CHAPTER - 1

INTRODUCTION
This is the age of technology and it is technology that is changing the entire landscape of businesses. It is commonplace to talk about technology; the term is all so pervasive that it is often taken for granted. Technology has become the key factor for businesses to differentiate from each other. With the entire spectrum of business charged with an intense and rapid kind of competition, organizations are finding it very difficult to sustain in this new competitive environment. They are on the constant lookout for using any new opportunities that the new technology provides them with, and to exploit it to its maximum potential. There is also a continuous strive to improve their existing processes. Organizations have realized that the most effective way to carve a niche for themselves is to adopt and develop any innovative methods to equip themselves with improved technology (Singh and Nandini, 1999).

The advent of the twentieth century saw the order of the world changing from agrarian to industrial. The onset of industrial era brought with it rapid changes in the employment structure of the workforce due to the then newfound role of technology in automation of the factories. Now, as the world has moved into the next century of the information era, again the buzzword remains the same-technology.

The evolution of technology is as old as human civilization. The first thing to note about technology is that there is no agreed meaning of this word.
Some regard it as the means by which man extends his power over his surroundings. The word ‘Technology’ comes from the Greek word ‘teckhnologia’, which means the systematic treatment of an art or craft. In a generic sense any invention used for productive purposes can be called technology. According to the Oxford English Dictionary “Technology is the scientific study of the practical or industrial arts”. But in the social realm it is viewed differently. According to Encyclopedia Britannica (1997), “Technology is the application of science to the practical aims of human life, or, as it is sometimes phrased, to the change and manipulation of the human environment” (cited in Ramesh and Sivaramakrishna, 1998).

A number of interpretations of the term ‘technology’ have become established. According to Cornwall (1997) ‘technology of a country at any point in time is the stock of knowledge that pertains primarily to the production of goods and services’. Rosenberg (1982) argues that technology is more than the mere application of prior scientific knowledge. It is application of techniques, methods and designs that work even if, at times, the reason why they work cannot always be explained. Technological knowledge may be accumulated by trial and error and often precedes scientific understanding. Dosi (1984) defines technology as a set of pieces of knowledge, both practical and theoretical, know-how, methods, procedures and physical devices that incorporate such knowledge.
Disembodied technology consists of particular expertise, based on past attempts and technological solutions. It is akin in many ways to, and, of course, includes computer software. Again, Jantsch (1967) in his report on Technological Forecasting to the Organization for Economic Cooperation and Development (OECD) defines technology in the broadest sense:

‘Technology denotes the broad area of purposive application of the contents of the physical, life and behavioural sciences. It comprises the entire notion of technics as well as the medical, agricultural, management and other fields with their total hardware and software contents.’

The entry barriers to countries are crumbling under the forces of globalization, deregulation, technological innovation and a liberalized economy. It’s a proven fact that new technology makes organizations complex and dynamic. Technology is a powerful means of achieving a faster rate of economic growth. It not only increases the utility of available resources but also permits improvements in productivity through better machines, improved methods and enhanced skills. But the critics of technology advocate that technology has become the master, and men, it’s slave (Khan and Qureshi, 1987). It must be remembered that there is no unique technology. Particular scientific principles and techniques are often shared. Indeed, the transfer of a technique from one technology to another often gives rise to technological progress.
Technology has intellectual content and its use presumes a certain level of education and training. It has utility and therefore value. The value depends on the context of application; technological change can alter it. Indeed, technology as determinant of growth has assumed a special significance in the present day world.

It has been suggested that new technologies, as distinct from scientific discoveries, emerge at certain stages of ‘long waves’ of economic development. Waves of innovative activity are associated with long-term cycles of economic upswing and recession, known as the Kondratiev waves after the Russian economist who first observed this relationship. The economic upturn within each cycle is linked to the development and diffusion of new technologies embodied in new products. Historically, such waves have lasted 40-60 years. The current cycle, known as the fifth Kondratiev long wave, is presumed to have begun in the early 1980s, mainly as a result of the further development of computers, data banks, networks, telecommunications and satellites, optical fibres, manufacturing automation, biotechnology and advanced materials (Lowe, 1995).

**Reasons for Introduction of New Technology**

There are numerous reasons for the adoption of new technology. The major one’s are (Preece, 1989):
1. Financial and economic objectives

➢ To increase profitability – New methods of production are introduced in order to maintain or increase profitability.

➢ To meet competition – In order to be successful in staving off competition, firms need to be able to design new product ranges, and to modify them rapidly in order to forestall competitors; or, where this is impossible, to meet the competition from new product ranges as soon as possible.

➢ To save on costs - New technology can contribute significant savings because the improved performance and flexibility which it offers can make it possible to replace several single purpose dedicated machines, provide tighter overall control, produce the maximum output with minimum waste, and also lead to savings in space.

➢ To save on labour costs – One of the perceived advantages of new technology is that it can lead to reduced labour costs. Labour saving include savings in direct labour costs (for example, eliminating the need for some types of labour, or making workers responsible for more machines); savings in skilled labour (for example, via the replacement of manual lathes with Computer Numerical Control machine tools);
savings in indirect labour (for example, through a reduced maintenance requirement because of the increased reliability of equipment and modular design); and savings in supervisory labour (for example, monitoring and communication systems being built into the technology).

➢ To help meet a labour shortage – A common motive for the adoption of new technology is the need to meet skill shortages. This is achieved by using new technology, which embodies skills within the software. An illustration would be the adoption of ‘conventional’ CNC (computer numerically controlled) machine tools, where there was a shortage of skilled operators who could program at the machine itself, and hence, scarcer programming skills are utilized more fully in the office, whilst semi-skilled labour is used to operate, but not program, the machine tools.

2. Technical and production objectives

➢ To achieve improvements in the processing, storage, transmission, and analysis of information – Introduction of new technology is also because of a number of advantages in processing, storage, transmission, and analysis of information such as better and more timely information about the state of a
process; faster response time in dealing with errors; communication of information in marketing, buying, and process control becomes more direct, accessible, and rapid.

➢ To increase flexibility – Flexibility in organizations can take various forms. The Institute for Manpower Studies has developed an influential model of labour flexibility. They refer to three main types of flexibility: functional, numerical, and financial. Functional flexibility involves employees gaining new skills and knowledge over time; numerical flexibility is concerned with changes in the number of people employed in the organization and the distribution of employees in terms of the number of hours worked—for example, the number and proportion of part-time as against full-time workers; financial flexibility relates to the way in which pay and remuneration packages reflect and support the two former types of flexibility.

➢ To improve control and consistency – Some of the advantages of new technology include better machine control and consistency, better and quicker information on the state of stages in the manufacturing process, greater speed and accuracy, allowing more on-line information to be available more quickly to more people, thus in turn facilitating faster response times.
➢ To achieve improvements in the product – This objective of new technology is to improve quality so as to achieve product consistency, price and quality required by the customers, and to improve product quality and consistency.

3. Social and organizational objectives

➢ Management control – The focus here is on control as exercised by managers over employees, and, in particular, whether, and to what extent, one of the objectives of the adoption of new technology is to increase that control.

**Technological Change**

A technology has a life cycle. The emergence of new technologies may render its predecessor obsolete. Technological change is said to occur where there is a change of, or an addition to, the underlying scientific principles that give a specific technology its particular character. Technical change is generally confined to changes within one or more of the other constituents of a technology, particularly to techniques and know-how.

Technological change can produce technical change; the inverse is less likely. Although the latter is a subset of the former, the cumulative effect of technical change within its technology can over time transform the application and value of a technology.
With the emergence of new technologies it is quite common for a new technology to impinge on existing technologies, such as the impact of microelectronics on the electromechanical control systems. The main features of technological and technical changes are novelty and application. Generally, these comprise discovery, invention and innovation. The term ‘invention’ has a meaning in law, but for our purpose it is also taken to include all ideas, the applications of which improve industrial operations and product attributes. The cumulative effects of such changes are, of course, important.

There are two categories of motivation for technological change. The first is from within a business; the second is a response to pressures from its environment. The chief characteristic of the first category is the perception of a business opportunity and the initiative from within. The opportunity is seen in terms of economic benefit in the form of increased, or maintained, revenues and profits. These are a function of added value, and/or the reduced cost of providing goods or services.

Technological change can also be seen as a response mechanism. A business survives and prospers, just like a biological organism, by responding to the nature and the changes of its environment. These can encourage, or even compel, a firm or an organization to introduce technological changes. The most important sources of pressure are legal,
economic and social. For instance, changes in legislation, such as health and safety, or environment, will encourage or demand technological change, e.g., vehicle emission control. As far as the firm is concerned, technological change is then a response to a new context in which it operates. Similarly, social needs have stimulated the development of advanced security systems and the development of new products, such as sophisticated electronic leisure equipment, is also fostered by a demand from higher-level income groups.

Technology giveth and technology taketh away. It is called ‘a Faustian bargain’. This means that for every advantage a new technology offers, there is always a corresponding disadvantage. The disadvantage may exceed in importance the advantage, or the advantage may well be worth the cost. The advantages and disadvantages of new technologies are never distributed evenly among the population. This means that every new technology benefits some and harms others. There are even some who are not affected at all (Postman, 1998).

Generally, with the introduction of new technology various issues are raised related to (Datta, undated):

a) control over the job,

b) changes in job content and responsibility,
c) substitution of machine for labour resulting into redundancy and / or redeployment,

d) job displacement,

e) retraining and re-skilling,

f) job classification and promotional effects,

g) sharing the gains and pay structure, and

h) stage at which the aforesaid issues get addressed in the management decision sequence.

No doubt, technological change has resulted in redundancy and displacement of workers both in private as well as in public sector enterprises. At the micro level, the direct and indirect consequences of introduction of new technology are more evident. The impact on productivity, quality, employment, redundancy skills, control and decision-making etc stand much clearer.

Spenner (1985) in his review of results in the United States and Europe concluded that:

There is no evidence that jobs, taken as a group, are experiencing dramatic upgrading and down-grading in terms of their skill requirements. This does not mean an absence of upgrading and downgrading changes but rather an approximate balancing in the direction and quantity of changes of an
approximate conservation of total skill. It is intriguing that there are more
hints of downgrading in studies of skill as autonomy-control and more hints
of upgrading in studies of skill as substantive complexity, suggesting the
possibility of divergent aggregate trends in the two dimensions of skill.

Spenner argues, "the impacts of technology on skill levels are not simple,
not necessarily direct, not constant across settings, and cannot be
considered in isolation". The same innovation in different firms can alter
skill requirements in different ways.

Re-absorption of these redundant workers is not an easy task especially in a
severely competitive business environment where the work of
restructuring-shedding business, retrenching employees, cutting costs, is
almost constant.

Although at present, new technologies have appeared piecement in most
manufacturing setting in India, many enterprises in response to the
demands of increasingly competitive pressures, are seeking to use new
technology, and endeavouring to restructure their work force to readjust
effectively (Datta, undated). An earlier study conducted in 1994 by Mundle
(cited in ILO-SAAT, 1996) estimated extent of potential redundancy in the
organized sector in India at 2.5 million - in public and private sector both.
Another study by Bhatt (cited in ILO-SAAT, 1996) estimate labour
redundancy in the organized sector to the tune of 4.403 million. The break-up is given below:

<table>
<thead>
<tr>
<th>SECTOR</th>
<th>REDUNDANT WORKFORCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central government</td>
<td>0.610 million</td>
</tr>
<tr>
<td>State government</td>
<td>1.273 million</td>
</tr>
<tr>
<td>Quasi-government organization</td>
<td>1.114 million</td>
</tr>
<tr>
<td>Local bodies</td>
<td>0.414 million</td>
</tr>
<tr>
<td>Public sector</td>
<td>3.411 million</td>
</tr>
<tr>
<td>Private sector</td>
<td>0.992 million</td>
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In another confirmation of the shrinking employment opportunities in the organized sector, new data shows that the available jobs in the organized sector dipped by 4.2 lakh in 2001-02. It makes the fifth consecutive year when organized sector jobs have declined. The reduction in jobs in 2001-02 is larger than the combined decline in the previous 3 years.

**Redundancy**

Structural adjustment programmes for moving the economy towards a more efficient and sustained growth path, often create an adverse impact on employment at least in the short run. Redundancies result from either gains in productivity, which facilitate the shedding of labour or from restructuring of enterprises to improve productivity. Therefore,
redundancies increase when economy is experiencing widespread technological change and also when it is experiencing widespread restructuring of enterprises. This suggests that redundancies occur due to adjustment of manpower with respect to changes in productivity (Harris, 1987). Here, it is worth considering the meaning of work and worker redundancy.

- **Work redundancy**: It implies the disappearance of a job.
- **Worker redundancy**: It implies the failure or inability of the employing firm to offer new employment to the worker whose job has become redundant (Hunter, Reid and Boddy, 1970).

In common parlance the concept of unemployment and redundancy are co-terminus. However, unemployment and redundancy are conceptually and analytically distinct phenomenon. Unlike unemployment, redundancy is a more recent term (Ashton, 1986 and Garraty, 1978). The problem of unemployment emerged during the Great Depression, while problem of redundancy emerged in post-war era of relative full employment, when there was general absence of joblessness (Kahn, 1964). Therefore, Unemployment is different from redundancy because they are rooted in two historically distinct economic periods (Jaffrys and Moss, 1954; Kahn, 1964). Redundancy is the shedding of labour as a consequence of either technological change, restructuring of the organizational structure of the
enterprise, redesigning of jobs and ending of product life cycle. Hence, redundancies are micro-level phenomenon, while unemployment results from macro-level experiences of general recession (Seth and Aggarwal, 2001).

Major undesirable side effects of new technology are related to its negative impact on employment and skills. Although scholars have been arguing that the production of new technology itself and its productivity and growth enhancing impact will generate many new jobs in the long-run, but, whether the redundant ones today – in terms of work and skills, will be able to even compete for ‘new jobs’ is doubtful. The fact is that new technology is capable of totally replacing the human element in performing work. The worker along with the stages of production process is removed. Workers are devalued, their power and skills are made redundant and are displaced from their jobs. The possibility and feasibility of these redundant workers to get absorbed back in the labour market with basic labour rights is minimal. For example, introduction of a single “airjet loom” in weaving displaces effectively around 100 weavers working on shuttle looms (Datta, 2001).

In his book entitled End Of Work (Penguin, 2000), author Jeremy Rifkin has very rightly written: While earlier industrial technology replaced the physical power of human labour, substituting machines for body and
brawn, the new computer based technology promise a replacement of the human mind itself, substituting thinking machines for human beings across the entire gamut of economic activity.

Technologies which have brought miraculous improvements in efficiency and productivity have also slashed the numbers employed in manufacturing and agriculture, while the service sector is quite unable to take up the slack. While a tiny elite of 'knowledge workers' - scientists, entrepreneurs and consultants - will still be in demand most jobs are disappearing fast, resulting in the creation of a morose 'underclass', caught between apathy and criminal violence.

While certain strategies can be adopted to keep the total size of redundancy low, redundancies cannot be avoided altogether. Organizations will continually need to adjust to technological and other factors and would require flexibility in the labour market in order to adjust continually to changing operational requirements.

**Legal Aspect of Redundancy (Layoff And Retrenchment)**

There are no Acts in India to deal with redundancy. However, The Industrial Disputes Act, 1947 is a principal legislation dealing with core labour issues like investigation and settlement of industrial disputes, regulation of strikes, lockouts, lay-offs, retrenchment, and other related
matters. The Act lays down the following rules regarding Lay-off and Retrenchment (Garg, 1999).

**Lay-Off**

An employee is said to have been laid-off on any day, if the employer fails, refuses or is unable to provide him employment on that day within two hours of his presenting himself for work at the normal appointed time, on account of shortage of coal, power or raw materials, or accumulation of stocks or break-down of machinery or natural calamity or for any other reason. The expression “any other reason” should be construed to mean reasons similar or analogous to the preceding reasons.

**Notice of lay-off**

The employer is required to give notice of lay-off of workers within 7 days of such lay-off. Notice of withdrawal of lay-off is also to be given within 7 days of such withdrawal.

In case of factories, mines and plantation establishments employing 100 or more workers, on an average per working day in the preceding 12 months, (excluding seasonal establishment), the employer cannot lay-off any workman without obtaining prior approval of the Government, except when such lay-off is due to shortage of power or natural calamity, and in case of mines due to fire, flood, excess of inflammable gas or explosion. Permission can be obtained by submitting an application within 60 days
before the commencement of lay-off stating the reasons for the intended lay-off. A copy of the application should be served simultaneously on the workmen also. In case of mines, where workers have been laid-off due to fire, flood, excess of inflammable gas or explosion, the employer shall make an application within 30 days from the date of commencement of lay-off, for permission to continue the layoff.

If no order is communicated within 60 days from the date of application, the permission shall be deemed to have been granted.

**Lay-off compensation**

The employer of any factory, mine or plantation establishment (excluding seasonal establishment), employing at least 50 but less than 100 workmen on an average per working day, is required to pay compensation to the workmen being laid-off. The compensation shall be payable at the rate of 50 per cent of the basic wages and dearness allowance, for all days of lay-off except weekly holidays.

**Conditions for entitlement to compensation**

A worker (other than a casual or badli worker) who is on the muster rolls of the establishment and who has been in continuous service under an employer for at least one year, shall be entitled to compensation on being laid-off.
Continuous service – A worker is said to have been in continuous service:

(i) for a period, if he has been in uninterrupted service, including service interrupted by sickness, authorized leave, accident, strike (legal), lock-out on cessation of work not due to the employee’s fault;

(ii) for one year, if he has actually worked for at least 240 days (190 days in case of a mine) during the preceding 12 months;

(iii) for six months, if he has actually worked for at least 190 days (95 days in case of a mine) during the preceding 12 months.

A laid-off worker is, however, not entitled to any compensation:

a) if a workman is laid-off for more than 45 days during any period of 12 months, no compensation shall be payable in respect of any period after the expiry of first 45 days, if there is an agreement to that effect between the workmen and the employer;

b) if he refuses to accept an alternative employment in the same establishment or in any other establishment of the same employer situated within 5 miles, and such alternative employment does not involve any loss of pay or require any special skill or previous experience:
c) if he fails to present himself for work at the establishment, at the
appointed time during normal working hours at least once in a day;
or
d) if such lay-off is due to strike or go-slow on the part of the workmen
in another part of the establishment.

Termination of contract of employment - whether void

In *Central Inland Water Transport Corpn. Ltd. Vs. Brojo Nath Ganguly*,
the Supreme Court of India held that a clause in a contract of employment
stipulating that the service of an employee can be terminated by giving him
notice for a certain specified period of time without assigning any reason is
void under section 23 of the Indian Contract Act as being opposed to public
policy and is also *ultra vires* Article 14 of the Constitution to the extent that
it confers upon the employer right to terminate the employment of a
permanent employee by giving him notice for a specified period of time or
paying him equivalent of wages in lieu of such notice. It also offends the
spirit of Directive Principles contained in Articles 39(a) and 41 of the
Constitution. However the supreme court has clarified that this principle
will not apply to the managerial and executive cadre in private sector
employment, where the right of the employer to cut off the dead wood and
get rid of a managerial cadre employee in case he is considered to be
wanting in performance or in integrity, has not been curtailed.
Retrenchment

Retrenchment means termination by the employer, of the service of a workman for any reason whatsoever, but excludes:

a) dismissal inflicted by way of disciplinary action,

b) voluntary retirement of the workman,

c) retirement on reaching the age of superannuation,

d) termination as a result of non-renewal of contract of employment, and

e) termination due to continued ill-health of the workman.

The words “for any reason whatsoever” are undoubtedly words of wide import and hence termination of service by the employer shall amount to retrenchment unless it is shown to be as falling within one of the exclusive clauses stated above.

In construing the powers of the management to retrench workmen, the Supreme Court of India in a series of judgments including those of *D. Marco Polo and Co. Vs. Their Employees Union* and *Parry & Co. Vs. PCL*, held that it was the discretion of the employer to organize and arrange his business in the manner he thought best. If termination of services of some workmen became necessary, the adjudicator could not interfere, if the action of the management was *bona fide*. 
Conditions of retrenchment

No workman who has been in continuous service for at least one year, shall be retrenched until and unless the following conditions are fulfilled:

a) In case of a factory, mine or plantation establishment (other than seasonal establishment) wherein at least 100 workmen were employed on an average per working day, for the preceding 12 months:

(i) Notice/Notice Pay: The employer is required to serve three months notice of his intention to retrench the workman with reasons for the same, in the prescribed form, to every workman who is being so retrenched. Alternatively, the employer may pay wages for the period of the notice, in lieu thereof.

(ii) Approval of the Government: The employer is required to obtain prior approval of the appropriate Government. Permission can be obtained by submitting an application within 60 days before the proposed retrenchment. The application should clearly state the reasons for the intended retrenchment. A copy of the application should be served simultaneously on the workman concerned.
(iii) Retrenchment Compensation: Where the approval of the Government has been granted or is deemed to have been granted, the workman being retrenched shall be entitled to receive retrenchment compensation.

b) In case of a factory, mine or plantation establishment (other than seasonal establishment) wherein at least 50 but less than 100 workmen have been employed on an average per day during the preceding calendar month;

(i) Notice/Notice pay: The employer is required to serve one month's notice of his intention to retrench the workmen with reasons for the same in the prescribed form to every workman who is being so retrenched. Alternatively, the employer may pay wages for the period of the notice, in lieu thereof.

(ii) Notice to the Government: The employer is also required to give a notice of his intention to retrench, to the appropriate Government in the prescribed manner.

(iii) Retrenchment Compensation: The employer is required to pay retrenchment compensation to every workman being retrenched, at the time of retrenchment.
The employer shall ordinarily retrench the person last employed in that category, unless there is an agreement to the contrary or for reasons to be recorded by the employer. For this purpose the employer shall prepare a seniority list of all workmen, in each particular category from which workmen are to be retrenched.

Failure to comply with the principle of ‘last come first go’ for effecting retrenchment will render it invalid. The rule is however, not inflexible and can be departed from, on grounds of inefficiency, unreliability or habitual irregularity, but the employer must prove existence of such valid reasons.

**Retrenchment compensation**

The employer is liable to pay compensation to each workman who is being retrenched, which shall be equal to 15 days’ average pay for every completed year of continuous service or any part thereof in excess of 6 months.

**Re-employment of retrenched workmen**

Where any workmen are retrenched, and the employer proposes to employ any person, the retrenched workmen who are citizens of India, shall be given preference for re-employment (at their option) over the other persons.
Socio-Economic Aspect Of Technological Change

The effect of technology on employment has been age old. It is well known that technology displaces labour and generates unemployment. New technologies alter both the volume and structure of employment. But this effect of technology on employment depends on the bias of technological change – whether the technological change is labour-saving (capital-using) or capital-saving (labour-using) in character. Technologies have changed forever the structure and functioning of organizations, and therefore, the fundamental nature of work. Technological change can bring about positive as well as negative results. On one hand, technological progress makes possible a higher standard of living by a fuller utilization of the resources, also new and superior products. On the other hand, technological change leads to unemployment. There are broadly two views regarding the effects of technological advancement on employment level and structure:

1. According to the optimists, not only will many new jobs and new kinds of jobs be created due to the growth of new technology, but increased skills will be required, there will be less skill polarization, and there will be greater opportunities for developing countries to expand employment and to increase efficiency of other domestic industries.
2. According to the pessimists, not only the net growth of employment be slowed by new technology but new technology will result in general deskilling even though a small percentage of jobs will require higher skills, and all this will lead to an increasing polarization of the labour force.

The new technologies are primarily science-driven and range from simple takeover of the routine, repetitive operations such as the application of computers in a bank or insurance or robot on a production line, to applications of bio-technology, advanced electronics where operatives have to have considerable scientific and technical knowledge. Technological change has negative impacts on labour market outcomes for all skill groups. Overall, technological change goes with higher demand for skilled workers, decreased training, and deskilling of low-skill jobs and up-skilling of high-skill jobs.

Today, we are talking about the old economy (off-shoot of industrial revolution) and the new economy (off-shoot of information revolution). In the new economy speed counts, not size. New technologies are resulting in shifts from mass production to parallel production over widely dispersed territories and new trends in employment patterns have emerged. Some of the recent trends in employment patterns are:

- declining stability and security in employment,
- declining labour intensity,
- growing irregular labour force, i.e., casual, contract, contingent, part-time, temporary, fixed-term, job-sharing, peripheral labour,
- shift from contract of service to contract for service (self employment/business relationship),
- increase in home based work and the consequent blurring of the gap between work and home,
- decline and/or the deaths of few occupations and the birth of few others,
- decline in mutual commitment. One person, one skill, one job, one company concept is fading, and
- declining influence of trade unions.

The intimate relationship between technology, market dynamics and social institutions is well accepted. Sociologists have used the Durkheimian concept of 'division of labour' to explain the interaction between technological change, on the one hand, and the organization of work, as well as the generation and distribution of skills, on the other. Since Durkheim, industrial sociologists have evolved other views on the relationship between technology and labour. The first view, called the 'decline and rise of skills' was proposed by Woodward (1965). He
suggested that the trend of degradation of work roles would be followed by
a new trend as part of an evolutionary process, a process that could be
attributed to new technology and the growing prevalence of continuous-
process production.

Braverman (1974) put forward a different view, which gave a new direction
to the ongoing debate. According to his theory, the degradation of work and
polarization of skills resulted from the implementation of new technology.
Braverman propounded a second view, known as the degradation of work
or polarization of skills. He proposed that in capitalist production complex
work roles are continuously broken up and divided in two ways. They may
be broken up into a) Lower grade, more routine, simple and monotonous
roles, within a relatively segmented organization of work-flow; and b) More demanding, responsible and varied roles, based on better education
and training.

Both approaches are based on a deterministic view of technological change
and work. A third approach that stressed the importance of socio-technical
choice was put forward on the basis of research at the Tavistock Institute.
According to it, the evolution of work is in no way determined by the
course of technological change. Instead, it is determined by the choices of
the organization's key decision-makers in the sphere of strategy. This view
suggest that the development of the technical, social and sentient systems of
an organization should be founded on a strategy of enriching skills and achieving an overlapping, rather than divisive, organization of tasks. On the basis of the results of their work on the applications of microelectronics, researchers like Sorge and Streeck (1988), Kern and Schumann (1987), and Hyman and Streeck (1988) decided to subscribe to the third view.

The relationship between technology, the occupational structure and the employees’ skills is a complex one. While obsolete knowledge and skills can act as constraints in the adoption of new technology, the latter may facilitate the development of new knowledge and skills. As Campbell and Warner (1992) observes, high levels of technological change will be increasingly associated with hybrid (or mixed skills). This implies a scenario in which the workers and managers have less specialized training and a broader range of newly acquired capabilities to cope with the emerging technological challenges. Low levels of technological change may be associated with low levels of skill.

The new trend represents a shift from operating skills to those of designing, programming and analysis, maintenance, diagnosis and supervision. This pattern has resulted in a decline in the number of employees and higher levels of skills. In some countries, this trend has created serious problems, as there may not be enough skilled people available to support a microelectronics-based system. Even developed nations, such as Germany,
do not have adequate numbers of IT professionals. Countries like Japan and the Republic of Korea have invested heavily in the development of appropriate skills and, therefore, do not face such problems. Further, the range of the skills required is expanding. There is a major requirement for core skills as also for an increasing convergence of skills. It must also be stressed that higher levels of skill are required not just at the level of operators and those responsible for maintenance, but also at the managerial level. The absence of such skills at the managerial level could limit a firm's ability to exploit new technology to maximum advantage, as indicated by the cases of some developing countries, in particular.

As products are customized using flexible technology, the ways in which machines are used affects the occupational profile of the workplace. Better skilled operators, backed up by highly trained technicians and engineers, become more predominant in the new workplace. The miniaturization and automation of microelectronics is gradually displacing the familiar labour-intensive operations. Campbell and Warner (1992) suggest that the changes required in the mix of skills are likely to alter the nature of the workforce in the following two ways. First, employees with distinctly new skills will be represented in the workplace. Second, since many workers will have acquired several new skills together with their existing ones, there will be hybridization of skills. Thus, the application of microelectronics seems to
be reversing the trend associated with industrialization and technological change in the past when the requirement was for a higher degree of specialization of functions. The craftsman trained in a single discipline has no foreseeable future, and the shift is in favour of the multi-skilled professional worker.

The new technologies have thus affected the structure of employment and the requirement of skills at work. Howell and Wolf (1991) differentiated skills into three categories — a) Cognitive, b) Interactive, and c) Motor skills. They noticed a decline in the growth of cognitive skills, and a slight decline in the rate of growth of interactive skills from the 1960’s to the 1970’s among the professional, technical and managerial staff. They also observed that the growth of the level of cognitive skills was faster for non-supervisory workers than for supervisory workers. On the other hand interactive skills grew substantially faster in the supervisory category. This shift has been attributed to the introduction of new technologies, which have reduced the need for jobs that require low cognitive skills in the manufacturing sector. The same reason can be cited for the relatively rapid growth in the average level of cognitive skills among the non-supervisory occupations. In other words, the new technology requires teamwork, inter-functional coordination and integration.
The new polyvalent worker performs a larger number of tasks. He occupies positions encompassing broader job descriptions. He works within a less hierarchical framework, in which the division of labour is less marked. In general, this is reflected in the overall reduction in the number of employees required to perform a given set of operations. This trend is more prominent at the levels of the unskilled and semi-skilled workers, as their jobs are easily mechanized and they can be replaced by machines. The three traditional categories of unskilled, semi-skilled and skilled workers are being replaced by two categories, consisting of less skilled and highly skilled workers.

**Psychological Aspect Of Technological Change**

In the present day world change is the only thing that is constant but the reality of change is that it is human nature to resist change. It is often said that the major hindrance to change is psychological rather than financial, technical or procedural. Change usually provokes fear because people no longer do what they feel comfortable. Change is a challenge to ones belief system. Human Factors, the so-called Soft Issues, play a vital role in highlighting the difference between success and failure for any project where people are involved, resistance to change, both at a personal and organizational level, being one such factor.
With the introduction of new technology always comes resistance. Technological change is sometimes feared precisely because it is suspected that job loss will occur if the new processes substitute for labour. A related fear is that one's own position will be undermined by failure to cope with the new systems: some workers are daunted by the idea of having to acquire new skills. Lacking information about the innovation, they are unsure of whether they have the cognitive abilities to work with it, and will probably suffer misapprehensions as to the specific abilities required (frequently computers are associated with mathematical competence, for example). Furthermore, "technofear" may be supported in the early stages of IT (Information Technology) use by the fact that IT systems are highly interactive, apparently behaving in a volitional way (Miles and Ducatel, 1992).

Bridges (1995) declares that when changes take place, people get angry, sad, frightened, depressed and confused. These emotional states can be mistaken for bad morale, but they rarely are. Rather, they are more likely to be a sign of grieving, the natural sequence of emotions people go through when they lose something that matters to them. People resist the loss of recognition of the competence that they have in their old familiar tasks and that was once lauded – but no longer is.
The initial employee attitude may be described as one of suspicion and apprehension: suspicion about the real aims behind the introduction of new technologies and apprehension about job security, retraining difficulties, especially for older workers, and future careers.

Levi, Slem and Young (1992) describe a model of the impact of technological change which can be used to assess workforce readiness for the implementation of new technology. Figure 1 outlines the three major factors involved in the technological change process. The first factor contains the characteristics of the organization that are affected by the technological change. The second factor involves the way in which the change process is managed. The final factor is the perceived impacts of the change on employees.
As shown in Figure 1, technological change can impact a variety of organizational factors. Technological change can affect task size, complexity, and the physical characteristics of the job. These changes can also significantly change the nature and amount of autonomy, control, and supervision of the task. Not only do specific task characteristics change, but roles are affected and change may produce role ambiguity, role conflict, and role overload. Informal group relationships and relationships between the supervisor and subordinates will be altered. The organization's corporate culture will affect how the change is viewed and in turn be affected by the change itself. In like manner, organizational problem solving and decision-making will affect how the new technology is adopted and used, and will be affected by the features of the new technology. Organizational communication can be dramatically changed by the implementation of new technologies, especially communication technologies. Career development paths and job security can be significantly affected by the adoption of a new technology.

The change process itself is the mediating factor in how the workforce views the technological change. The change process includes the quality and amount of the training for the new technology, the participation of the workforce in the decision-making process about the change, the commitment of upper management, and the ability of change agents to take
risks. Proper management of the change process can increase acceptance of the new technology.

The final part of the model summarizes the perceived impacts on the employees themselves. Personal benefits are the positive personal effects of technological change. These include improving one's career in the organization and increasing one's marketable skills. Job improvements may include more personal control, increasing challenge, and providing the opportunity to work on more important tasks. Job stress may be due to role issues (conflict, ambiguity and overload) and damaged co-worker relationships. Personal insecurity includes anxiety about the future of one's job and anxiety about one's ability to adapt to the new situation. Previous research using the survey on U.S. companies (Levi, Slem & Young, 1991) has confirmed the relationships outlined in this model of the impact of technological change.

This model suggests that workforce cooperativeness in the technological change process is likely to be associated with beliefs about technological change. If the workforce believes that the introduction of advanced manufacturing technology will make their jobs more difficult, damage co-worker relationships, and threaten the existence of their jobs, their fears or concerns may lead to resistance to the new technology. Conversely, if the workforce believes that the new technology will make jobs easier, enhance
careers, and leads to greater sense of control over the workplace, then they will most likely facilitate the implementation of new technology.

New technologies and the impact of globalization have sparked more stress and bouts of depression for workers, while causing a growing burden for social security systems, a new ILO report (2000) says.

Up to one in 10 people suffer from workplace stress, leading in some cases to unemployment or hospitalization, the International Labour Office (ILO) says in its study of Finland, Germany, Poland, Britain and the United States. The findings of the study are as follows:

➢ In the United States, an estimated $US30 billion ($AS56 billion) to $US40 billion ($AS75 billion) is spent on treatment of depression alone, and around 200 million days lost from work each year.

➢ In the European Union, the report estimates that between 3 and 4 per cent of gross national product (GNP) is spent on mental health problems.

➢ In Germany, nearly 7 per cent of cases of early retirement are linked to depressive disorders. Workers suffering such problems are also likely to be away from work about two and a half times longer than those suffering from other illnesses, it said.
German workers have seen changes in the last few decades "due mainly to rationalization and the rapid introduction of technology along with rising unemployment".

In Britain, one in every 20 people of working age are likely to experience major depression, while in the United States, the rate is one in 10 and in Finland, more than half the workforce suffers some kind of stress-related symptoms.

In the United States and Britain, the threat of unemployment has been less in recent years, the report notes, but workers face pressure as a result of new technologies and rising productivity demands.

In Poland, political changes also brought a socio-economic transformation that had "serious ramifications for the labour market and for the mental well-being of people in the workplace".

A joint study on the same subject by ILO and the World Health Organization warns that predictions indicate the future will witness "a dramatic increase" in mental health problems.

Stress can come from workers feeling out of control, because they are not well trained for their new work roles or the technology. The stresses of greater responsibility would be compounded if managers were attempting to introduce new technology and new practices 'on the cheap', without sufficient support and training for workers moving into their new roles.
Agervold (1990) notes studies from Denmark, Germany and Ireland in which workers using new IT (Information Technology) reported that training was too theoretical, and paid too little attention to practical problems that arise in the actual work. Though formal training programmes are often used when IT is first introduced, workers joining at later stages are given only informal training: though this may be more problem oriented, it is often felt to be inadequate too.

Beer, Eisenstat and Spector (1990) argue that most change programs do not work because they are guided by a theory of change that is fundamentally flawed. They identify the fundamental flaw as the fallacy of programmatic change - that the place to begin an organizational change is with the knowledge and attitudes of individuals.

Job loss for a redundant worker involves substantial economic and non-wage social-psychological costs for the adversely affected worker and his/her family. A worker’s internalized concept of self, which is based on one’s feeling of mastery and control over one’s environment is destroyed. Forced separation thus damages self-image and self worth.

Workforce cooperation has been a thorny issue in the introduction of technological change. While there is ample evidence to support either positive or negative effects of new technologies on employees (Shaiken, 1984; Majchrzak, 1988; Zuboff, 1988), it seems clear that the
characteristics of the technology alone do not determine employees' acceptance or rejection of any new technology (Manufacturing Studies Board, 1986). Employees' beliefs about the impact of the technology and how the technological change is being managed appear to be significant factors in their decision to actively cooperate with the change or resist it (Slem, Levi, & Young, 1986). When viewed as a means to dehumanize the workplace, increase stress, or threaten one's job, it is likely that the workforce will resist change. If perceived as a means to introduce more challenging and creative jobs, enhance one's career, and lead to a more participative organization, the workforce is more likely to cooperate and facilitate the technological change. Managers have to incorporate the workers into their objectives in order to achieve efficient and effective performance from the new technology: and if they are to substantially reduce the problems of implementation by increasing workforce acceptance of change and by encouraging trust between workers and managers.

**Adjustment Mechanisms**

Firms in which there are frequent changes in processes and equipment must continually retrain their employees. Training is expensive, even more so for employees who are difficult to retrain. As a result, firms in which the implementation of technology is relatively ubiquitous or which are undergoing speedy technological improvements are likely to shift their
work force from those with a high cost of training to those with a low cost of training (Bartel and Sicherman, 1998). Alternatively, firms may substitute expensive-to-train employees with labour saving machinery or equipment. This shift is likely to negatively affect certain expensive-to-train groups of workers, including low-skilled or older workers or those without previous training. Older workers may also be replaced because a firm receives smaller incremental increases in future revenues from training older employees because it has fewer years to recoup the cost of training. In addition, Kremer and Thomson (1998) suggest that high-technology firms may shift away from older workers because workers of different ages may have comparative advantages in different tasks. For example, older workers may be better managers given their extensive work experience, and younger workers might be better technicians and programmers because their recent education might allow them to adapt more readily to new equipment and technologies. Therefore, shifts toward a more technical work force (and less middle management) might result in the displacement of older workers. Similarly, a lack of training and education among less skilled workers may reduce their productivity, further reducing the demand for such workers (Baumol and Wolff, 1998).

Social policy cannot be unconcerned about the workers who get displaced in the process of industrial restructuring. An important concern of the
policy-makers is that those who are displaced are helped into better adjustment paths and are meaningfully redeployed. Active labour market measures for displaced workers include job-search assistance, job placement, retraining programmes, and job creation and employment subsidies, while passive responses generally refer to unemployment benefits and subsidies for early retirement. Active labour market policies are designed to improve the employability of the displaced workers and assist them in finding new jobs. These measures become particularly important when viewed in the context of a growing body of opinion that it is better to invest in improving workers’ employability than in artificially maintaining job permanence. The former strategy includes developing general skills, updating existing skills, and improving the job search skills of the threatened employees and generally building an environment in which new firms can improve performance in job creation.

**National Renewal Fund**

In order to deal with the issues related to redundancies and job losses, typically active labour market policies of ‘job creation’, ‘retraining’ for redundant workers to redeploy, and ‘adequate compensation’ for the adverse effect of loss of job, under the name of social safety net are introduced by many developing countries that have undertaken structural adjustment reforms.
India’s policy makers well recognized the social consequences and hardships that may result from the various reforms, and therefore, the government, as part of the New Industrial Policy, setup a National Renewal Fund (NRF) - to provide a social safety net for the labour, by a government resolution on 3 Feb, 1992. In fact, the New Industrial Policy, 1991 declared, ‘the government will fully protect the interests of the labour, enhance their welfare and equip them in all respects to deal with technological change. Intensive Training, Skill development and Upgradation programs will be launched.’” The idea basically was to ‘renew’ the work life of the ones who were to become redundant, primarily by reducing their hardships and rehabilitating them through investment in their retraining. The two constituents of the National Renewal Fund were:

- National Renewal Grant Fund (NRGF): This fund was to deal with the immediate requirements of redundancy arising from the revival or closure of sick units.

- Employment Generation Fund (EGF): This fund was to deal with the employment generation programs both in the organized and unorganized sectors. Special schemes were to be designed to regenerate employment opportunities in areas affected by industrial restructuring.
The progresses in the implementation of these programs have been rather poor so far. The area regeneration schemes for areas with high incidence of job losses have not been implemented at all and the other programs have targeted only the industrial enterprises owned by the central government. Till June 2000, 0.14 million employees of Central Public Sector Undertakings opted for VRS under the NRF scheme. Of these, more than 50 percent did so in the first and second years of the scheme. Upto June 2001, 114094 workers were surveyed, of which 73194 were counselled, 55374 retrained and only 19073 redeployed. It is worth noting that about 40 percent of the VRS availees were retrained and merely 13.7 percent could be redeployed under the NRF (Mamgain, Parashar and Datta, 2001). Thus, the key objectives of the NRF: to help in retraining, counselling and redeployment of affected workers and employment generation have almost been by-passed (Gupta, 1999 and Chandra, 1999).

**Significance of the Study**

Technological change is taking place at a very fast pace and it has assumed a special significance in the present day world as a powerful determinant of growth. No doubt, adoption of new and improved technology leads to increased productivity, efficiency, cost reduction and profitability but its negative implications are numerous. Technological change leads to slowing down of net growth of employment, deskilling of the labour force,
displacement of the workers, skill biasness, multitasking, and also redundancy.

Work and worker redundancy is a burning issue that is arising due to number of factors such as outsourcing manpower, off-loading production, and regular downsizing. New technology is one of these important factors.

In spite of the importance and prevalence of the use of new technology in work organizations, little empirical research exists about how new technology impacts work and the worker. Not many studies have been conducted on redundancy due to technological change, and the very few literature that are available related to this topic deal with aspects such as: technological change and labour market implications; technological change and industrial relations; economic reforms and redundancy; effects of technology and innovation on firm performance, employment and wages; layoffs; retrenchment etc. No study could be reached that has been conducted to deal specifically with the problem of redundancy due to technological change. Most of the studies that could be reached related to this topic have been conducted abroad and very few could be reached in the Indian context.

An attempt has been made in this study to address this problem specifically. Moreover, this study has tried to address the problem of redundancy in different units of the organizations selected for the study.
Studies have shown that technological change leads to skill-biasness and that there are certain levels of workers who are most affected by technological change. This study has tried to see which levels of workers are actually affected by technological change and whether it is the same for organizations in different industries.

Existing literature mostly deal with past and present employment problems due to technological change but these studies have not dealt with the impact of technological change on future employment. The present study has tried to address this issue also.

If there is redundancy, some adjustment mechanism must be employed by management. This study has tried to focus on the adjustment mechanisms employed by organizations to deal with redundancy.

It is a well-known fact that it is human nature to resist change. We all like it the way it is. Hence, it is only natural that when technological change takes place, workers are bound to resist it. This problem has also been addressed in the present study.

There is no literature available to show that any study has been conducted to find out the trauma faced by employees due to redundancy. This study has tried to address the issue of the psychological impact of redundancy on workers.
Objectives of the Study

1) To study the nature of change and period when redundancy program was carried out.

2) To study whether insourcing has taken place leading to job increase.

3) To study work redundancy due to technological change.

4) To study worker redundancy due to technological change.

5) To compare work redundancy among different units of the organizations taken up for the study.

6) To compare worker redundancy among different units of the organizations taken up for the study.

7) To study the rate of work redundancy for different types of jobs.

8) To study the rate of worker redundancy for different workers having various skill levels.

9) To study the adjustment mechanisms employed by organizations to deal with redundancy.

10) To study the implications of technological change on future employment.

11) To study resistance by employees towards technological change.

12) To study the psychological impact of redundancy on workers.
13) To study the difference between the mean scores of manufacturing sector and service sector on the nature of change and period when redundancy program was carried out.

14) To study the difference between the mean scores of manufacturing sector and service sector on whether insourcing has taken place leading to job increase.

15) To study the difference between the mean scores of manufacturing sector and service sector on work redundancy due to technological change.

16) To study the difference between the mean scores of manufacturing sector and service sector on worker redundancy due to technological change.

17) To study the difference between the mean scores of manufacturing sector and service sector on work redundancy among different units of the organizations.

18) To study the difference between the mean scores of manufacturing sector and service sector on worker redundancy among different units of the organizations.
19) To study the difference between the mean scores of manufacturing sector and service sector on the rate of work redundancy for different types of jobs.

20) To study the difference between the mean scores of manufacturing sector and service sector on the rate of worker redundancy for different workers having various skill levels.

21) To study the difference between the mean scores of manufacturing sector and service sector on the adjustment mechanisms employed by organizations to deal with redundancy.

22) To study the difference between the mean scores of manufacturing sector and service sector on the implications of technological change on future employment.

23) To study the difference between the mean scores of manufacturing sector and service sector on resistance by employees towards technological change.

24) To study the difference between the mean scores of manufacturing sector and service sector on the psychological impact of redundancy on workers.