areas as urban planning, population density and land use studies, highway planning and urban transit studies. Computers are being used in job placement systems to help match unemployed persons with available jobs. These and other applications illustrate that computer-based information systems can be used to help solve the problems of society.

Impact on Employment and Productivity

The impact of computers on employment and productivity is directly related to the use of computers to achieve automation. There can be no doubt that the use of computers has created new jobs and increased productivity, while also causing a significant reduction in some types of job opportunities. Computers used for office information processing or for the numerical control of machine tools are accomplishing tasks formerly performed by many clerks and machinists. Also, jobs created by computers within a computer-using organization require different types of skills and education than do the jobs eliminated by computers. Therefore, individuals within an organization may become unemployed unless they can be retrained for new positions or new responsibilities.

However, there can be no doubt that the computer industry has created a host of new opportunities for the manufacture, sale, and maintenance of computer hardware and software, and for other information system services. Many new jobs, such as systems analysts, computer programmers, and computer operators, have been created in computer-using organizations. New jobs have also been created in service industries that provide services to the computer industry and to computer using firms. Additional jobs have been created because computers make possible the production of complex industrial and technical goods and services that would otherwise be impossible to produce. Thus, jobs have been created by activities that are heavily dependent on computers, in such areas as space exploration, microelectronic technology, and scientific.

Impact on Competition

The impact of computers on competition concerns the effect computer systems have on the size and market control of business organizations. Computers allow large firms to become more efficient or gain strategic competitive advantages. This can have several anti-competitive effects. Small business firms that could exist because of the inefficiencies of large firms are now driven out of business or absorbed by the larger firms. The efficiency and technological superiority of the larger firms allows them to continue to grow and combine with other business firms and thus create large corporations or strategic business alliances.

It is undoubtedly true that computers allow large organizations to grow larger and become more efficient. Organizations grow in terms of people, market share, business alliances, productive facilities, and such geographic locations as branch offices and plants. Only computer-based information systems are capable of controlling the complex activities and relationships that occur. However, it should be noted that the cost and size of computer systems continue to decrease; due to the development of microcomputers and minicomputers, and that the availability of computer and telecommunications services continue to increase, due to the offerings of computer service bureaus, time-sharing companies, telecommunications carriers, and cooperative industry ventures. Therefore even small firms can take advantage of the productivity, efficiency, and strategic advantages generated by computer-based systems.

Impact on the Quality of Life

Since computerized business systems increase productivity, they allow the production of better-quality goods and services at lower costs, with less effort and time. Thus, the computer is partially responsible for the high standard pf living and increased leisure time many people enjoy. In addition, the computer has eliminated monotonous or obnoxious tasks in the office and the factory that formerly had to be performed by people. In many instances, this allows people to concentrate on more challenging and interesting assignments, upgrades the skill level of the work to be performed, and creates challenging jobs requiring highly developed skills in the computer industry and within computer-using organizations. Thus, computers can be said to upgrade the quality of life because they can upgrade the quality of working conditions and the content of work activities.

Of course, it must be remembered that some jobs created by the computer - data entry, for example - are quite repetitive and routine and can create an "electronic sweatshop" work environment, especially if computers are used to monitor worker productivity. Also, to the extent that computers are utilized in some types of automation, they must take some responsibility for the criticism of assembly-line operations that require the continual repetition of elementary tasks, thus forcing a worker to work like a "machine" instead of like a skilled craftsperson. Such effects do have a detrimental effect on the quality of life, but they are more than offset by the less burdensome and more creative jobs created by computers.

Impact on Privacy

Modem computer systems make it technically and economically feasible to collect, score, integrate, interchange, and retrieve data and information quickly and easily. This characteristic has an important beneficial effect on the efficiency and effectiveness of computer-based information systems. However, the power of the computer to store and retrieve information can have a negative effect on the right to privacy of every individual. Confidential information on individuals contained in centralized computer databases by credit bureaus, government agencies, and private business firms could be misused and result in the invasion of privacy and other injustices. The unauthorized use of such information would seriously invade the privacy of individuals. Errors in such data files could seriously hurt the credit standing or reputation of an individual.

Such developments were possible before the advent of computers. However, the speed and power of large computers with centralized direct access databases and remote terminals greatly increases the potential for such injustices. The trend toward nationwide information systems with integrated databases by business firms and government agencies substantially increases the potential for the misuse of computer-stored information.

Individual Implications

People are related indirectly to the Information Technology, but any business is directly related. We can perform a Work Centered Analysis of any Business Process (BP) to reveal four links connected to this and they are: -

1. Technology
2. Information
3. Participants and
4. Product / Services

In this diagram, customers as individual are linked to the BP through Product/Services.

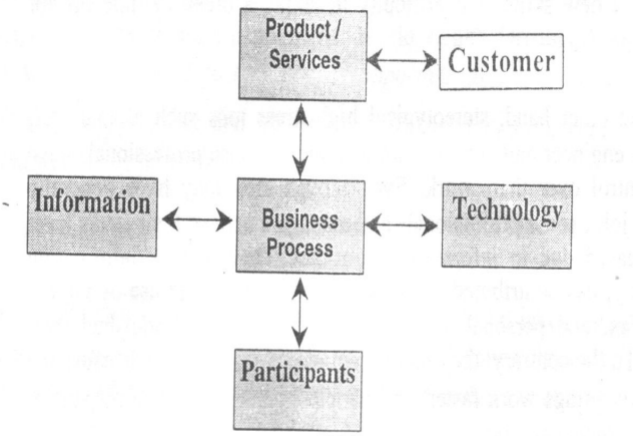


Fig. 13.2: Four links of the Business process according to WCA

The double headed arrows here indicate that the impacts of BP in all dimensions are both good and bad.

The amount of impact on individuals depends upon type of jobs - the healthy or unhealthy jobs. In healthy jobs, people use their skills in meaningful work by enjoying certain level of autonomy and entertaining social relationships with others. Oppositely in unhealthy jobs, people feel continuous pressure to perform from somebody above.

Impact on individual can be studied in the following headings: -

- Ergonomics and Work Environments
- Solution of RMI
- Autonomy and Power
- Skill and Knowledge
- Involvement and Commitment
- Variety and Scope of Work

Ergonomics and Work Environments

Ergonomics is the scientific study of individuals and their physical relationship with the work environment or in other word, it is the study of the mental and physical capacities of persons with respect to the various kinds of work. The word "ergonomics" comes from the Greek word, "ergos" means work and "nomos" means laws. Impacts of health, related to the physical relationship between people and their work environment are studied in this field. Thus, the science of ergonomics can be defined as the study of the laws of nature and their effects on the work environment. With respect to the office environment, this includes how the body interacts with workspace, computers, tools, and furniture.

Occupational disease/injuries were first studied by Bernardino Ramnazzini during 17th century. He is known as the father of occupational medicine. He identified that certain diseases were due to irregular motions and unnatural postures, which over time led to discomfort, pain or impaired function. This is known as *Repetitive Motion Injuries* (RMI). RMI are also known as Repetitive Strain Injuries (RSI), Cumulative Trauma Disorder (CTD) and Carpal Tunnel Syndrome (CTS), which are the most common musculoskeletal injuries currently reported in the computer related health magazine. Let us know about the origin of this disease.

Human body is made for free movement. Holding the body or a part of it in a particular position causes static muscle contractions. Muscles cannot maintain static contractions for more than a few seconds without experiencing some fatigue. Muscles engaged in static work require more than 12 times longer to recover from fatigue than muscles engaged in dynamic work. Prolonged and excessive static work causes the weakness in joints, ligaments, and tendons. This makes the workers more prone to pain and injuries. On the other hand, dynamic work allows muscles to contract and relax during the work cycle, therefore making muscles more resistant to fatigue and injury. The symptoms of RMIs are as follows:

i) Pain or stiffness in the fingers, hands wrists, forearms, elbows, or shoulders

ii) Pain or stiffness in the back or neck

iii) Tingling or numbness in the hands or fingers

iv) Loss of strength or co-ordination in the hands

v) Pain in the hands or arm that wakes you up at night

vi) Feeling a need to massage the hands, wrists, and forearms

As RIM develop slowly over a period of time, the symptoms of these illnesses can be initially very mild, but it becomes very painful and even leaves the pulses crippled if left untreated. Secondly, it will grow very fast, if the worker does not change the present work habits. The goal of ergonomics is to study work activities and the associated equipment. Secondly, it has to design jobs, tools, equipment, facilities and the environment to prevent injuries and ensure comfort and improve effectiveness.

There are various situations, where the health of intensive users is affected by the IT-enabled systems. Recently the RMI has increased due to the extensive use of the computers. These Individuals often suffer higher stress levels and related physical problems than other workers in the same businesses. This stress has been attributed to a combination of lack of control, feelings of being monitored by the boss.

Work performed at the computer terminal requires that the person hold his body still and in static postures, for considerable periods of time. This involves frequent, repetitive movements of the eyes, head, arms, and fingers. Secondly, retaining a fixed posture over long periods of time requires a significant static holding force, which causes fatigue. It is therefore required to give more emphasis on the proper and safe use of computer equipment to prevent injury. There should be studies and experiments for the safe use of the computer, including body posture, typing and mousing methods, and adjustment of the Video Display Unit (VDU) with the vision. Apart from the musculoskeletal problems, computer users sometimes experience temporary symptoms such as eyestrain, burning eyes, blurred vision, focusing difficulties, and headaches. The major causes of strain are:

i) Poor body alignment with the VDU;

ii) Prolonged sitting in particular positions;

iii) Repetitive movements;

iv) Inadequate vision capability.

A study has been done among an office assistant, who worked on Video Display Unit (VDU), and another assistant who did not work on VDU, and a professional who worked on VDU. It has been revealed that office assistant working on VDUs had the highest stress. He had to follow rigid work procedures and had little control over what he did. He felt that he was being controlled by a machine. On the other hand, the professionals, who used VDU experienced the least stress and found satisfaction in his work and had flexibility in meeting deadline. A number of studied have concluded that there are negative effects of electromagnetic emissions from VDU, which can cause various physiological and psychological problems. World Health Organization reported that *psychosocial factors are as important as the physical ergonomics of workstations and the work environment in influencing health and well being of workers.*

Solutions of RMI

In order to minimize the RMI a number of steps should be taken into considerations. Let us discuss one by one. Proper workstation design is very important in eliminating these types of problems. Some variables of workstation design include the computer table, chair and document holders. The workstation should provide the user with a comfortable sitting position that is sufficiently flexible to reach, to use, and to observe the display screen, keyboard, and related documents. Some general considerations to minimize fatigue include posture support such as back, arms, legs, and feet and adjustable display screens and keyboards. Keyboards have also a lot of design issues that have made them a subject for studies. A variety of keyboard designs are now available to assist in avoiding awkward postures related to keying the characters. Secondly, it is important to consider the typing technique and the location of the keyboard for use. Computer tables or desks should be vertically adjustable to allow for operator adjustment of the screen and keyboard. Furniture, office, and computer accessories can help keep natural postures and reduce static and forceful exertions related to RMIs. Proper chair height and support to the lower region of the back are critical factors in

reducing fatigue and related musculoskeletal complaints. Document holders also allow the operator to position and view material without straining the eyes, neck, shoulders, and back muscles.

There are many developments, which can avoid the repetitive use of the keyboard and mouse, by which the user can use their hands for a limited time. This is achieved by speech recognition system. It is tool to assist in getting the job done through dictation. This has been possible by a complex technology, which requires serious dedication and training between the software and the user.

The problems due to regular use of video display unit can be minimized over time by adjusting the VDU, with respect to the body position. Secondly, the user should take a short break after each half-an-hour or so to shift position or stretch the body or walk a while. Next, problem can be minimized by mixing up a second type of physical work, which involves the dynamic work. And lastly, the user should check eyes annually or may have to wear special glasses.

There are software in-built in your computer, which will tell you, to take rest as and when necessary by you, depending on the percentage of mistake you commit on your job. There is also development in the accessories, which has changed the mode of operations from the wrist based operations to foot based operations and the likes.

Autonomy and Power

Autonomy in a job means the degree of discretion of individuals or group in the process of planning, regulation, and control of their own work. *Power* is the ability to get other people to do things. Information technology may increase or decrease autonomy and power in the work systems. It is said to be more autonomous in work system, when the individual can control the use of the tools and techniques to get the output independently. For example, a *Data Analysis System* might give more autonomy to a manager in the analysis work, which required previously, the assistance of a data analyst. Usually, professionals such as engineers and lawyers use IT-enabled systems to do work for them. It gives them more autonomy and flexibility over their work.

On the other hand, sometimes information technology is used to reduce autonomy, as and when it is required. Transaction processing and record keeping systems are examples of such systems, which require limited autonomy. These are designed to use the same rules for processing the same data in the same format by everyone involved in this repetitive process, such as order taking or producing pay checks, etc. If Individuals will be allowed for autonomy, there will be a total collapse of the system. IT-enabled system, which monitor workers closely and decrease autonomy often give rise to threats to the workers. Secondly, systems that increase employee monitoring may lead to resistance and may result in jettisoning of personnel.

Just as an IT-enabled system affects the autonomy, it can also affect power by redistributing information, changing responsibilities, and shifting the balance of power in an organization. It has increased the power of people in the entire organization, who operate on facts, information and technical competence and at the same time has reduced availability of information across the entire organization has made it possible to resolve conflicts based on facts rather than on opinions and power.

An IT-enabled system has another impact in reducing the power of middle managers in the organization. Higher-level executives are now getting information directly, by using MIS or EIS and modern communication system, such as e-mail and v-mail. In addition to this, they can go directly to the individuals who know about a particular. Therefore, middle level managers feel IT-enabled systems pose a threat to their job.

Issue of Skill and Knowledge

Information technology has positive or negative effects on people's skills. Consider the example of the use of a pocket calculator to do arithmetic. One can get the right answer quickly, but the ability to do arithmetic manually deteriorates through repetitive use of calculator. Here, the calculator has the

positive impact of calculating more quickly and the negative impact of deteriorating ones skill of manual calculation.

New IT-enabled system has enhanced the skills in a wide range of jobs like MIS and EIS. It helps the manager to learn how to manage an organization, based on analysis of facts and information rather than just on intuition. Decision Support Systems (DSS) and execution systems such as CAD have helped professionals analyze data, define alternatives, and solve problems in new ways. Automating the job components also tends to reduce peoples' skill by encouraging mental dis-engagement.

IT-enabled system also has a negative effect in some cases, as in automated judgment and discretion system. In such systems, an individual's autonomy and power has been replaced with computer-programmed Experts systems for consistency and control. As a result, a less skilled person could do the same task, and the expert in that area has been devalued. Reducing the value of skills is called de-skilling. Therefore while automating the work systems, one must be vary careful in designing. The tasks, which require repetition, perseverance, and speed of operation, should be automated, rather than the tasks, which require flexibility, creativity, and judgment.

IT-enabled systems operate successfully only if participants have the necessary skills and knowledge. It requires new skills to be learnt by the professionals, and the technical staffs. The skill may involve new analytical methods or new ways to obtain information for professionals and may only be literacy for non-professional workers. The system sometimes also requires knowledge about how to use computers for specific tasks and how to interpret information in that particular system.

Involvement and Commitment

People have a tendency to do work in the same fashion they were doing earlier. Therefore, they oppose the change in the work systems. It is known as 'Social Inertia". It is required to overcome this social inertia. The main factor to counter balance the social inertia is involvement and commitment by participants and their managers. The involvement and commitment may be of different degrees, like non-involvement, low level and high-level involvement.

The situation of non-involvement will arise if the users are unable to participate or they are not invited to participate or the system is imposed on them. In this situation, involvement through advice and sign-off helps to initiate input about the priorities and features of the system and therefore reduces political problems. Secondly, if the participants are invited and properly explained and trained about the system, the system will run nicely and it can be converted to a high-level involvement.

Low level of involvement and commitment makes IT based system prone to failures, although implemented properly. It always leads to overlooking the system shortcomings and organizational issues, which otherwise lead to active participation. The highest level of involvement requires continuous involvement by the participants in the project team. Sometimes a representative of the team may also manage the system. This may lead to chaos after his retirement or departure. Higher level of involvement can solve different issues such as mutually inconsistent requests from different users and different needs that cannot all be supported due to resource constraints.

Variety and Scope of Work

Information technology can either increase or decrease the variety and scope of work. It reduces variety if they force the worker to focus on a small aspect of work. The range of different types of works people do at workplace is called *task variety*. Almost all workers want a variety in their work environments and feel it monotonous if the work becomes too routined and repetitive. *Scope of Work* is the size of the work/tasks relative to the overall purpose of the organization. If the specialization is very narrow, just like a single job in an assembly line, it is a work with minimal scope. Assembling the entire job or a few numbers of jobs is a task with greater scope.