

Science and Technology as the Inevitable Necessity of Man's Development in the 21st Century

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SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

In the 21st century man's development should come within the context of increasing GNP, improving quality of life and standard of living, better health, education etc. We need sustainable development in the standard sense of protecting the environment for future generations. Also, in the 21st century, we need egalitarian development in which fruits of the growing prosperity are shared widely within the population. Finally, we need democratic development in which citizens participate meaningfully in the collective decisions that affect their lives and livelihoods in so many ways (Stiglitz, 1998).¹

The subtitle of science and technology for development reflects the growing awareness of the importance of knowledge for development. To further substantiate the matter is that: one of the major ways in which less developed countries are separated from more developed ones is by their level of knowledge. Successful development thus entails not only closing the gap in physical or even human capital, but also closing the gap in knowledge. Not only science and technology are necessary for successful development of man, but good institutions and economic management are also ingredients of functional and effective development. Good institutions and effective management will not only facilitate the transfer of knowledge, but will also enhance the likelihood that such knowledge will be used effectively. knowledge revolution, or so to say science and technology revolution, among other things towards development, has also opened up new opportunities at the outset of the new millennium. Remote villages can be interconnected through the Internet, and have access to a knowledge base beyond the dreams of any one living half a century ago. Distance education can bring the finest teachers in the world to countries around the globe—leading to extensive development for mankind. But, the knowledge revolution has also brought about new challenges: those without access to these resources, and the knowledge and training to

use them, may fall further behind.

The knowledge revolution based on modern science and technology, and the change in modes of thinking that modern science has brought with today, constitutes one of the major aspects of development process in the 21st century. The scientific mentality does not just accept traditions and received wisdom. It questions beliefs; asking what is the evidence? And how do we know what we believe? Once we begin to question traditional beliefs, change is inevitable. The scientific process itself is one of constant change, with one idea leading to another, often challenging the previous one as new evidence overturns existing hypotheses and beliefs. Science is thus necessarily iconoclastic—ever breaker of images.

ANALYSIS OF THE PROBLEM

Science and technology have influenced the different dimensions of man's life with respect to social behaviour, family relationships, power in the family, social actions, culture fertility, economic behaviour, and so on. The trend of changes has continued since the start of industrial revolution, but all the societies have not been influenced qualitatively and quantitatively in an equal manner. In this paper, we will examine as how man has changed through the technology, and the amount and scale of development brought about to societies as a result of the emergence of science and technology. Also, such infrastructure must be there so that the man's development continues in the 21st century.

During the twentieth century, science became a huge undertaking and technologies grew rapidly in pervasiveness, scale and power. Scientific knowledge and technological systems played a pivotal role in transforming the natural world into a created environment subject to human co-ordination and control. Such a phenomenon brought about a great change to mankind's life. It is an inevitable consequence of modern life that people use technologies such as electricity, medicines and computers; without really understanding how they work.

We trust the claims of scientific knowledge and take the advice of technical experts: a striking illustration of this, is the way we hand our bodies over to doctors, i.e., medicine, as a profession and a form of knowledge, claims to understand our health better than we ever could ourselves. In the meantime, the contemporary medical, scientific and technical systems are so large and complex. Although the development of science and technology have brought pressing threats to modern life such as nuclear war, global warming, large-scale pollution, and one percent reduction in world's forests per annum, they (science and technology) have been found as potent sources of development and social change. Sociologically speaking, how have science and technology changed our lives? Some part of the answer may be: science increases the stock of reliable knowledge about the external world, and technology yields machines and processes, that make new human accomplishments possible. In the other words, we can say that science gives us more facts and technology gives us more tools. These two socio-industrial processes have reshaped our lives, and which, man's development is based on, in the 21st century.

THE IMPACT OF SCIENCE

Science, being a method for establishing reliable and useful knowledge about natural and social phenomena, has had great impact on human material and non-material life too. The impact of science is not however limited to the growth of new knowledge and information, but the expansion of scientific thinking, and the growth in the number of scientists and the amount of capital invested in scientific research, is also a measure of major shift in the basis of authority in modern societies. Max Weber's theories of social change justify the impact of science on society, life-style, social welfare, human development and so on. In this movement, the Western culture since the seventeenth century or so, has influenced the direction of increasing rationalization. Before that time, decision making was rooted in tradition, common sense, charisma, and force. Today, and in the 21st century, increasing number of public and private decisions are being made only after logical calculations of anticipated costs and benefits; in short, after the rational evaluation of alternative means for reaching a desired end.

Science has played a growing role in this rationalization of public and private choices. The whole socio-industrial process of change has influenced the social stratification of societies and the social mobility of the people too. The whole process which means development, will inevitably continue in the 21st century—influencing man's life.

THE IMPACT OF TECHNOLOGY

Technology, being the application of knowledge to the solution of practical problems, smoothens the ground for social, cultural and economic changes. The impact of technology on social life is not limited to new machines that enable the people to do unprecedented, unexpected and miraculous new things; like flying, going to the moon, computer operations etc., it also develops man's life. Just as the rise of science is both an increase in new knowledge and the transformation of cultural authority, technology is simultaneously new machines or tools, and new social and cultural arrangements. These transformed institutional structures are, on one level, consequences of new technical inventions. Such phenomena become the causes of further creation, manufacture, and diffusion of the next generation of new tools, machines, and processes. The relationship between technology and society is interactive, and the whole process brings about a lot of changes, new patterns, styles, new norms and value system in a vicious circle manner.

The cinema, radio and other mass media have opened the eyes of the poor two-thirds of the world population to the levels of affluence achieved elsewhere. Increasingly, they will demand their share of it. This is what is called "the revolution of rising expectations" (Keller, 1994). Another impact of technology which has caused a complication, and which is reflected in the developing nations, is the consequence of population pressure, caused by the decline of population death rates. These are some of the dilemmas caused by science and technology. As man has to develop to respond to the rising expectations in the 21st century, dependence on science and technology is inevitable.

TECHNOLOGICAL CAPABILITY

In the early stages of development, capability of technology is influenced by factor endow-

ments and inter-sectoral linkages which eventually result in changes. In the past few years, there has been renewed interest in activities that generate technical change (Romer, 1990). This process leading to industrial development and rise of urbanization, gives rise to problems of public health, housing and control of the urban environment particularly in the developing world. Man's ability to use resources in a society efficiently and develop rapidly depends not only on society's policy regime, but it also depends on its technological infrastructure too. This framework consists of many institutions and agents such as technological information, cultural readiness, productivity advice, consulting services, that include universities, public and private research facilities, social norms and standards—all helping technological diffusion.

SOCIAL CHANGE AS CAUSED BY TECHNOLOGY

The technological factors contribute to social and cultural changes in different respects. Likewise, as no society is static, the rapid technological progress in the last five decades in the Third World setting, and in the last two centuries in general, so far as the industrial world is concerned, has made tremendous contributions to the effective utilization of resources in the environment. As a result, mortality rates are substantially reduced, and human labour is increasingly replaced by complex tools and machines. Since people can be more certain about the survival of their children to adulthood, and do not need so much human labour for economic reasons, the importance of high fertility norms decreases. Under such conditions, logically, fertility motivation should decline. However, the fact is that in many transitional societies, despite the rapid technological development, fertility rates still remain high which itself creates various socio-economic problems. In the first place, it could be due to the sacredness of high fertility norms. Since these norms have been regarded as divine nature and have been unquestionably observed for generations, they have developed a powerful tendency to persist for a prolonged period of time after the technological conditions have changed, and considerable development achieved by man.

Another reason could be the emergence of alienation, i.e., the complex feeling of being isolated and of powerlessness, normlessness and

meaninglessness (Keller, 1994). As Ogburn (1922) has impressively demonstrated, the much faster the rate of technological growth than that of social, organizational and ideological changes, it may lead to the state of "cultural lag". This problem is particularly serious in many of the developing societies today, as they usually import very modern machines and tools from the advanced nations, but are not able to make social, organizational and ideological adjustments within a relatively short period of time. A consequence of cultural lag is the rise of alienated attitudes and behaviour. The third reason as Rich (1985) might suggest, could be the unequal distribution of the economic and social benefits of progress. In many traditional societies, in spite of the rapid increase of economic productivity due to great technological change, there exists wide disparities in income. Only a small segment of population has benefited from the progress, while the majority remains in a state of poverty. The favoured minority may easily accept new patterns and norms, but the disadvantaged majority may remain traditional and sacred-oriented, and thus continue to be motivated for high fertility. Moreover, the lack of opportunities for the majority of population to attain a "fair" share of the benefits may increase their feeling of alienation, which in turn leads to controversy of values, i.e., high fertility motivation.

A central feature of the belief system in modern society under the influence of science and technology is the rise of rationalism; that is, the increasing emphasis on mastering the environment, making greater achievement and planning for the future. Rationalism as a consequence of science and technology has caused the people to evaluate each other on the basis of universalistic achievements, i.e., emphasis on the competency and the actual performance of an individual, rather than some particularistic relationship or ascriptive qualities. The evaluative standard gives rise to a high degree of social mobility which is very important from social and industrial view-point.

In a technologically complex and universalistic achievement-oriented society, formal education is not only an important mechanism for a society to develop and allocate its human resources, but, it is also an important means by which an individual achieves upward mobility, and that is known as the inevitable necessity of man's development in the 21st century. Like-

wise, the expansion of educational opportunities for females, and the rise of female-demanding industrial structure, increases the employment opportunities and wages for wives outside home. This movement has brought about great socio-economic and cultural change for women, too. Associated with the social and economic development due to technological change, is the process of urbanization, i.e., the migration of rural population to urban areas, and the resultant increase in the urban inhabitants, and hence the emergence of social problems. Many nations around the world have been rapidly urbanized during the last few decades, and the trend is likely to continue (Morgan, 1992). The result of urbanization due to technological development, is housing congestion, slum-dwelling, deviant behaviour and so on.

Family planning technology too, with special reference to the 21st century, primarily works as a facilitating factor: it facilitates the impact of socio-economic and family variables on fertility behaviour, and the consequence of which is smaller families, with richer qualities and lower economic dependency. Such modern nuclear families tend to be there for both the spouses.

THE TECHNOLOGY OF MANAGEMENT

Industrialization as the outcome of science and technology increases control over workers, turning an artisan into a factory hand, and so it is with computers. The general trend has been to maximize managerial power and control, at the expense of the autonomy of workers, and even at the expense of productivity.

The technology of management has identified three types of control:

- * The early days of industrialization were characterized by "simple control"; in that, the "boss" was both owner and manager; supervision was direct, personal, often arbitrary and harsh, and difficult to oppose. In that, the "boss" word was law, and opposition would lead to dismissal from job.
- * Another control was called "technical control", in which the physical organization of the work process compelled employees to work in ways through assembly line to speed up production.
- * The third type of supervision was called "bureaucratic control" in which special so-

cial relationships and an arranged hierarchy were observed so as to increase production. Such work relations and technological impact did not create much change and social mobility among the work force. The status quo prevented the individuals from dynamism. Impact of automation and industrialization is also reflected in alienation — referring to the feeling of being separated from one's work and, through one's work from other people.

The idea that industrialization dehumanizes work and alienates workers (Marx, 1883), in the process of which the capacity to shape the material world, to produce something of value, sets humans apart from other species — that creative work is a vital part of being and feeling human. This school of thought predicted that workers in capitalists, industrial societies would become alienated, first, because they sell their labour to someone else, rather than working for themselves, and second, because they produce standardized parts of a product rather than individualized, finished goods. Such dehumanizing situation which is the by-product of technological development, is against human dynamism.

Many industrial sociologists agree that both rural development and industrialization are necessary for the economic development of a society based on science and technology. But, what should be the nature of this industrialization so that it does not harm the process of rural development, and instead, facilitates it? Should it emphasize on heavy industries or small scale and tinny industries? Should we go for decentralized industries or centralized ones? The experience from highly developed countries of the world suggests that heavy industries from highly developed countries of the world suggests that heavy industries run by highly sophisticated technology, create many problems, endangering happiness and peace of people in the society, and there is need for promoting small industrial units, using intermediate technology, laying emphasis on human beings, having common ownership, and utilising locally available resources. Therefore, there is a need for "production by masses, rather than mass production" (Schumacher, 1977). This dream of "production by masses" can be realised only if we can develop decentralized, small-scale, tinny and cottage industries in a country. Hence, it is nec-

essary to analyse various aspects of national industrialization; linkages between industrialization and development, sustainable development including financing, marketing, training etc. Policy planning with regard to socio-cultural values and conditions must be well thought of, and observed so as to sustain a balanced process of industrialization leading to national development. At the end, the complexities due to technological changes have determining impacts on people's behaviour and value system; such a movement has brought about contrasting conditions with special reference to many developing societies.

CONCLUSION

Man's development being inevitably dependent on science and technology, is also ever changing his way of life followed by new cultural values specially at the turn of the new millennium. Science and technology as key factors of change and development have profoundly influenced social life of man and the process is more stressed upon in the 21st century since all the necessary backgrounds have been provided in the past decades. Likewise, new and further technologies emerge and develop in social and cultural contexts in the new century which need due sociological and anthropological considerations so as to prevent any possible controversies. Because of the growth of science and technology, social change occur inevitably too; that is, alterations over time in the behaviour patterns, cultural values and the structure of society. The individuals over their life-course are greatly influenced by structural, institutional and environmental changes. According to functional integration, all social changes are inter-related; that is, the developments in one area, force changes in another, and they continue in a vicious circle manner.

Reduction in imports is one of the key strategies through which development plans may be implemented. Therefore, to attain such an objective, developing countries must build up their educational infrastructures with the help of science and technology. What the developing countries should act upon, is to simultaneously practice rural development and extend industrialization so as to sustain economic development and consequently man's development. Hence, socio-industrial grounds must be provided as the pre-requisites of development at the turn of the 21st century.

KEYWORDS Social Change. Industrialization. Development. Cultural Change.

ABSTRACT Science and technology as the key factors of production, are even more important than the natural resources and financial capital in the modern times with special reference to the 21st century. Being the generator of development, they encompass man's life and development; without which continuity of life would not follow. Resources have to be spent both on the general capacity to absorb it, that is an educated man-power, and on the specific capacity to apply it, that is technical skills. In a cyclical manner, man creates science and technology, and science and technology cause man's life to continue and improve. Man's life depends on scientific development more than any time in the history. Such a dependency could be acknowledged as the cornerstone of new concept of "globalization" of the post-modern era of the 21st century. Various technologies (means) are necessary to be used to diffuse knowledge so as to have access to development. Hence, countries must try to have access to that means so as to reach their ultimate end, which is development, social welfare, security, better use of resources, better conditions for the present generations and the generations to come. We may also argue that man's evolution depends on the development of science and technology. It must also be kept in mind that production of knowledge counts much in the development of man-kind, and that could be made possible through the development and increase of the university system and research centres.

NOTE

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