ABSTRACTS

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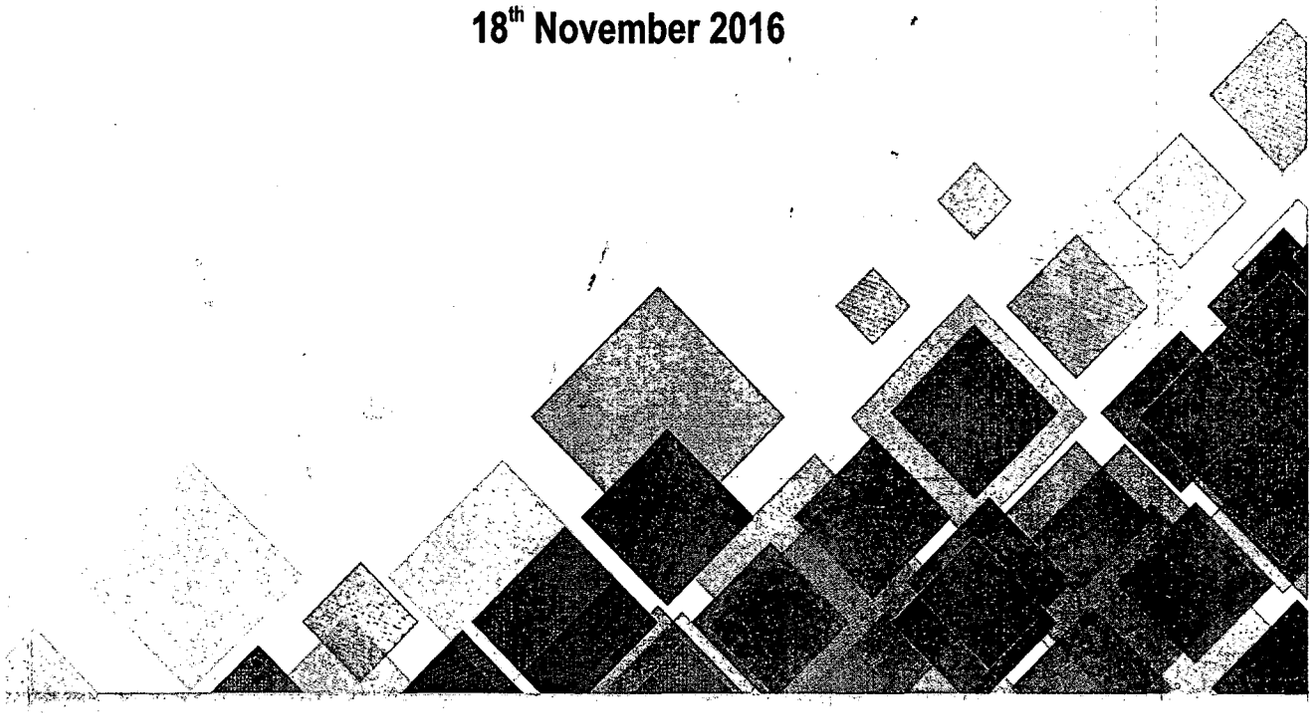

KEYNOTE ADDRESS

Management Research in Science and technology Development in Sri Lanka.

Science and technology are today developing at an ever increasing rate. The outstanding achievements of modern science and technology, which have been embodied in spaceships and automatic space devices, in lightning-quick electronic computers, in atomic power stations, in the deciphering of the genetic code, in the transplantation of human organs, and in many other fields have increased the impact of man on his environment. At the same time these achievements have fundamentally affected the relations between people. Never before have science and technology intruded so insistently upon the various spheres on man's social activity, forcing him to change his concepts of the world and of himself.

The scientific and technological revolution now proceeding before us in full view shows how important is the question of the driving forces of society, the aims of social progress and the rate of this progress. Other questions of paramount importance are the role and place of working people in the technically highly developed system of production and control, the question of what constitutes work and recreation, how the increasing efficiency of labor should be utilized, the inter-relation of man and his natural environment, and similar vital considerations.

The social aspects of modern scientific and technological development concern everyone. For many people the introduction of new technology creates a serious problem of adaptation to new conditions, even though the scientific and technological revolution has made only its very first steps as yet. On the social plane, technological progress is closely interconnected with the most important problems of our time-the problems of war and peace, of want and social inequality, and of democratic and social changes.

In recent years many books and pamphlets have been published dealing with the economic and social problems accompanying the scientific and

technological revolution. These problems have been high on the agenda at many conferences, symposiums and scientific discussions, very often there are irreconcilable differences of opinion over these questions, which reflect opposed class interests, and behind which rages the battle between progress and conservatism and reaction.

Marxist teachings have a direct bearing on the problems of the scientific and technological revolution and made an important contribution to their solution. Marxism has always attached great importance to the development of the forces of production, regarding them as the most important objective condition for social progress. The works of Marxist scholars and the records and documents of conferences of Communist and Workers' Parties contain a profound analysis of the contradictions of the scientific and technological revolution and its influence on the structure and position of the working class and on the development of the class struggle in the capitalist countries. Marxist scholars have explained the reasons for the radically different forms and consequences the unfolding scientific and technological revolution has had in the capitalist and socialist countries and have analyzed the role of this revolution in the economic competition between the two world systems-socialism and capitalism. This was the background of the research culture in 1970s.

At the same time it should be noted that analysis of the complicated processes born of the scientific and technological revolution has only begun and the study of many of the problems is far from complete. Also, the social impact of the scientific and technological revolution is very wide, ranging over practically all aspects of social life.

The present work includes only some of the social aspects and problems of the scientific and technological revolution, the great significance of which has now been properly evaluated. The emphasis has been laid on the advanced capitalist countries where the social consequences of the scientific and technological revolution, bound up as they are with the processes born of the deepening crisis of capitalism, have revealed themselves with sufficient clarity.

The profound social consequences of present day progress in science and technology reflect the revolutionary nature of this progress, its far-reaching achievements.

There are various points of view as to what constitutes the substance of the scientific and technological revolution. Some authors see this substance only in certain of its aspects, such as the great importance of science, the manufacture of synthetic raw materials, etc. The different views and the differences in the understanding of the substance of the scientific and technological revolution can also be seen in the variety of general definitions of the present-day epoch as "the age of electronics"' "the age of cybernetics"' "the age of automation"' "the atomic age"' "the cosmic age"' "Internet of things" etc.

Such definitions are insufficient, of course, because the present-day scientific and technological revolution is a whole complex of inter-connected qualitative changes in the means and tools of labour, in technology and the organization of production, in power resources, and in the content of labour. Taken together these changes have resulted in raising the forces of production to a qualitatively new and higher plane.

The current revolution in the forces of production, as distinct from the technical revolutions of the past, is based on the systematic utilization and tremendous expansion of scientific knowledge. For example, most of the knowledge the world has today has been accumulated during the life of the present generation, while the amount of research to be carried out in the next 10-20 years will equal the amount done throughout the entire history of science. The revolution in science, which is the result of fundamental discoveries in physics, chemistry and biology has given man much more powerful means to use in the conquest of nature. In the past the connection between science and production was for a long time an indirect one. Now scientific research has become an indivisible part of the sphere of material production. The prediction made by Kari Marx about the transformation of the process of production into a material, substantivized science is coming true.

In the course of this process science fuses with production, which serves to enrich both of them. Research institutes and laboratories have become factories of discoveries, producing ideas for industry and developing new types of products, new technological processes, devices and technological means.

The amount of time it takes to introduce scientific discoveries into the production process has become much shorter, Whereas the time that passed between the discovery of electricity and its utilization was about 100 years, and approximately the same period divided the discovery and utilization of telephone communication,

It took a mere five years to put transistors to industrial use and little more than a year for lasers. It has been estimated that the average time it takes to introduce a major technical discovery into industry has shrunk to one half of what it was at the beginning of the 20th century, while the period of development and testing has been reduced to less than one-third.

Many new branches of industry (such as nuclear power engineering, the electronics industry, space technology) owe their existence entirely to scientific discoveries of recent years-striking evidence of the importance science has acquired as a productive force of our time.

The scientific and technological revolution is thus gradually transforming all the three fundamental material elements of production: the mechanical means of labour (automation), the objects of labour (artificially made substances with properties predetermined by man) and sources of energy (wide use of liquid and gaseous fuel, development of nuclear power). The revolution affects all stages of production from the acquisition of raw material to the sale of ready-made products.

The various directions scientific and technological progress has taken are closely linked, but the principal direction of this progress has been the revolution in mechanized forms of work through the automation of production.

Some economists see automation as nothing but an extension of mechanization, as just a "new name for an old process". But one can hardly

agree with this view. Automation is not a mere extension of mechanization, the result of specialization and standardization, but a qualitatively new step in technological development.

Those who consider that the present-day stage of scientific and technological progress is nothing radically new tend to divorce technological advance from the development of social processes, and ignore the qualitative changes in the nature of the mutual relationship between technology and man. Meanwhile, the most important and drastic changes in the technology of production have led to radical

Changes in the technological nature of the relationship between man and machine. Such changes have been brought about by automation. In the preceding stage of technological progress-mechanization-the function of the direct effect on the object of labour was transferred to the working mechanism. Here, however, man remained the principal agent of the technological process.

He retained the functions of control, regulation and direct intervention in the production process in order to eliminate the possibility of any deviation from normal. With the advent of automation these functions were transferred to the mechanical device. The properly functioning automated production process does not entail the direct participation of man, who is relieved of any forced technological connection with the machine. The automation of production enables man to operate machines with the help of other machines.

The very concept of the machine has changed. Whereas before the machine was understood to be an artificial device made by man to replace certain production functions, now machines discharge not only production but also intellectual, and in some cases even physiological progress new types of machines-control-and-regulatory, logical and cybernetic have been added to the earlier familiar classes of machines-power generating, transport and technological.

A characteristic feature of the scientific and technological revolution is the creation and wide utilization of managerial machines based on the practical application of the theory of control (cybernetics).

The old-type machines made it possible to increase the power of the instrument of labour far beyond the physical capacity of man. The introduction of automation increases the powers of the instruments of labour beyond the reflex potential and other limitations of the human organism. Whereas the ordinary machine, figuratively speaking, extends and strengthens the working man's hands, automation makes not only his hands stronger, but also his intellect. The automated system, besides fulfilling the requirements of the earlier pre-fixed programme, can even perfect it.

The system of "feed-back" control, which hinges on man, a clumsy and slow system by modern standards, has been replaced, through automation, by electronic-control devices that process tremendous amounts or information, working at speeds close to the speed of light.

The invention of the electronic computer has been one of the most striking developments in the history of the scientific and technological revolution of the 20th century. In the comparatively short time of 15-20 years, four generations of these machines with high-performance characteristics have come into being.

The latest computers can perform several million operations in the space of just one second. They have memory banks which can store information equal to 5,000 books of medium size.

Thanks to the use of computers the scientific and technological revolution has moved into the area of control, management and planning of production. The computer has made it possible to solve one of the fundamental contradictions of our time, the contradiction between the avalanche of information and the physical limits of man to absorb and effectively use this information.

One of the important aspects of the present-day scientific and technological revolution is the changed raw material base of production, the ever wider utilization of new materials which do not occur in nature, The deep penetration of science into the laws of the structure and transformation of matter, and the laws of the emergence and occurrence of chemical reactions has made it possible to synthesize substances and

materials with predetermined properties. The utilization of artificial and synthetic materials, in turn, makes it possible to evolve more economical technological processes, and reduces man's dependence on nature.

The modern industrial system would be unable to function without the large-scale production and consumption of electric power. Electricity is the main source of power in industry and is used to a large extent in transport. Its use in various technological processes is constantly increasing. Despite the priority accorded to power construction, even the most advanced countries have not been able to satisfy their requirements for this type of power.

The growing use of electric power to replace physical labour is one of the most important factors behind growing labour efficiency, and this fact determines the great importance of the transformations that are taking place in the power base of production under the influence of the technological revolution, The first stage of these transformations that gradual transition from comparatively expensive solid

Fuels to more economical liquid and gaseous fuels. The next stage consists in the transition to the entirely new sources of energy inherent in matter itself.

The great scientific discoveries of the 20th century have led to the creation of atomic energy. Initial estimates regarding the future of nuclear energy were contradictory, interpreted at various times as promising and as hopeless, once of various to the industrial utilization of nuclear energy was the very high capital cost involved. Now, however, we have a clearer idea regarding the future of nuclear energy. In the late 1960s the cost of producing electricity at large atomic power stations had come close to the cost of power generated at conventional power stations. In the future, nuclear engineering will most probably develop on the lines of breeder reactors,. Using the more widely available thorium, instead of uranium. And, what is still more important, re-using the nuclear fuel they reproduce.

In the more distant future, thermo-nuclear power engineering based not on the fission of heavy nuclei of uranium and plutonium, but on the fusion of lighter nuclei, will, it is hoped, open up tremendous sources of power. The

thermo-nuclear method of power production will release about ten times more of the latent energy of nuclear particles than atomic power production does today.

We can agree in general, with the estimate of the American atomic energy commission that by 1980 atomic power stations will account for 23-30% of all power produced, while in the year 2000 this figure will rise to 50%.

Thus, the interconnected complex of qualitative changes in the forces of productions, which is what underlies the scientific and technological revolution, makes science and important element of production. Science serves to automate the economy with the help of cybernetics, in produces new raw materials, and transforms the power base. The revolution also changes radically the content of labour and gives man a new role in the whole system of production.

The present-day scientific and technological revolution has a number of specific features which distinguish it from the industrial revolution of the 18th and 19th centuries and other revolutionary developments in the tools and means of production, In the first place it surpasses all previous technological transformations in its scope. The industrial revolution of textile industry, spread to other branches, converting them on the basis of machine production, and giving rise to new industries. However, its main sphere remained industry, transport and communications.

In contradistinction the modern scientific and technological revolution, from the very beginning, has served to transform not only industry, transport, communications and the power system, but also agriculture and non-productive spheres such as trade, finance and even the state apparatus.

At the present stage, the development of the productive forces is attended by an expansion in the sphere of exchange between man and nature. This sphere now includes, to a much greater extent than before, the seas and oceans, which occupy 70% of the earth's surface. And more recently it also includes trial space and other planets of the solar system.

The rate of scientific and technological advance has grown considerably. There have been more changes in science and technology over the past few

years than occurred in several decades in the last century, to say nothing of more distant times. The socio-political aspect of the present-day scientific and technological revolution is also important. The revolution is taking place in the historical epoch of the transition from capitalism to socialism, in the epoch when socialism is becoming the determining factor of the world revolutionary process.

The scientific and technological revolution is developing both in countries whose economies are based on the exploitation of hired labour and in countries whose economies are based on the free labour of those who own the means of production. There is an increasingly significant connection between the scientific and technological revolution and socio-political revolutionary processes.

The present-day scientific and technological revolution has many and far-reaching economic consequences. In the first place, the among of machinery available to labour has grown considerably. The efficiency of the means of production and the accumulation of scientific and technical knowledge is now responsible to a much greater degree for the creation of national wealth than the amount of direct labour used, as was the case in the past.

The increased speed and intensity of production processes, the unitizing of machinery, the introduction of optimal regimes for technological processes, the introduction of new technological process and new materials, and new methods of managerial control, make it possible to raise the efficiency of production to a much higher level than before. For the first time technical prerequisites have emerged for the creation of a real abundance of material and cultural benefits.

The application of the achievements of modern science and technology considerably raises the efficiency of the means of production, More-over, a new correlation has emerged between the rates of the growth of their cost, with the rate of growth of productivity tending to be ahead of the rate of growth of the cost of the equipment used. This new correlation enhances the importance of economic development through intensification when production growth is achieved to so much by way of increases of labour

and capital as through the more intensive utilization of both, In this connection important changes are taking place in the industrial structure and in the economy as a whole, Greater efficiency of the means of production reduces capital investment requirements and the consumption of material.

The revolution in the technical basis of production is inseparable from the revolution in the functions and composition of the personnel engaged in the process of production, for it inevitably affects the quality of the work force and the relations between people engaged in production.

Prof. (Dr.) Kennedy D Gunawardana

Professor of Accounting Information Systems

Department of Accounting,

University of Sri Jayewardenepura

kennedy@sjp.ac.lk