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NATIONAL COLLEGE OF ART & DESIGN

DEPARTMENT OF INDUSTRIAL DESIGN

FACULTY OF DESIGN

BY

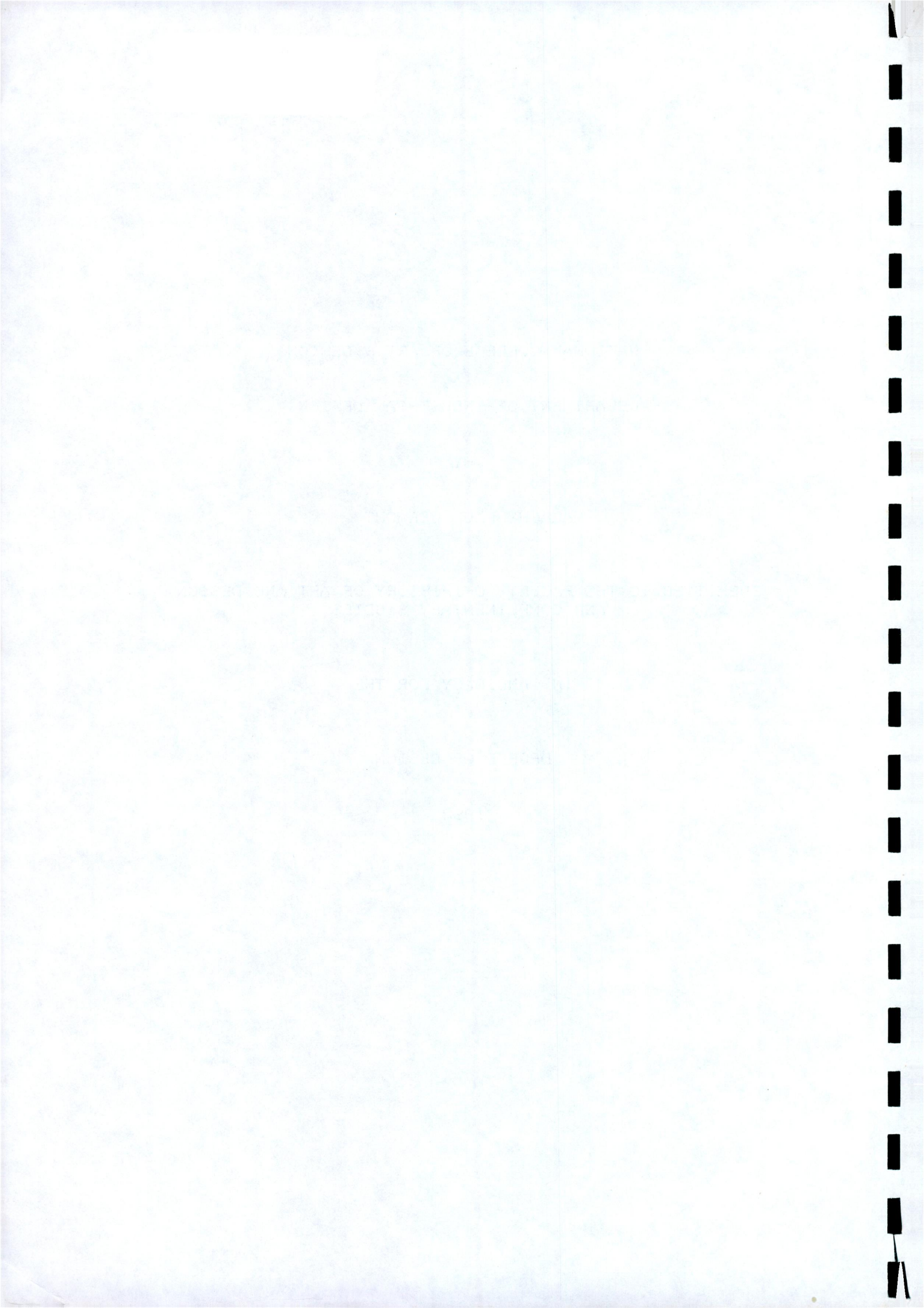
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SUBMITTED TO THE FACULTY OF HISTORY OF ART AND DESIGN
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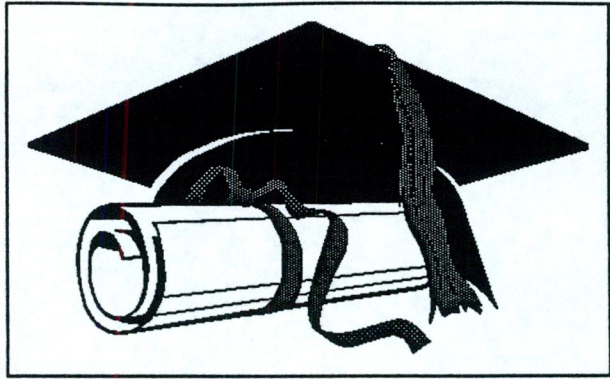
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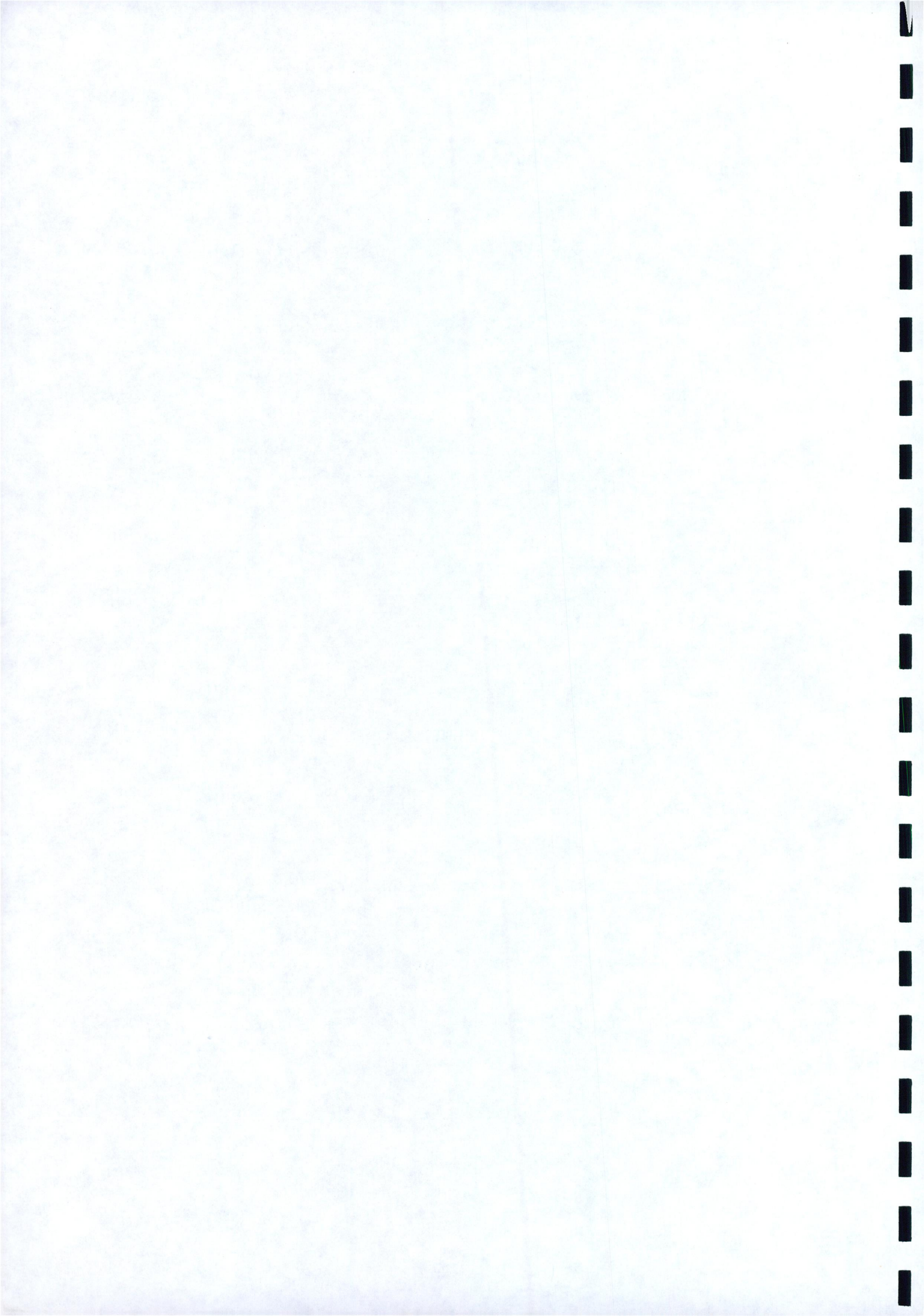
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INTRODUCTION

Contemporary Industrial Ideology is based on the following structures.

*New technology is fundamental to growth.

*It is unethical to be unemployed.

Today we find that these two structures contradict each other.

By integrating new technology into industry we reduce labour by capital investment, we thus reduce costs of production. This 'Technological Fix' creates new products, new markets and new growth. The new industries that this produces creates employment for those displaced from the old industries. Unemployment is thus purely simtumatic of this transition.

But unfortunately we have a situation where we have had this 'Technological Fix' and it has increased unemployment.

We now have a situation where unemployment is rising in a society where it is unethical to be unemployed. Unemployment is no-longer a transient thing.

Is one or both these structures untenable?

Has Industrial ideology, as a bases for structures, outlived its usefulness?

From Industrialism to Post Industrialism:
Changing Structures And Ideologies

IDEOLOGY OF INDUSTRIALISM

An ideology is a form of social or political philosophy in which practical elements are as prominent as theoretical ones; it is a system of ideas that aspires both to explain the world and to change it. It is also described as a "science of ideas" a science with a mission; it aimed at serving men, even saving them, by ridding their minds of prejudice and preparing them for the sovereignty of reason. Earlier philosophers had stated that all human knowledge was knowledge of ideas, that the destiny of science was not only to enlarge men's knowledge but also to improve the life of men on earth.

Some historians of philosophy had called the 19th century the age of ideology, not because the word itself was then so widely used, but because so much of the thought of the time can be distinguished from that prevailing in the previous centuries.

The subject of ideology is a controversial one much of which originates from the meaning of the word. From the period of the French revolution to the present day ideology plays both a laudatory and abusive role.

The French Revolution and the Industrial Revolution saw the break-up of the older order of kinship, land social class, religion, local community and monarchy - set free as it were, the complex elements of the status, authority and wealth.

The effects of the two revolutions, the one overwhelmingly democratic in thrust, the other industrial-capitalist, had been to undermine, shake or topple institutions that had endured for centuries, even millennia, and with their systems of authority, status, belief, and community.

These changes at the time were viewed by social philosophers and scientists as nothing less than of earthquake intensity.

A large number of new words coined or redefined appeared in this period of history, the final decade of the 18th century and the first quarter of the 19th.

Among these are : industry, industrialist, democracy, class, middle class, ideology, intellectual, rationalism, humanitarian, atomistic, masses, commercialism, proletariat, collectivism, equalitarian, liberal, conservative, scientist, utilitarian, bureaucracy, capitalism and crisis. Some of these words were invented others reflect new and different meanings given to the old ones by the leading minds of the age. All of these words bear witness to the emergence of new social philosophies.

ref. The early years of the 19th century saw the beginnings of what David Dickson in his book Alternative Technology describes the 'ideology of industrialization'. This ideology playing a passive role, that is neither political nor social. The message of this is that industrialism through technological development is a practical - rather than a political necessity for achieving social development. The social squalor of the late Industrial Revolution becomes justified as the 'price' that had to be paid for human progress. (8, P.42)

CAPITALISM

Capitalism as an economic system dominated Western society since the break-up of feudalism. Flourishing

pockets of capitalism were present during the middle ages although the continuous development of capitalism as a system dates only from the 16th century.

Beginning in the 18th century in England capitalist development shifted from commerce to industry. The steady capital accumulation of the preceding centuries was invested in the practical application of technical knowledge during the Industrial Revolution. The work ethic encouraged by the Protestant Reformation of the 16th century suited capitalism admirably. Traditional disdain for acquisitive effort was diminished, while hard work and frugality were given a stronger religious sanction. Economic inequality was justified on the grounds that the wealthy were also the virtuous.

The ideology of classical capitalism was expressed in Adam Smith's Inquiry into the Nature & Causes of Wealth of Nations (1776) which recommended leaving economic conditions to the free play of self regulatory market forces. Smith's policies were increasingly put into practice. The policies of 19th century political liberalism included free trade, sound money (the gold standard) balanced budgets and minimum levels for poor relief. (20)

SCIENCE AND TECHNOLOGY

Science in the classical world both East & West belonged to the aristocratic philosophers and embodied all of knowledge and in the beginning was divorced from technology which belonged to the working craftsman.

Technology first appeared in England in the 17th century. It was used to mean a discussion of the applied arts only. By the early 20th century the term was coming into general usage and embraced a growing range of means, processes, and ideas in addition to tools and machines. Man has often been described as a tool making animal and has been since the dawn of civilization.

By the second half of the century technology was defined by such phrases as the means or activity by which man seeks to change or manipulate his environment.

Science and technology gradually came together during the course of the 19th century and technology was now based on science.

The first Scientist to become a major figure in technology was Justus Von Liebig, the German father of organic chemistry and inventor of synthetic fertilizer. The great 19th century inventors built on the work of

Scientists; Edison, inventor of the first practical system of electrical lighting, on that of Faraday and Henry, early experimenters in electricity; Bell, inventor of the telephone, on that of Helmholtz; Marconi, inventor of radiotelegraphy, on that of Herz and Maxwell. The first research laboratory was established on October 21st 1879 with Edison's demonstration of electric light. From this period onwards the application of scientific principles to technology grew. The engineering rationalism that Frederick W. Taylor applied to the organisation of workers in mass production and the time and motion studies of Frank and Lillian Gilbreth were logically followed later in the 20th century by the invention of systems engineering, operations, research, simulation studies and mathematical models. These developments added to the increased specialization and professionalization of technological work, brought technology to its highly efficient modern state.

The coming together of capital and science/technology/innovation and labour accelerated the rate of growth and change leading to the process of industrialization.

INDUSTRIAL REVOLUTION

The years between 1760 and 1830 are thought of as the period of the Industrial Revolution. It began first in Britain and spread only gradually to continental Europe and North America and subsequently throughout the world, particularly where the culture of Western Civilization had been felt. The Industrial Revolution has continued up to the present day.

It was not a revolution in the sense of a sudden and violent social rupture but the changes were fundamental and irreversible. Industrialization brought about a movement of workers from the primary sector (agriculture and extracting industries) to the secondary sector (manufacturing industries). In recent years there has been a shift from the secondary to the tertiary sector (service industries) of the industrial economics. (5. P.7)

From an agriculture economy where over 80% of the population lived and worked in the countryside, by 1851 Britain had become an industrial economy with over half of its population living and working in the cities. A manufacturing system dominated by the laws of supply and demand reflected an economy dominated by seasons and harvests. The prerogatives of the land owning aristocracy were increasingly challenged by the new group - the factory owning entrepreneurs.

There was a series of inventions during the 18th

century. In Britain the cotton industry and other industries gave rise to a new mode of production - the factory system. Industries carried out in the home with simple machines were transferred to factories with power driven machinery where supervision and organisation of factors of production could take place.

INCREASED PRODUCTIVITY AND EMPLOYMENT

As a result of the Industrial Revolution, labour productivity increased thousands of times in some branches of industry (cotton spinning, for example) hundreds of times in others (weaving, steelmaking, chemicals) with corresponding decreases in the cost of manufacture. By contrast those activities little effected by the new techniques - skilled arts and crafts, for example, or barbering - showed almost no gain in productivity and little reduction in costs. The result was a massive shift of demand in the direction of those products and services, the costs of which fell the most and an increase in the numbers of persons and amount of capital employed in the branches furnishing these products and services. This shift was reinforced by the gains in income per head which made it possible for the population of advanced industrial countries to devote a smaller portion of their income to necessities

and to spend more of it on luxuries or 'extras'. This expenditure over and above the requirements of subsistence is especially responsive to the changes in relative prices entailed by changes in relative costs of production. The effect was a substantial growth of these branches most affected by the new technology and in general a shift of resources (including labour) out of agriculture into industry and services and a movement of population from the countryside into the cities and towns.

The industrial revolution led to a vast increase in employment, but this was no straightforward expansion of job opportunities for working class people. The transition from a rural economy dominated by the domestic system of production, to one dominated by the factory system, involved massive social costs and the forced redundancy of thousands of hitherto skilled workers. The early machines of the factory system not only increased productivity but also enabled owners to draw on entirely new reserves of labour, particularly that of women and children. Marx observed that because the early machinery of the Lancashire textile employers:

does away with the need for any considerable expenditure of muscular power, it becomes a means

for the utilization of workers with comparatively little strength, and those whose bodily growth is immature but whose limbs are all the more supple. The labour of women and children was, therefore, the first word in the capitalist utilization of machinery. (14, P. 418-419)

With the rapid expansion of the factory system, the deskilling of many areas of domestic craft production and the repeal of the Elizabethan apprenticeship laws, the regular employment of crowds of children became the rule. By the early 1830's from a third to a half of all workers in the cotton mills were under 21 years old. (22, P. 341).

Initially the factory owners found it impossible to get workers to do a full days work as a consequence the first factories went bankrupt. Mans reluctance to spend so many hours each day, week in week out, ran contrary to his whole social life. Workers were willing to do enough work to earn sufficient for their needs for as Ure is observed writing of workers from rural or artisanal backgrounds "it is found nearly impossible to convert persons past the age of puberty into useful factory hands. In order to cover the needs of a stable workforce, growing industry resorted to child labour as the most practical solution. (24, P. 16 and 14, P. 549)

The insatiable demand of the early factories for cheap labour and the reluctance of individuals to enter them was not solved by some 'free play' of market forces, nor by an amelioration of working conditions. Rather, when 'the new middle classes' took control of the state they were to create an alternative so unacceptable that people were driven to the factory gates. This alternative was determined by the Poor Law, and its operational

principle of 'less eligibility' (which dictated that relief should not exceed the worst

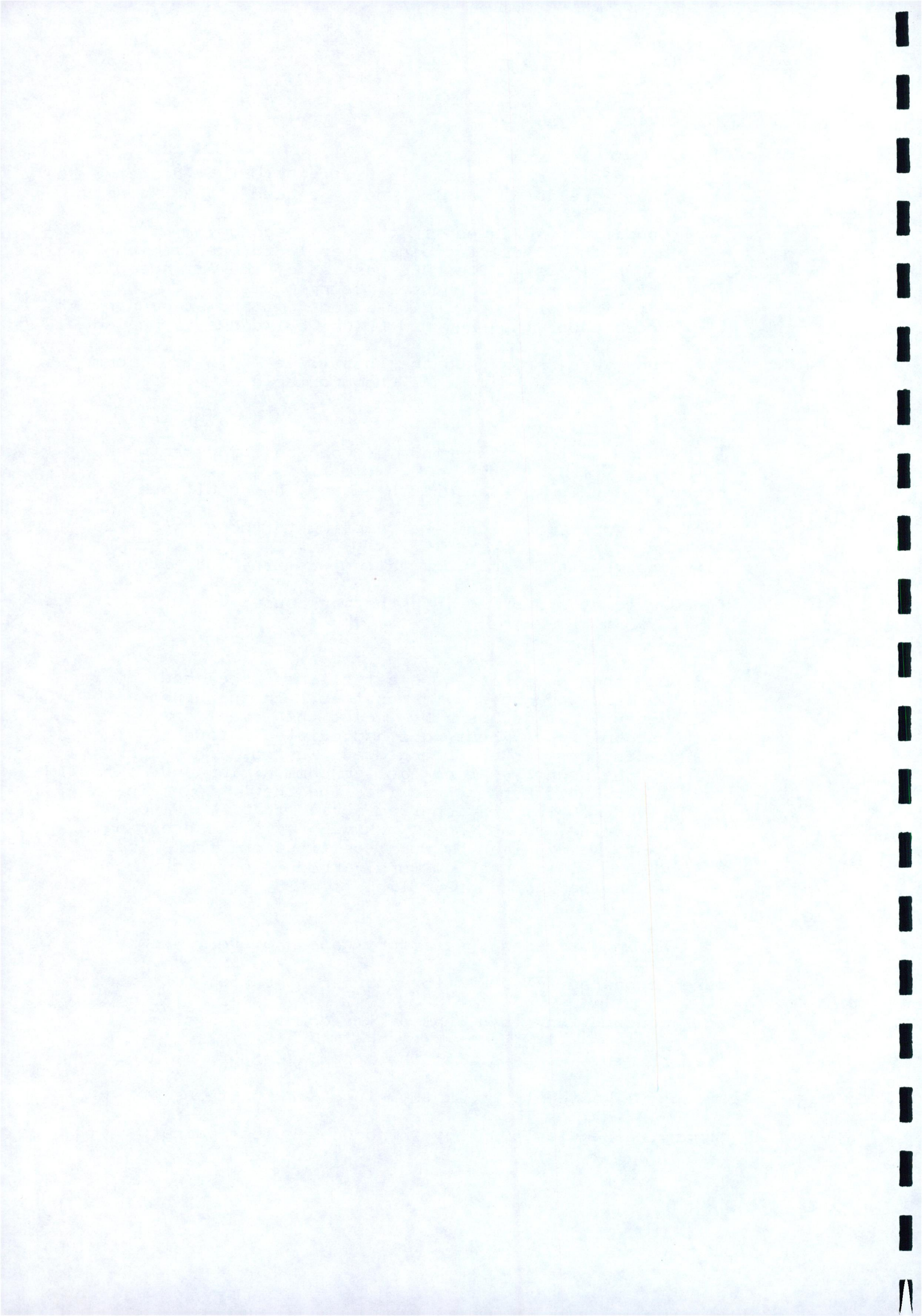
conditions offered in the wage economy) was to haunt the lives of ordinary people for generations. In the 1830s, after the passage of the Act people watched new workhouses being built. On the outskirts of every medium-sized town and at country crossroads the new red brick buildings appeared

and were christened the 'bastilles'. Inside them life was to be made as uncomfortable as possible. (13, P. 109-110).

Faced with this kind of choice, manufacturers recruited their workforce with ease. The conditions of factory work could only be tempting to those with no alternatives, and early capitalism was generous with its freedom to starve or go into the workhouse:

As the industries were established more and more workers were needed to run them. In the nineteenth century, this usually meant the creation of a labour force where none had existed before - the necessary workers being drawn in from other parts of the country, from earlier communities and other lives. Workers poured into the 'new' towns in a flood of immigration from agricultural and older declining areas where work was fast disappearing. Many were driven by rural destitution from areas where local agricultural production had been undermined by new food imports. (23, P. 15.)

Having reached the factory gate however, workers were expected to submit to a different rhythm of work and consumption than that of the domestic system. In transforming workers into the appendages of machines, employers wanted to break them into work patterns of an unvarying regularity. They introduced rules against

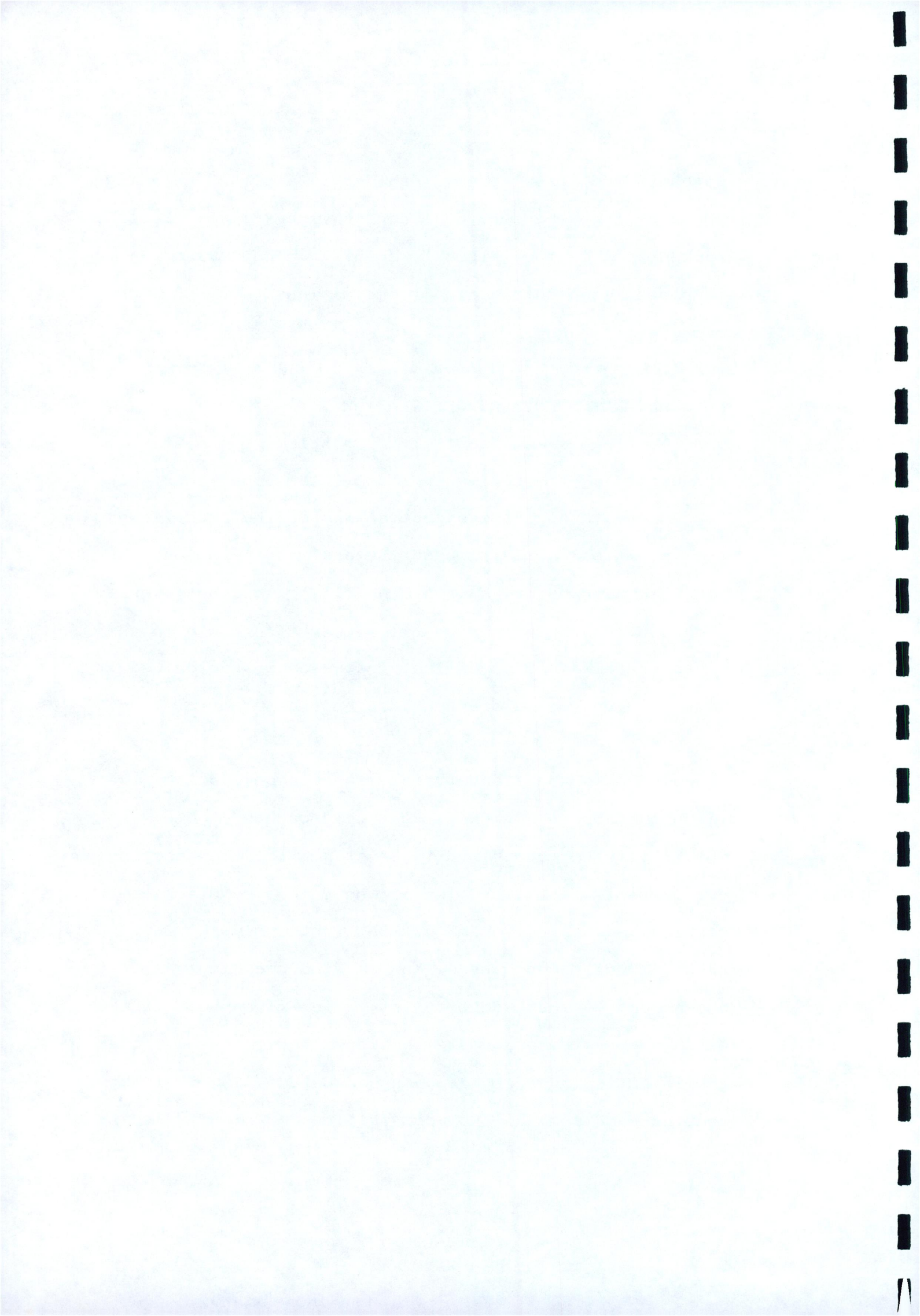


lateness and absenteeism, against talking and relaxing. Punishments were served. Workers were fined, beaten, sacked or denied 'truck' credit. They were also forbidden to enter into 'combinations' or challenge employer prerogatives. (22).

LUDDISM AND EMPLOYMENT LEGISLATION

Working class hostility to this new system of production, at first sporadic, assumed increasing importance through the direct action of the Luddites and the political activities of the early trade unions and older craft societies. This hostility was not merely economic in origin, nor was it simply a response to the sheer brutality of conditions in the early factories. It was bound up with a desperate defence of a way of life.

Indeed, the stereotyped image of the Luddite - a virtual 'machine-mugger' - that we encounter today, and which is used to discredit resistance to technological developments, is very wide of the mark. Luddism was a complex social movement which went through various phases in different areas, and machine-breaking was only one aspect of the Luddites' struggle. Thompson (1968) has shown that Luddite actions were taken after parliamentary avenues had been exhausted. The activists consisted of some of the most skilled and highly paid



workers in the textile trades, their actions were disciplined and well organized, and they enjoyed the near total local community support necessary to maintain a complex underground organization.

The Luddites were not crudely anti-machinery, and their demands made up a transitional combination: some harking back to old customs, other anticipating new conditions. For example, they wanted the introduction of technological change to be gradual and accompanied by alternative employment. They called for taxes of 6d per yard for machine-dressed cloth, with the revenue going into an unemployment fund. They wanted a legal minimum wage, control over the hours and work of women and children, prohibitions on shoddy work, and the right to legal trade unions. After marshalling this evidence, Thompson concludes:

In this light, the conventional picture of the Luddism of these years as a blind opposition to machinery as such becomes less and less tenable. What was at issue was the 'freedom' of the capitalist to destroy the customs of the trade, whether by new machinery, by the factory system, or by unrestricted competition, beating-down wages, undercutting his rivals, and undermining standards of craftsmanship. (22, P. 600)

The struggle against machinery did not evaporate with the demise of the Luddites. Although the factory

was to be the key source of new forms of working class organization and politics, and working people were forced to come to terms, and live with the 'new technologies', the struggle against the introduction of machinery characterized many sectors of employment until well into the nineteenth century:

In industry after industry the machine question was still being fought out in mid-Victorian times, and there was a whole spectrum of occupations where mechanization was still being resisted, or its scope drastically curtailed, in the 1890s; the last great machinery strike in the boot and shoe

trade did not take place until 1895; while as late as 1898 a steam saw mill was blown up in the Forest of Dean. There were also striking regional variations in the application of invention and progress of the machine, and in some cases at

least the strength or otherwise of the workers' opposition seems to have been the deciding factor. (18 , P. 9)

Nevertheless, within the factories, working class organization was to adapt and develop, and extended from there outwards in the great agitations for control of the length of the working day and the regulation of the work of women and children.

Through various stages of employment legislation in the form of the Factory Acts, popular struggles were able to actually modify the way in which employers could control and use workers. Just as employers were to use the state to create their version of a 'free' market, so

too they were forced to make concessions to the working class and accept limitations on the working day. The demands were resisted to varying degrees, but the point is that concessions relating to working conditions and the length of the working day have never been conceded gratuitously. They have never flowed 'naturally' from increases in productivity. They have always been fought for and usually only attained after protracted struggles.

State intervention and restrictive legislative controls can themselves give rise to important technological changes. A fundamental consequence of the introduction and enforcement of restrictive legislation was that it precipitated. What is described by Marxists as the shift from the extraction of absolute to relative surplus value. Employers moved away from simply intensifying work and extending working hours, towards systematically increasing the productivity of labour by introducing new techniques and technology to be operated within a legally regulated working day.

However, there is little point in introducing machines capable of increasing the efficiency of production unless there is sufficient control over the workforce to ensure that the machines will be operated

to maximum capacity. In this situation, technological innovation took on a new role. Machines were introduced both to help create a framework within which discipline could be imposed, and as a conscious move on the part of employers to counter strikes and industrial militancy. As Dickson points out: 'technological innovation was one of the new management techniques'. (8, P. 79).

TAYLORISTS MANAGEMENT

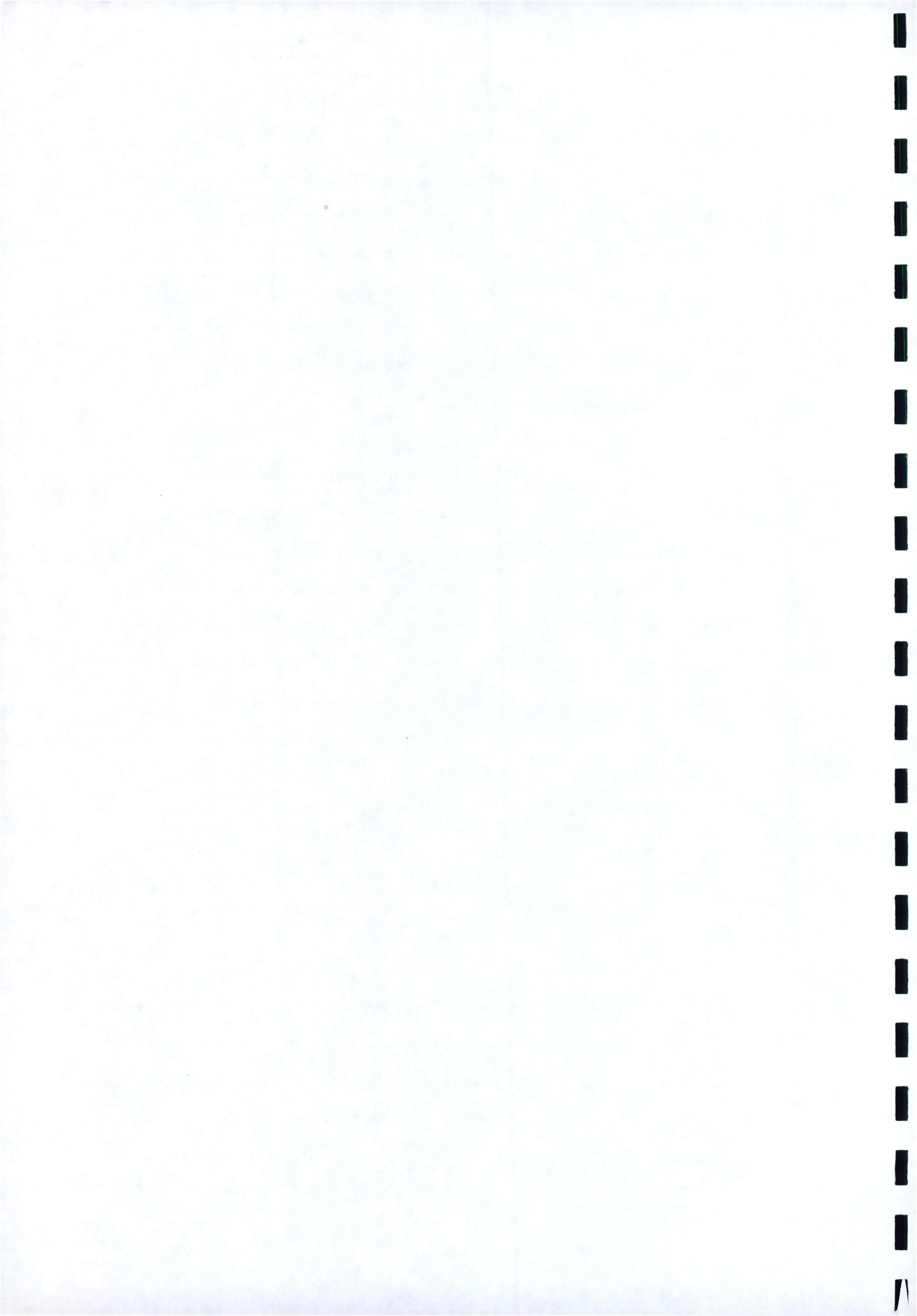
As science and technology were applied to the creation of new products and markets, so too they were directed by management towards organizing the process and methods of production and controlling labour. At the turn of the century, this movement was to receive its most coherent exposition in the practical and intellectual work of F.W. Taylor - The Principles of Scientific Management - where he distinguished between what he called ordinary and scientific management.

Under ordinary management there is a reliance on the traditional skill of workers. Their activities are controlled by general orders and managers try to induce 'each workman to use his best endeavours, his hardest work, all his traditional knowledge, his skill, his ingenuity and his good will - in a word, his 'initiative', so as to yield the largest possible return to his employer' (10, P.92).

For Taylor this was inappropriate for overcoming the 'systematic soldiering' which scientific management was aimed at. This 'soldiering', or worker resistance consisted of the deliberate and organised reduction, or control, of the pace of work by groups of workers. Taylor's solution was to introduce a particular set of management techniques, legitimated as scientific.

The crucial task for management was to ensure that individual workers behaved as much like machines as possible. This would be achieved in two main ways. First, the work process was broken down into its component elements, so that the exercise of skill and judgement and the coordination of different activities could as far as possible be removed from workers. Secondly, workers needed to be motivated through the use of economic incentives and sanctions. In this system, according to Taylor: 'the workman is told minutely what he is to do and how he is to do it, and any improvement he makes upon the instructions given to him is fatal to success'. (7, P. 87)

Taylorist management techniques have been modified by subsequent experience, and have been undermined by countervailing tendencies, but they undoubtedly influenced the approach and practices of contemporary industries (6, and 10,).



Clearly, the application of technical innovation cannot be viewed as a neutral, value-free activity. Nor can we assume that its employment effects are invariably benign. Rather, it occupies an ambiguous position in the dynamic process of material production. It effects, and is designed to structure, the social organization and division of labour at the same time as it is aimed at incremental increases in physical output. Only by appreciating this double-edge to technological innovation can we understand current debates about the quantitative and qualitative effects of new technologies.

DISENCHANTMENT

Disenchantment with technology was first expressed in a novel 'Brave New World' by the British author Aldous Huxley appearing in the midst of the Great Depression in 1932, contrasted sharply with Edward Bellamy's 'Looking Backward'. Huxley pictured a society of the near future in which technology was entirely enthroned keeping mankind in bodily comfort without knowledge of want or pain, but also without freedom, beauty or creativity and robbed at every turn of a unique personal existence. An echo of Huxley's viewpoint found unexpected artistic expression in the

film Modern Times, in which Charlie Chaplin depicted the depersonalizing effect of the mass production assembly line.

TECHNOLOGY AND ITS CONTROL

I believe we have now reached the point where humanity has to find a new stable life form in which its forward development is an inward journey rather than an external expansion. The problem is not the abolition of technology, but its subordination. (2, P. 221)

Technology, Ellul held, had become so powerful ubiquitous that other social phenomena such as politics and economics are situated "in it" rather than influenced "by it". Modern mans mind is completely dominated by technical values and his goals are represented only by such progress and happiness as is to be achieved through techniques. The individual in other words had come to be adapted to the technical milieu rather than the other way around. (9,)

Whatever justice lies in the views of Ellul, his predecessors, and his successors to come, no actual repudiation of technology appears to be possible. Technology seems destined to grow, in accordance with laws that man can in all likelihood discover only in retrospect. The need to exercise control over technology

at once raises the question of who or what is to control the controllers. Yet some critics feel that this question may not be as formidable as Huxley and others have made out, because a planned technological society in which the planning would be limited to producing abundance and eliminating the need for drudgery might leave great scope for freedom and democracy. At least in a relatively short run, it would be fair to say that the momentous political-philosophical questions with which the world will grapple in the closing decades of the 20th century and the first decades of the 21st may be influenced by technology in a favourable as well as unfavourable sense. A few general principles in respect to technology's future have won broad acceptance: that the problem is global and cannot be adequately dealt with inside national borders; that institutions are needed to study technological problems, both technical and social; that both technologists and non-technologists must be given appropriate educational formulas; and that, by these means and whatever others are discovered, technology must be made man's servant. In the final analysis, this surely means mastery by man over himself, for if anyone is to blame, it is not the tool but the human maker and user. It is a poor carpenter according to the adage, who blames his tools, and, just as it was naive for the 19th century

Victorians to imagine that technology would bring paradise, it seems equally so for the 20th century pessimists to make technology itself a scapegoat for man's shortcomings.

CHARM OF TECHNOLOGY

One of man's shortcomings may be a common failure to appreciate the charm of technology. Novelist and social critic Arthur Koestler has pointed out that the traditionally humanities-educated Western man is reluctant to admit that a work of art is beyond his comprehension but will cheerfully confess that he does not understand how his radio or heating system works. Koestler characterizes such a modern man, isolated from technological environment that he possesses without understanding, as "an urban barbarian." Despite its publicized shortcomings and its sometimes sinister hint of autonomy, technology is after all a human product, growing not only out of man's need to improve his material condition but out of his love of play and adventure. It is capable of furnishing a distinctively human pleasure at its workings and a human excitement at its unfolding. Man orbits the Earth and visits the Moon because, among other reasons, he finds the experience thrilling.

The spirit of adventure that has been associated throughout history with man's association with technology will certainly be of value in confronting the massive challenges of the future. 'The day before yesterday' wrote Gaston Berger, president of the Encyclopedie Francaise:

We follow unconsciously what was call Nature; yesterday we tried conscientiously to conform to "nature", but today, our power having grown considerably, it behoves us sometimes to protect nature and sometimes to arrange it in ways which seem favourable. We have somehow responsible for evolution...a reality is to be constructed and events awaited. (4)

TECHNOLOGY AT A CROSSROADS

We stand at a crossroads in the evolution of Western consciousness. One fork retains all the assumptions of the Industrial Revolution and would lead us to salvation through science and technology, in short, it holds that the very paradigm that got us into trouble can somehow get

us out. Its proponents (and they generally include the modern socialist states) view an expanding economy, increased urbanization and cultural homogeneity on a Western model as both good and inevitable. The other fork leads to a future

that is as yet some what obscure. It advocates are an amorphous mass of Luddites, ecologists, regional separatists, steady - state economists, mystics, occultists and pastoral romantics. Their goal is the preservation (or resuscitation) of such things as the natural environment, regional culture,

archiacmodes of thought, organic community structures and highly decentralised political autonomy. The first fork clearly leads to a blind alley, or Brave New World. The second on the other hand, often appears to be a naive attempt to turn around and go back where we came, to return to a feudal age now gone by. But a crucial distinction must be introduced here, recapturing a reality is not the same thing as returning to it. (3, P. 188-189)

Science and technology have a tremendous influence on social, political, economic and ecological conditions and are ultimately bound up with our hopes and fears for human life now and in the future.

Science and technology have given us standards of comfort and technical marvels, unimagined formerly and they promise more, but they pose threats too, graver in some ways than those faced in the past. Their products permeate our environments at home, at work and at leisure; they invade our minds and shape our consciousness with the ideas they promote. (5. P.1)

The concrete experience of scientific management in the workplace, and the impact of science and technology on other areas of social life, has led to a degree of scepticism about their benefits. In many ways we appear to be emerging from a consensus about the role, place and potential of science and technology - a process that has been accelerated, and given a new focus, by debates and microelectronics.

However, such a development is not necessarily surprising. There has been a pervasive ambivalence detectable in attitudes to modern industrial society since the mid-nineteenth century. This has not been a prerogative of the factory workers, who have experienced its worst effects. It has been a state of mind shared by many in the middle and upper classes who have objected

to the social consequences of industrialism and economic growth. Martin Wiener, in his extensive examination of English Culture and The Decline of the Industrial Spirit 1850-1980) argues:

The era of the industrial revolution, which had established the order of Victorian England, was ripe for re-evaluation. Disenchantment with industrialism encouraged historical reinterpretation of the origins of the machine age. Beginning in the eighteen-eighties, both scholarly and popular historical accounts of the industrial and agricultural revolutions were intertwined with the recasting of social values. This historical writing was not only hostile to unregulated capitalism, but also questioned the value of technological advance, and the pursuit of economic growth itself. Through this writing there was fixed upon the English mind a strikingly negative image of what was, in the long perspective, perhaps the most decisive contribution of England to the history of the human race. (26, P. 82)

Subsequently, these attitudes have been augmented by a critique of the role and neutrality of science and technology. Questions have not only been raised about the outcomes of particular innovations or inventions, but about the basic assumption that science and technology are progressive forces (1).

In the 1960s there seemed to be a shared assumption about the ability of science and technology to be enlisted in remedying many social problems - from poverty and unemployment to underdevelopment and

ill-health. Today it would appear that far fewer people are convinced. Few people would suggest rejecting advances which have been of manifest benefit, but they are unwilling to transfer that 'legitimacy' to many other 'scientific' activities which are seen as implicated among the causes of many contemporary problems.

Scientific and technical discoveries are now often perceived not as incremental advances along an evolutionary path, but more often than not as malevolent and threatening. 'Science' is associated with nuclear weapon systems; with animal experimentation; with environmental hazards and pollution; with the technology that is putting people on the dole; and with the gene splicing that manipulates the very substance of life. The cultivated image of benevolent scientists producing magical cures and inventions of genius has, according to Science on Our Side: A New Socialist Agenda for Science, Technology and Medicine British for Social Responsibility in Science (1982), been replaced for many by the image of those who gave us the atom bomb, Seveso, Thalidomide, Opren, Three Mile Island and Flixborough.

The beneficial effects ascribed to the new technologies are no longer taken at face-value. Of

course scientific development and technology has the capacity to relieve monotony and isolate workers from dangerous processes; but it can also be used to subject them to new health hazards, reduce them to mindless machine-minders and ultimately deprive them of work. The scientific developments which have given rise to biotechnology, microelectronics and the new information technologies have themselves been part of the social processes which, for good reasons, have been questioned.

The application of science and the technology of production always involved far more than the creation of new products or technical gadgets. It necessarily affected the social organization of work. Time and motion studies, assembly lines, mechanization, automation and, nowadays, robotics, have all been presented as the application of 'science', with enormous implications for the employment conditions of those affected. These methods are now also being applied to work in offices, shops and banks.

Science, technology and society studies draw on many disciplines. The chief concern of those studies is not with peripheral abstract and academic issues but with problems which are central to our lives. They are projected at us from our television screens and newspapers every day:

shortage of food, suffering and ill health; scarcity of energy resources; disruptive effects of new technologies and new modes of communication; art, above all, threats of devastation by war -

these are concerns which demand attention and action. They are not the sort of problems that, if ignored, will go away. They are diverse, but they have one thing in common. Science and technology are deeply implicated in all of them, both as part of their cause and part of the attempted cure. (5, P. 1)

FROM 1900 TO 1945

From 1900 to the present day there have been more advances in technology over a wide range of activities than the whole of previously recorded history. From 1900-45 technology had a tremendous social impact, the automobile and electric power for instance radically changed both the scale and the quality of 20th century life, promoting a process of rapid urbanisation and a virtual revolution in living through mass production of household goods and appliances. The rapid development of the aeroplane, the cinema and radio made the world seem suddenly smaller and more accessible. The development of modern pharmaceuticals, medicine, antibiotics, pesticides and many products of the chemical industry further transformed the life of most people. In the years following 1945 the constructive and creative opportunities of modern technology could be exploited although the process has not been without its problems.

CHAPTER II: POST INDUSTRIALISM

FROM 1945 ONWARDS

From 1945 to 1970 saw the space age. The atomic bomb was used at the end of the Second World War in August 1945. Nuclear weapons underwent great advances with the technique of hydrogen fusion (1950) and the use of long range weapons. There were also great advances in engineering, chemicals, medical technology, transport and communications. Some writers refer to this period as the "Second Industrial Revolution". The rapid development of electronic engineering created a new world of complete technology remote control, miniaturization and instant communication which has transformed almost every department of industry and administration and reached into every household. Even more expressive of the character of the period has been the leap over the threshold of extraterrestrial exploration. The techniques of rocketing first applied in weapons, were developed to provide launch vehicles for satellites, lunar and planetary probes and eventually in 1969 to set the first men on the moon and to bring them back safely again. This astonishing technological achievement resulted from the rivalry between the Soviet Union and the U.S. Atomic power stations were built in advanced industrial nations to

supply electric power but they present formidable problems of waste disposal and maintenance.

CHALLENGE OF TECHNOLOGY

Technology confronts modern civilization with a challenge to make a decision, or rather a series of decisions about how the enormous power now available to society will be used. The need to control the development of technology by regulating its application to creative social objectives make it even more necessary to define these objectives while the problems presented by rapid technological growth can still be solved.

These problems and the social objectives related to them may be considered under four broad headings: nuclear technology, populations explosion, social difficulties and the ecological problem.

NUCLEAR PROBLEM

The solution to the nuclear problem is generally thought to be political. Large scale nuclear war pose the ultimate hazard to life. Immediate death for up to one billion people and subsequent death, disease and famine calculated to effect four billion people. Nuclear weapons are a worldwide problem. Fortunately,

the lowering of the Iron Curtain gives hope that these weapons of destruction will decrease in numbers. (19)

POPULATION PROBLEM

The population problem (assuming that the nuclear threat can be averted) must be tackled if life is to be tolerable on the planet in the next century. Medical technology which through new drugs and other techniques, has provided a powerful impulse to the increase of population, also offers means of controlling this increase through contraceptive devices and through painless sterilization procedures. Again, technology is a tool that is neutral in respect to moral issues about its own use, but it would be futile to deny that artificial population control is inhibited by powerful moral constraints and taboos. Some reconciliation if these conflicts is essential, however if stability in world population is to be satisfactorily achieved. On the other hand, even the most optimistic program of population control can only hope to achieve a slight reduction in the rate of increase by the end of the 20th century, so that a second approach to the population problem must be made simultaneously in the shape of an enormous effort to increase the world's production of food. Technology has much to contribute here, both in raising the productivity of existing sources of food

supply and in creating new sources by making the deserts fertile and by farming systematically the riches of the oceans. There is enough work here to keep engineers and food technologists busy for many generations. In 1988 the world population numbered 5 billion. It is anticipated to be some 6.25 billion by the year 2000 and between 7.5 billion and 9.0 billion by 2025. (21, P. 139)

SOCIAL PROBLEM

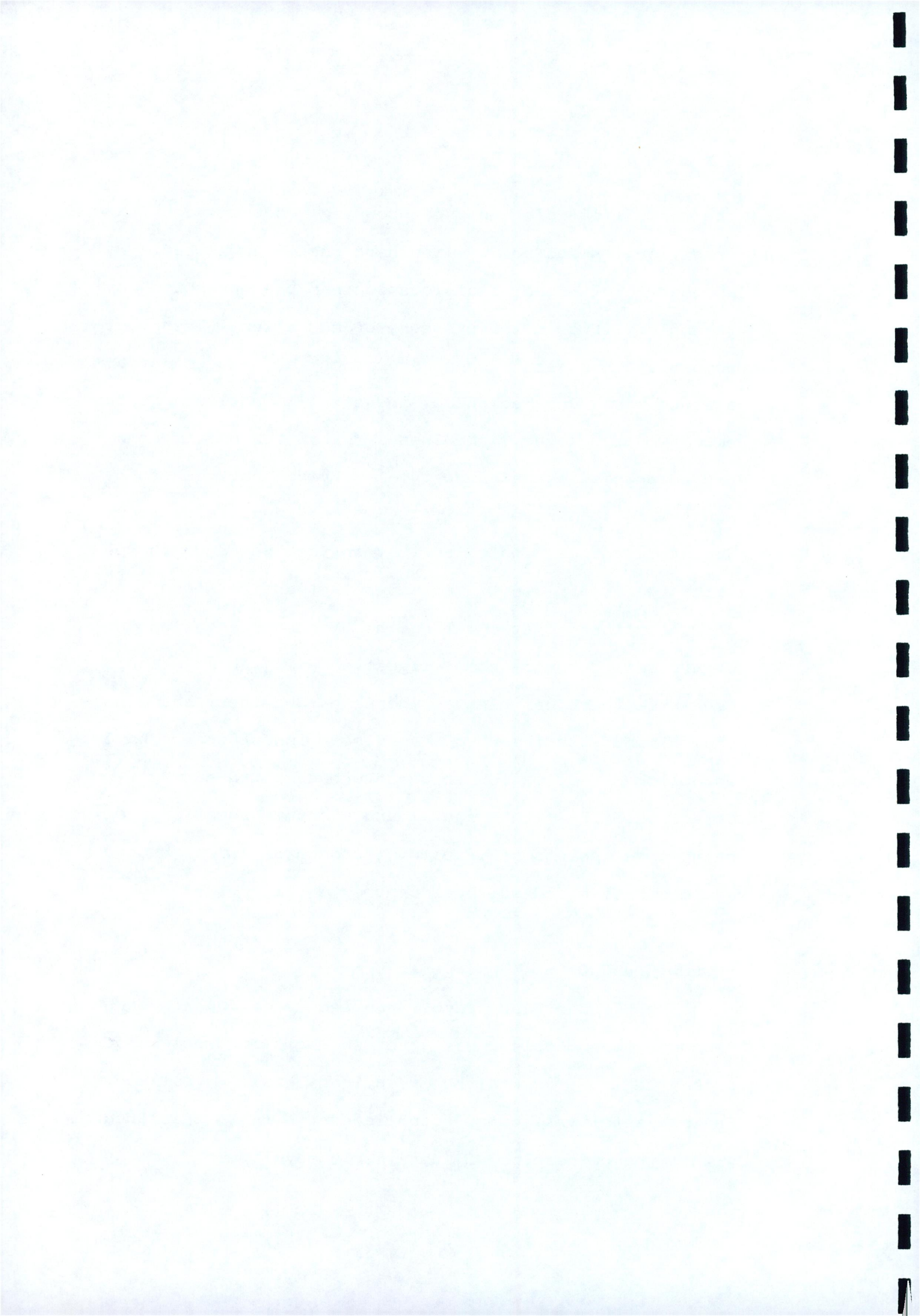
An operative solution to these first two problems will bring to the fore secondary social problems associated with a way of life based upon large-scale technology. These are already clearly visible in the advanced industrial countries, but they are likely to become more widespread. The cities of many industrial nations are already afflicted by urban blight, as the traditional centres are deserted by the middle class and left to socially disfavoured and impoverished groups, with a consequent loss of social order.

This decay of the megalopolis has been caused largely by the automobile and electricity, which made possible the rapid expansion of towns and then contributed to their depopulation. Another consequence has been the increase of urban sprawl around cities, and

the spoiling of the neighbouring countryside as traditional rural communities have been overwhelmed. At another level, social dislocation has been prompted by technology through the pressure of education. Technical education has long been recognized as an essential feature of any advanced industrial nation. Such education, however, requires a high level of literacy and numeracy, so that industrial survival has come to be equated with an elaborate system of national education. Recent evidence indicates that in the USA and Europe with their efficient agriculture, transportation and communications systems there has been a cessation of significant rural-urban migration (in Third World Countries there has been an increase) and the transition from manufacturing to service industries have established a situation in which urban growth has established. A city's social and economic function from being focal points of industrial production will become administrative and cultural centres. (21, P.141)

ECOLOGICAL PROBLEM

The fourth and final problem area of modern technological society is the ecological problem of preserving a healthy environmental balance. Environmentally secure economic growth was described within the principles of sustainable development, as



'development that meets the needs of the present without compromising the ability of future generations to meet them.' (27,) Though man had been damaging the environment for centuries by overcutting trees and farming too intensively, and though some protective measures, such as the establishment of national forests and wildlife sanctuaries, were taken decades ago, great increases in population and in the level of industrialization have caused a public crisis. Thus the great public concern with pollution in the advanced nations is both overdue and welcome. Once more, however, it needs to be said that the fault for this waste-making abuse of technology lies with man himself rather than with the tools he uses. For all his intelligence, man behaves in communities with a thoughtlessness for his environment that is potentially suicidal. It is debatable, then, whether technology is a blessing or a bane. The history of technology has led from the earliest technological achievements of man the tool-maker to the crossroads at which the species now stands, in the last third of the 20th century, confronted by a choice, that of self-destruction or a millennium of adventurous growth and expansion, reaching out to colonize the universe, unlocking the secrets of controlled nuclear fusion as a source of power, exploiting exotic sources of food, and creating a healthy and well-regulated environment. (16 Ch. 3-4)

CHAPTER III: INDUSTRIAL CRISIS

Many writers and thinkers view the advances that technology has made over the last 200 years are concerned with the ethics and ideology of present day technology and where it will take us in the future.

Capitalism along with Science and Technology have brought enormous benefits to mankind. In the process an enormous price had to be paid, the labour force had been decimated. Advances in technology had increased productivity but at the expense of jobs and an increase in unemployment.

INDUSTRIAL UTOPIA

As societies practices are founded on the idea that these practices will eventually result in a Utopian society. When a society realises its practices will not deliver this Utopian, the practices are no longer tolerated. Recent history proves this with fall of communism in the east.

Capitalism provided a Utopia based on an expanding economic sphere. Because of this expansion each person would be able to achieve economic fulfilment, this potential to accumulate capital would mean emancipation for all and an end to scarcity. All resulting demands

from society being met by market forces, would turn society into abundance. Emancipation and liberty would come about because of competition between producers and an end to dependence on single producers and monopolies.

This utopia has been achieved twice-in America in the 50s and 60s and again in Japan in the 80s. Unfortunately both were short lived and they are now trying to deal with the crisis of work.

SELLING CAPITALISM TO THE WORKERS

The economic rationalization and organization of labour, or selling capitalism to the workers, was by far the most difficult task in industrial capitalism. Craft production and craft related activities are pleasurable, and the pleasure derives from doing something well that you know well how to do. Craft production also involves the complete loss of oneself in the task because of the complete involvement of ones mind and body. Mass production depends on making activities methodical and better adapted to their object. It requires just enough physical attention to perform a repetitive task, and this work by its nature is not pleasurable. Industrial capitalism was a revolution, a subversion of the way of life, values, social relations and relations to nature. Productive activity now meant earning a wage and became

a way of earning a living, rather than a living in itself. Time for working and time for living became disjointed. The social aspect of work became important, a sense of community was promoted among people working on the factory floor. Satisfaction from work was achieved in spending the money earned during work.

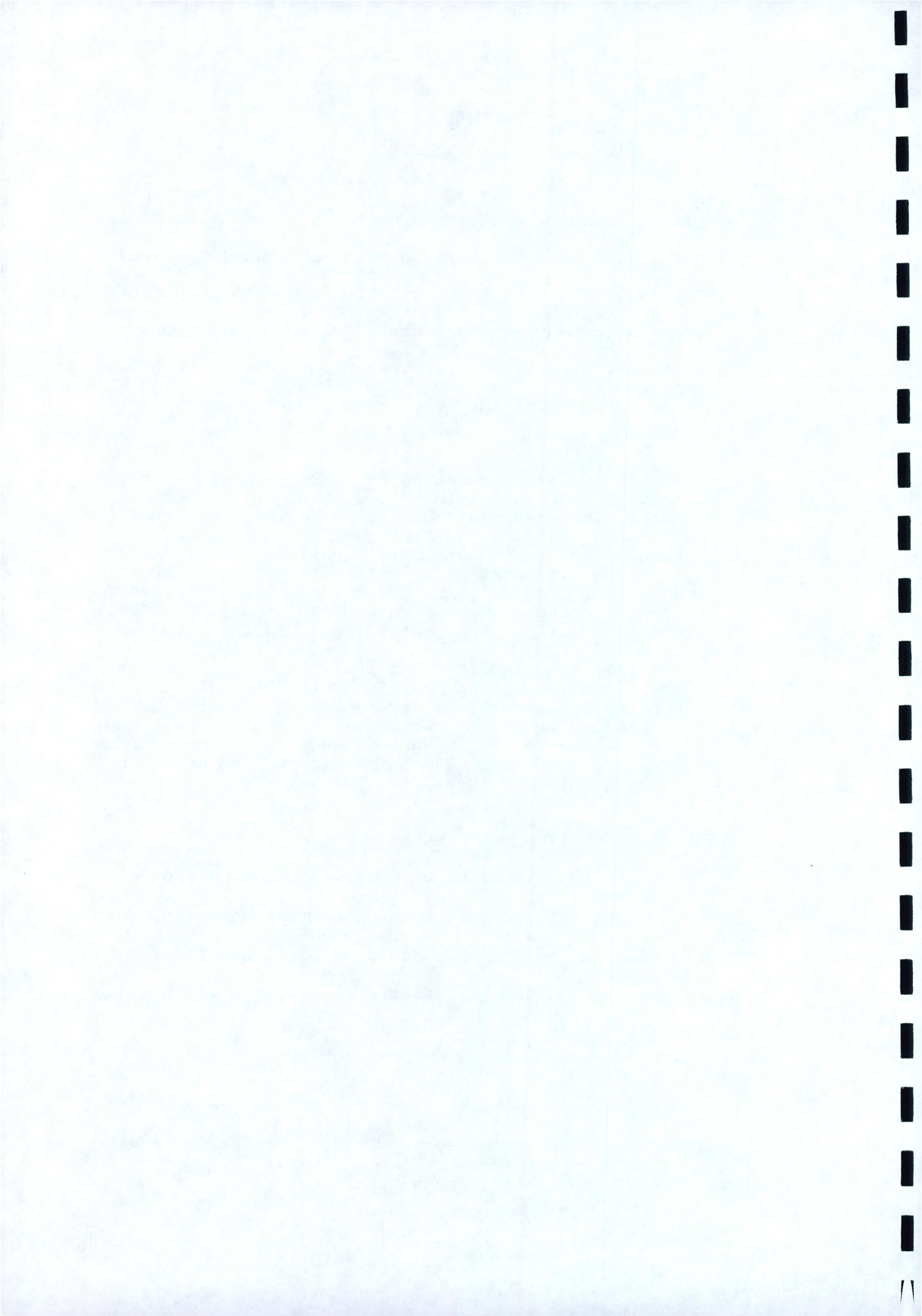
It is essential to calculate and forecast labour costs accurately since it was on this condition alone that volume and price of the merchandise produced and the expected profit could be calculated. Without this knowledge the risk involved in making investments was too great. Labour must be capable of being measured in itself as an independent, isolated from the individual characteristics and motivation of the worker.

But this also implied that the workers could enter the process of production stripped of their personality, individuality, goals and desires, as simple labour power, which was interchangeable and comparable to that of any other workers and which served goals which were not their own and moreover, meant nothing to them. (14)

THE MORE THE BETTER

The pre-industrial worker derived pleasure from his activity not the economic rewards of that activity. He would tend to limit his economic needs to his level of activity, and he was satisfied with a level which was sufficient.

The idea of 'sufficient for ones needs' was centred in a traditional society. The 'desire for more' was a rebellion against the natural order.



The idea of the 'sufficient' and the idea of 'too much' are equally alien to the spirit of capitalism. No quantity can be too great, no enterprise can earn too much, nor any worker be too productive. The rank everyone occupied would be determined by competition with others and by perpetual competition.

WORK ETHIC

It became our moral duty to work harder and longer so that we would produce more and more material goods so that we would earn more and consume more. More work would end unemployment. Work was the panacea for all our ills.

The protestant work ethic effectively removed men from their families, preventing them from thinking and engaging in social activities. In short it prevented the worker becoming a human being. People would work longer and longer hours for money. Money became their only goal.

Money earned by work came to be perceived as being worth more than the life one had to sacrifice for it.

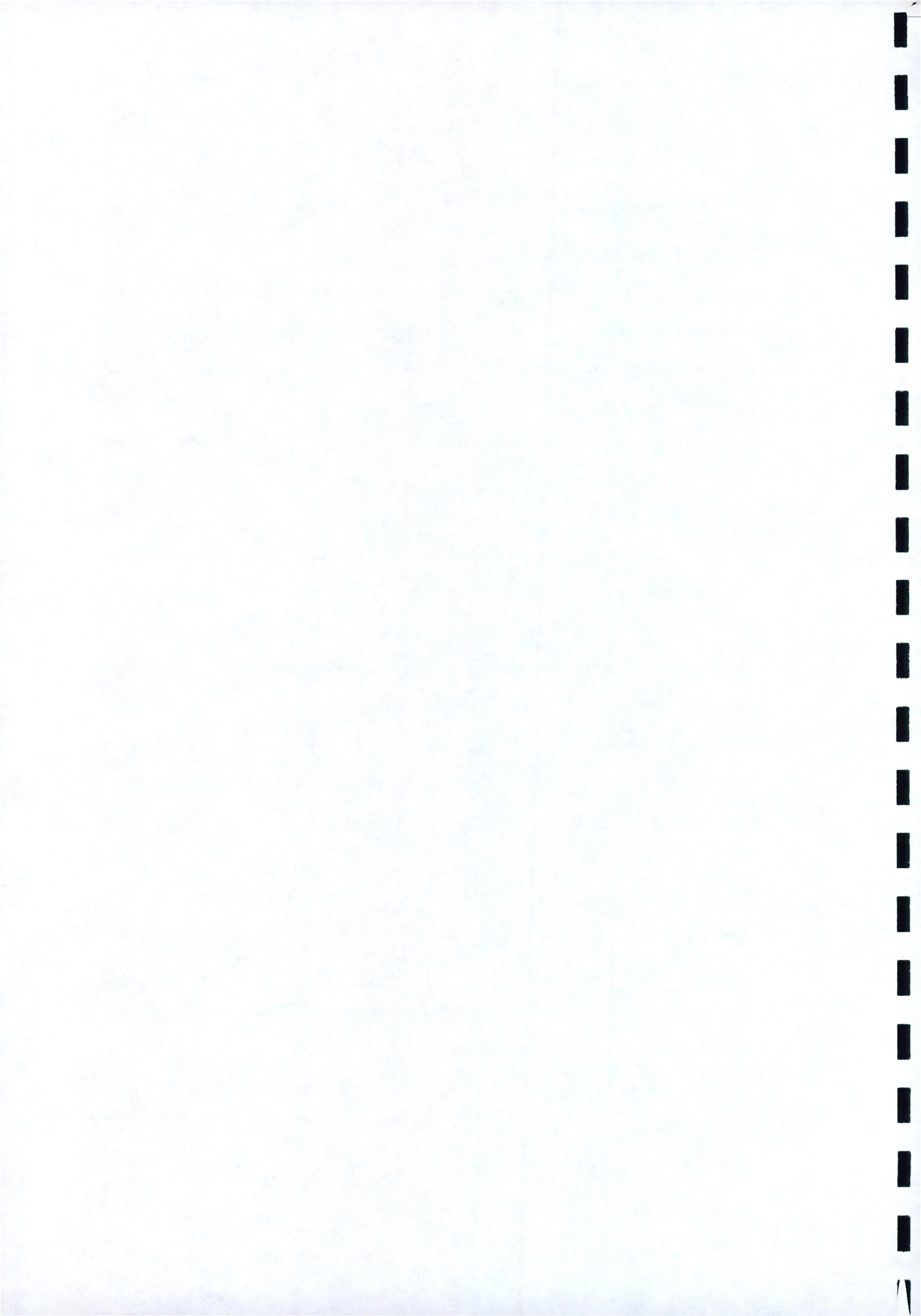
The socialist work ethic was founded on the principle through social cooperation on the factory floor a socialist worker's utopia would be created.

NEW NEEDS CREATED

The introduction of new and better machines along with the increase in productivity of labour produced an enormous quantity of material goods, well beyond the existing needs of the people. A demand would have to be created particularly for the goods that were most profitable to produce.

Unlimited maximization of demand is needed to supersede all principles of self-limitation. There must be a craving created for more goods helped by the privileged elite's conspicuous consumption. The ideas of sufficient and enough were no longer relevant, more is always better. Every known mechanism to increase consumption must be brought to bear. Advertising is the main tool in increasing consumption.

According to J Walther Thompson advertising's main function is to educate people to expect higher standards of living associated with consumption. Advertising plays on people's aspirations and insecurities, materialism reflects people's prowess and standing in society, possession and consumption gives meaning. (11, P. 119-120)



MACHINES AND MORE MACHINES

It is impossible, according to industrial rationality, to plan production economically if one is depending on labour to produce goods with varying degrees of speed and efficiency. Quality, quantity and cost of production depend on rationalization of production. Rationalization of production depend on the rationalization of labour. This in turn demands the standardization of machines. Standardization of machines results in standardization of products, and that calls for standardization of workers.

Technological advances have rendered a whole series of jobs unnecessary. But technology is not directly responsible for these loss of jobs, the capital requirements of labour are responsible. Labour as a commodity was a useful 'asset', if a factory owner liberated this 'asset', it would quickly take up alternate employment in a continually expanding economic sphere, well thats how the idea works anyway. Unemployment was seen as constituting a displacement of activity rather than the abolition of jobs.

So as technology advanced increased production is obtained by decreasing amounts of labour and as a result the social process of production no longer needs

everyone to work on a full time basis. The work ethic was no longer viable and work based society was thrown into crisis.

SELLING INDUSTRIALISM TO THE WORKERS.

To combat the above a new work ethic was to be created which would enable workers to identify with their work.

The Scanlon Plan of 'Participation' was introduced. The Scanlon Plan owes its name to a steelworker who became a management consultant in the late 1940s.

Work was to be much more gratifying and autonomous due to;-

- *Restructuring of jobs.
- *Job Security/Employment for Life.
- *Co-operation of workers with management.

Complex tasks would be undertaken by semi-autonomous teams who would divide the work between themselves as they thought best. This co-operation between workers would, it was hoped, increase productivity and reduce absenteeism and disruptive strikes which had previously allowed a few dozen workers paralyse large factories.

Manufacture using labour had reached its maximum output by the 1960s. Rising labour costs with no corresponding increase in outputs led capitalist rationality to one conclusion, reduce jobs. Gorz refers to research in Germany which contrasts the impact of investment between 1955 and 1960 and between 1970 and 1975. In the former period the investment of 100 billion D.Marks was associated with the creation of two million jobs in German industry; in the later period and equivalent level of investment was associated with a fall in jobs of half a million.

Technical restructuring in industry and the industrialized services caused a contraction in the number of waged workers. Repetitive jobs were progressively automated or computerized, semi-skilled workers and unskilled employees were dismissed, retired early or encouraged to retrain.

Splits in the trade union movement appeared, the 1965-75 period came as a result of the fragmentation and subdivision of labour whose principle aim was to dominate the workers. The labour process had been developed into a scientific process and was no longer dominated by the workers. The workers job security disappeared because industry was no longer dependant on the workforce.

Semi-skilled workers rebelled against scientific work organization especially the extreme forms of Taylorist fragmentation of jobs. There was a period of wildcat strikes, mass absenteeism and sabotage which produced a rapid rise in wage costs and the motives for the rebellion were difficult to express in terms of negotiable trade union demands. Economic rationality had been pushed to its limits.

JAPAN HAS A GO

The Japanese took the scanlon plan and adapted it and it was in its Japanese version that it was reimported to the West in the 1970s.

This job security/employment for life offered in exchange for co-operation is increasingly coming under pressure. Even the Japanese can only guarantee jobs for life by subcontracting out certain manufacturing and services in which the parent company has no vital interest to many satellite companies. These subcontracting companies when uneconomic conditions arise can be sacked by the parent company.

Job security in the parent companies is matched by unstable employment and social insecurity through out the rest of the economy, including its subcontractors.

THE IDEOLOGY OF HUMAN RESOURCES

This new employers' ideology, the so called ideology of 'human resources' is seeking to integrate a stable core of permanent skilled workers into modern enterprises which are portrayed as 'sites of intellectual and personal fulfilment;' whilst advocating 'modest jobs for a modest wage' in service enterprises particularly 'person to person' services for the rest.

The new ideology also acknowledges that labour is not an instrument of production like any other, and that its efficiency and performance depended on factors which are not calculable and do not derive from economic rationality, such as the working environment, job satisfaction and the quality of social relations of co-operation and so on.

Employment for life and social integration are privileges reserved for an elite (about 25% of Japanese employees in 1987). This figure is decreasing, older workers are encouraged to retire and are not replaced.

The stable elite core of employees with a wide range of skills will be subject to retraining and modifying their career plans in exchange for job security. There will be continuous in house training in

company skills and the firm relies largely on the employees it has trained and vice-versa.

Around this stable core is a peripheral workforce divided into two groups. The first group has permanent employment to do administrative jobs and to monitor, service and test installations but it is not highly skilled and can be renewed, enlarged or replaced at will by recruiting from the ranks of the unemployed. There is also the second group of peripheral workers employed on a temporary and part time basis as economic conditions demand.

By increasing or decreasing the proportion of temporary and part time workers at will enterprises can adjust their work force to meet fluctuations in the market made possible by an almost inexhaustible reserve of unemployed workers.

Lastly there is the external workforce which includes extremely highly skilled professionals (such as data processing specialists and chartered accountants) as well as workers with no particular skills (such as cleaners, transport workers and catering staff) and the large fluctuating workforce occasionally employed by subcontractors.

Capital has brought about the disintegration of the working class, the trade union movement and what remained of social solidarity and cohesion.

The ideology of 'human resources' created by the employer in earning the loyalty of an elite class of workers they cannot do without and integrating them within the enterprise, also means cutting them off from their class of origin and from class organizations, by giving them a different social identity and a different sense of social worth. This elite will be encouraged to form their own independent trade unions and develop their own form of social insurance. The employers will have eliminated the desire to fight trade union struggles, by stressing the privileges its members chosen from among a large number of applicants enjoying job security, good prospects of promotion envied by all.

DUALIZATION AND MARGINALIZATION

Capital has managed to cut society in two, those who have work and those without work. This has brought about a disintegration of the working class, the trade union movement and what remained of solidarity and cohesion. The creation of an elite of workers was seen by employers as a necessity produced by changes in technology and not to any humanism on the part of the

employers. Hard work would be encouraged and rewarded and we should not subsidize the unemployed, the poor and all the other 'layabouts'.

This ideology in Europe was known as Thatcherism and as far as capitalism is concerned is rational. This ideology failed because it did not see or did not want to see that the amount of work/jobs had diminished and that there was a need to share the jobs available which would reduce the amount of work everyone would do.

The social division or dualization is characteristic of all industrialized society since the mid-seventies due to the unequal distribution of the savings made in working hours. An increasingly large section of the population will continue to be expelled or 'marginalized' from the sphere of economic activities while another section will continue to work as much as or even more than, it does at present, commanding as a result of its performances or aptitudes, ever increasing incomes and economic powers unwilling to give up part of their work and prerogatives and powers that go with their jobs.

ELITE WORKERS

Gorz in the 1990s sees the fragmentation of the workforce into three categories as follows

- * 25% of the working population will belong to a central core of workers, who have stable permanent jobs.

- * A further 25% will have semi-permanent, semi-stable jobs.

- * The remaining 50% will be insecure in occasional employment in unskilled external or peripheral jobs.

In the United States, the percentage of people unemployed or working less than six months a year is 25%, in addition there are 30% of casual workers, usually illegal immigrants, in the tertiary section which are underpaid and have no social insurance whatsoever.

Already 51% of the active population in France aged between 18 and 24 fall into the tertiary category (26% unemployed and 25% in casual labour).

Gorz sees this 50% of the population being excluded from society and the traditional working class emerging

a privileged minority.

The neo-proletariat has nothing to expect of contemporary society nor of its subsequent evolution. That process - the development of the productive forces - has reached its end by making work virtually superfluous. It can go no further. The logic of capital, which after two centuries of 'progress' has led to this outcome through the accumulation of even more efficient means of production, can offer no more and no better. More precisely, productive industrial society can offer no more and no better. Progress has arrived at the threshold beyond which plus turns to minus. We are not going anywhere! (12, P. 73))

The problem with this notion is that it depends on a future which we know might not happen, also the statistics Gorz uses are dubious for two reasons. Migrant workers in the United States have gained illegal entry they have no rights as citizens of that country and should therefore not be included, their status is that of economic refugee. Young people seldom choose permanent employment immediately, an amount of living is permitted.

SERVICE CLASS OR SERVICE INDUSTRY

According to forecasts the world economy is supposed to pick up in '94/'95. There is supposed to be an increase in jobs in the tertiary industries - the service industry. Gorz sees this as just another example of the untenable position industrial rationality has placed us in.

A 'Servile' class which had been abolished by the industrialization of the Great War period, is again emerging. Conservative Governments and even a number of trade unions justified and promoted this social regression on the pretext that it permits the 'creation of jobs', that is, that servants increase the amount of time their masters can devote to activities which are highly productive in economic terms - as if the people who do "odd jobs" were not capable of productive or creative work; as if those who have services done for them were creative and competent every minute of their working life and were thus irreplaceable; as if it were not the very conception the latter have of their function and rights which is depriving the young people of chances of economic and social integration; as if, the differentiation of economic tasks required such a degree of specialization that the stratification of society - into a mass of operatives on the one hand and a class of irreplaceable and overworked decision makers and technicians who need a host of helpers to serve them in order to do their jobs, on the other were inevitable. (11, P. 6)

Consumption depends on people having capital to spend, previously capital was earned in industry. This is where the dilemma begins. People worked in industry to earn an income above their basic needs, the disposable income was spent on consumer durables, and services. If industry is not using labour in production where does the capital come from to support growth in the service industries.

There has been continues growth in GNP the industrial sector. Economic growth in one area creates economic inequalities and political inequalities. This reduces political power and democracy. The service

industries are seen in the West as a means of redistributing the wealth created in industry. (17, Ch.5)

Today, full time employment in the service industry seldom exists. The chances the service industry has of providing full employment are slim.

CONCLUSION

Utopia in crisis

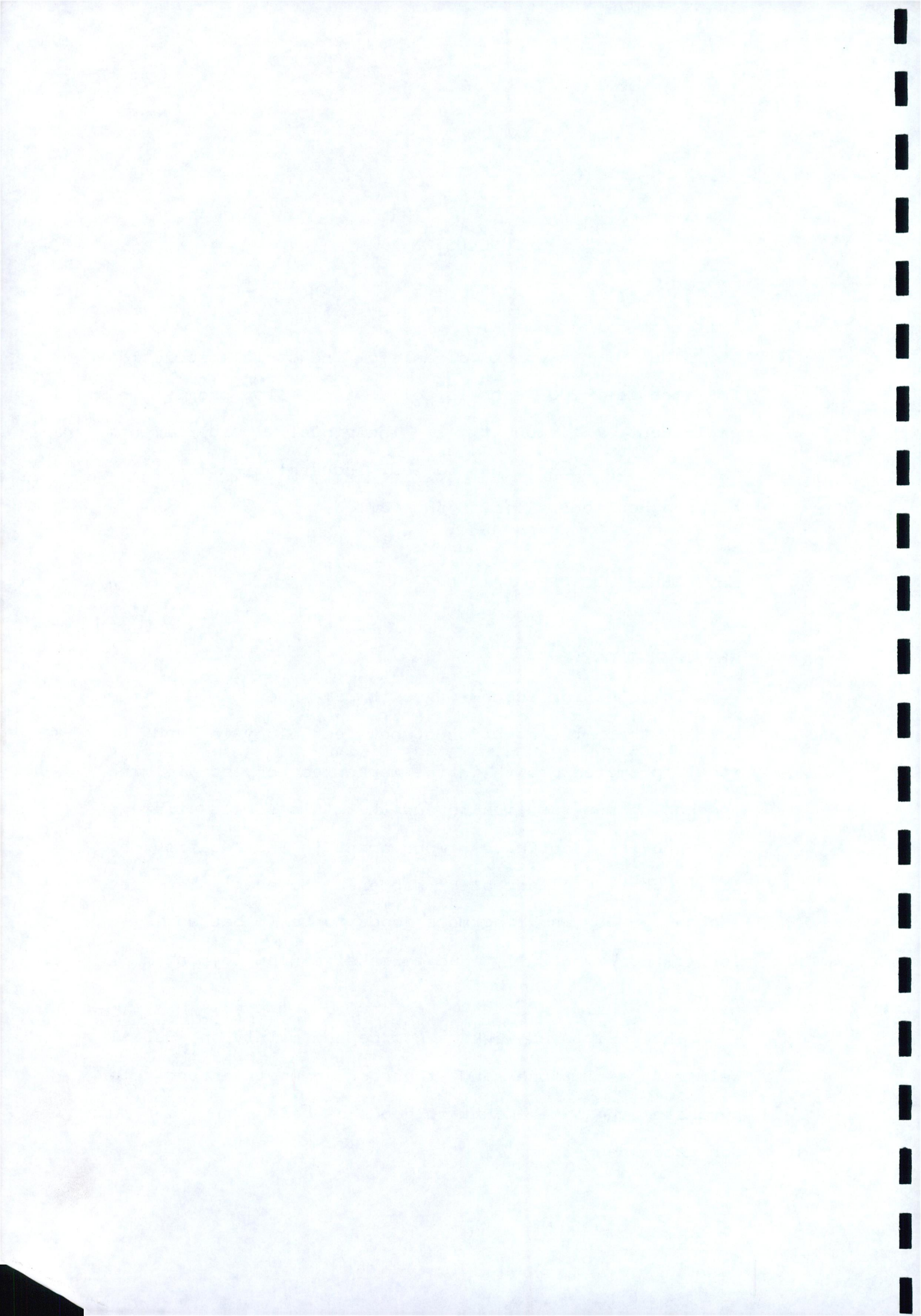
The utopia which galvanised industrial societies for the last 200 years is collapsing. Its promise of employment, security, individual fulfilment, emancipation for all has failed. Industrial rationality has reached to its limits and failed.

HAVE THE STRUCTURES FAILED ?

NEW TECHNOLOGY

Policies for economic growth have been based on the belief that the adoption of new technology in and by itself promotes growth in the market economy so yielding increasing monetary wealth and that this simple strategy can provide continuous improvement in the quality of life. What has actually happened however, is that technology by enabling more goods to be produced with less labour eventually lead to massive unemployment.

The unemployed workers now depend mainly on Social Welfare assistance and therefor cannot afford to purchase the same amount of goods as before and demand for goods decreases.



As demand falls further workers are 'laid off' in an effort to reduce costs. In order to regain profits the producer adopts more new technology which leads to increased production with less labour.

Unemployment and falling revenues to the State increases pressure on social welfare, re-training services and capital for developing new job openings. This deficit must be met by increased taxation, including those with taxable incomes. The quality of life of the employed therefore falls along with that of the unemployed.

FREE TIME VERSUS UNEMPLOYMENT

These technical changes save on working hours across the whole of society and not just only on the scale of particular enterprises, there is better production using fewer working hours and less capital. The factors of production are used as efficiently as possible.

We are thus faced with a social system which is unable to distribute, manage or employ this new found free time, a system fearful of expansion of this time yet which does its utmost to increase it and which, in the end, can find no purpose for it other than seeking all possible means of turning it into money.

It is [writes Hannah Arendt] a society of labourers which is about to be liberated from the fetters of work, and this society does no longer know of those other higher and more meaningful activities for the sake of which this freedom would deserve to be won. What we are confronted with is the prospect of a society of labourers without labour, that is, without, the only activity left to them, surely nothing could be worse. (11, P. 7-8)

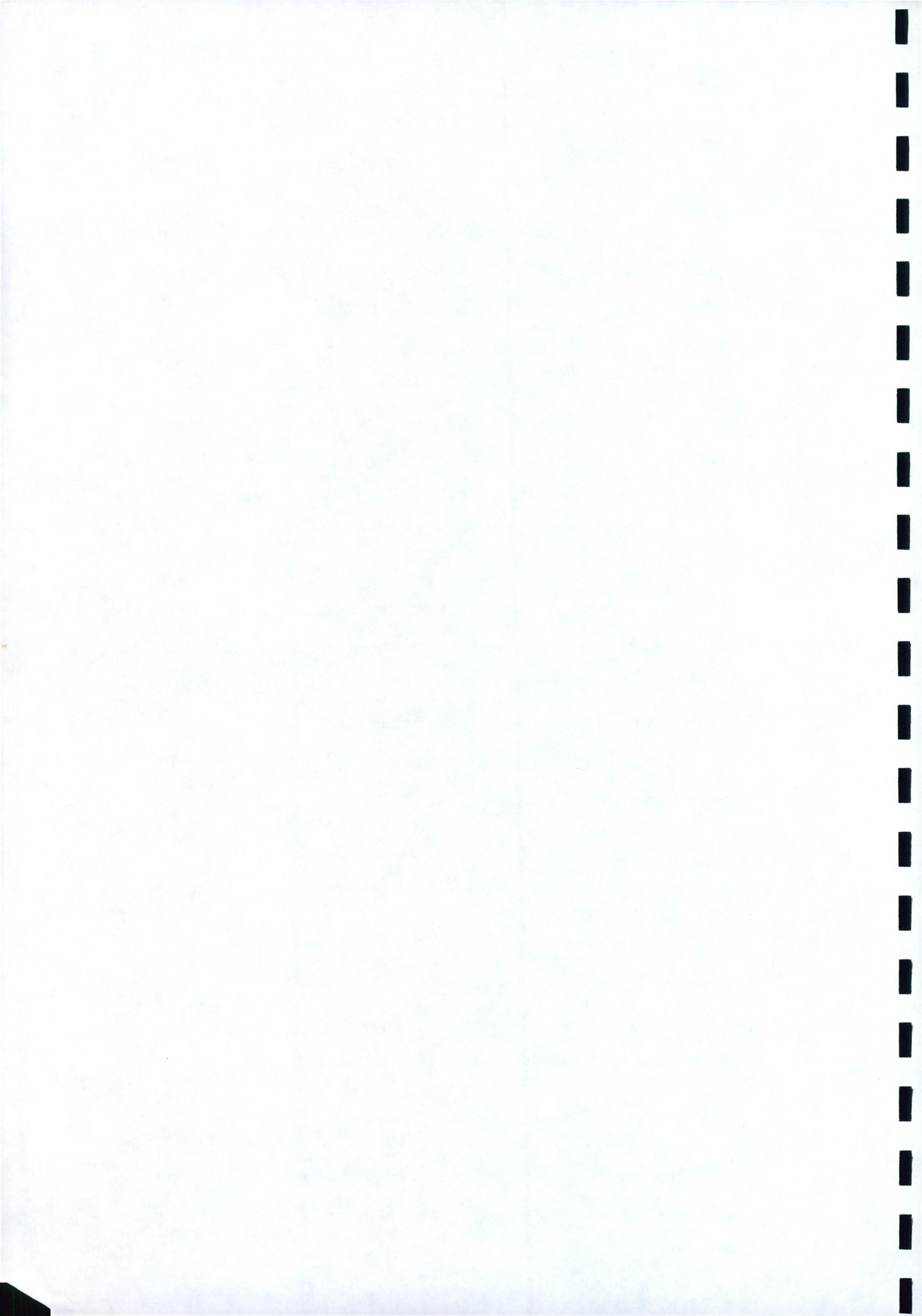
'Advances in Technology' thus inevitably poses the question of the meaning and content of free time, better still of the nature of a civilization and a society in which there is for more free time than working time, and in which therefore industrial rationality ceases to govern everyone's time.

Industrial rationality has effectively made the work ethic obsolete.

WHERE DO WE GO FROM HERE ?

It is now obvious that industrial ideology has outlived itself and as such its structures are no longer valid.

But this is where the problem starts, is one or both structures invalid?



The only way to preserve the environment within which future generations must live is to accept in full the obligation of managing it responsibly. The preservation of our environment and conservation of the earths scarce resources will play an enormous part in which way technology will operate in the future.

But this does not necessarily mean we have to 'through the baby out with the bath water'. Technology has given us huge benefits.

The question is whether or not we remain using a market economy. The obvious advantage of a market economy is that it has supplied the western world with all of its material needs, albeit at the expense of the third world. It is also fuelled by human nature-greed. The problem, in a market economy, is that one will never be able to replace the machines with labour, unemployment would continue.

But this is where anew utopia could be created, the utopia of leisure.

The system could continue as it has been. Power would remain in the hands of the industrialists, and the emerging worker elite. Two basic human instincts-greed

and laziness would keep the world moving. Applying capitalist rationality to the situation the industrialists would realise that by paying the 'people at leisure' a decent living wage the wheels of commerce would keep turning. But power would be kept in the hands of the wealthy.

The alternative is we transcend our basic competitive needs and share equitably employment, resources, and leisure.

The second option seems an impossible goal, but the western world can be internally equitable while it exploits the third world.

The following structures should be used in to enable the establishment of the ideology of leisure.

- *Industry should no longer dictate to society.
- *Freedom as a consumer should be guaranteed by a decent social wage.
- *Education should become a dominant pursuit.
- *Available work should be shared out equitably.
- *Social and environmental impact of new technology should be evaluated.

A SKILLED POPULACE

A quick note on education.

Making skills and higher qualifications more accessible to large numbers is therefor combating the dualization of society. By reducing the working week and recreating jobs by redistributing them, even highly skilled ones, among a greater proportion of the active population, more people can be involved in active employment. The time liberated by reducing the length of the working week could be used to improve and broaden ones skills, occupational and otherwise.

NEW PARADIGMS

We are faced with a future in which unemployment will be normal, not an aberrant experience for the mass of the population. Since we are all potentially among the unemployed we have no choice but to insure that unemployment be solved are its worst effects be alleviated.

New paradigms for society will have to be found.

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