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IMPLICATIONS OF TECHNOLOGICAL ADVANCES FOR HUMAN RESOURCE DEVELOPMENT*

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Knowledge and Technology

The stupendous increases in human knowledge, particularly scientific knowledge, has also brought about tremendous advances in technology in the recent past. This is ever accelerating and pushing the frontiers of knowledge further and further forward and therefore producing new technological activities also, which are even over-exploiting the resources of the earth and generating basic questions regarding the very survival of humans on the planet earth due to ecological imbalances and pollution of the environment. A balanced human resource development is timely now to evolve a sustainable development strategy for mankind.

The Hunting Phase of Man

These two aspects of human endeavour, namely, knowledge and technology, were originally blended with the artistic, aesthetic and religious activities and experiences of prehistoric man which had steadily developed over the last half a million years. At this early stage, these social activities were regarded as 'magic' by primitive man which by gradual stages through the old stone age and through the new stone age grew up into the differentiated and specialized activities of Modern Man. Up to about 10,000 years ago this development took place when man was yet a huntsman and lived more like an animal living perfectly balanced with the forces of nature and the environment. This hunting type of life required a certain specialized type of knowledge. This was mostly concerned about knowing the ways of animals and how to hunt them. The technology of hunting was the development, at first of pebble tools and then of stone implements for the hunt. Language may also have developed during this period as a tool for coordinating the activities of a group of primitive men for hunting. A certain knowledge of plants as food may also have been slowly gathered because primitive man also surely would have lived off leaves, fruits, roots and tubers of wild plants. Through a long process of trial and error their primitive knowledge may have been garnered with great sacrifice and pain and even untimely death. This phase must have also produced magical (religious) rituals for propitiating the evil forces of nature. The knowledge so gathered may have been slowly passed onto the succeeding generations through group participation. Skill in hunting may have been very slowly imparted to succeeding generations by the young taking part in such hunts along with the more experienced ones. Traditional activities

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through imitation would have been the basic method of human resource development then.

Even in these early stages the person with know-how and skill (that is science and technology) may have been at an advantage and at a premium and would have been the natural or born leader.

The Agricultural Revolution

The advent of an agricultural way of life, now reckoned to have started about 10,000 years ago, brought about an entirely different pattern of life. This may have started gradually and because of its advantages over the hunting way of life been copied and emulated by more and more groups of prehistoric peoples. It is generally assumed that this agricultural revolution may have been ushered by women-folk who would have planted a few types of crops close to their cave dwellings. This would have led to the matriachcal stage of social evolution.

With agriculture, primitive man, began to interfere for the first time with nature and the face of the earth by ploughing fields and making irrigation channels. It would have also produced more leisure time for people to think and indulge in activities other than those required purely for the gathering of food. Furthermore, technologies like, domestication of animals and plants, animal and plant breeding pottery making, taming of fire, brewing, bread making and sailing on water may have also developed gradually during this phase. Also with a need to understand the weather for the proper planting of crops primitive agricultural man may have looked into the skies and the clouds started the understanding of the planets and the stars by looking deeper into space instead of the rain clouds.

Knowledge would have slowly outgrown the technology, although surely, technology would have by necessity produced that knowledge. Therefore, action for survival, that is technology, would perhaps have been ahead of knowledge. Something can be done merely because it has to be done due to the exigencies of a situation or because something simply had to be done - innovation through trial and error practices would have been largely responsible for the production of new technologies without much understanding at first. The repeated practice of such a newly discovered technology would have produced in slow stages the understanding of the underlying principles- though not fully realized, yet in some incipient manner - that was knowledge.

With each additional increment of manual knowledge new technologies would have been developed and then with the use of such technologies then further knowledge would have grown. Knowledge is to the brain (mind) what technology is to the hand (labour). These two activities of man may have developed together in consonance, one re-inforcing the other all the time in quick succession. These agricultural practices would have been blended with other practices such as primitive medicine, primitive engineering, aesthetics and play or sport of prehistoric, but modern man.

Passing on of this knowledge could be heightened now with further developments in language which would have rendered the teaching process into one of memorizing mnemonics or poetry. It is easier to remember poems with metre and rhyme than ordinary sentences. In this way such knowledge would have got concretized into superstitious sayings handed over from mouth to mouth from generation to generation. This gives continuity to a culture and also tends to give a spurious effect of changelessness and stability to a culture. The Agricultural Revolution and way of life may have nurtured this very unreal state of knowledge in such pastoral cultures. Changes take place each year but they form cycles which are repeated each year with monotonous regularity giving an overall effect of an unchanging stable and absolute world masking the real world which is one of constant flux and change.

These larger concepts could have seeped in and formed the bedrock also for most of the religious beliefs which too arose during this period and produced the concept and feeling of an absolute and unchanging world. This religious revolution about 2000 years ago was not a paradigmal shift but within the agrarian way of life. This was only the replacement of a matariarchical hegemony by a patriarchical one.

The teaching process would yet have been largely a process of apprenticeship under elders with the knowledge of the tribe, and by community sharing of such practices the knowledge was slowly handed down the generations. There would have been more time however, for thinking and developing knowledge through thought in this manner. As a result knowledge would have got separated from practice and use and action or technology, and because thinking was faster and cheaper without expenditure of much energy which is used up in technological innovation, thought would have quickly outstripped action. Also a separation of the other activities of man would have occurred namely the separation of religion from other secular activities of Man as also the slow separation and cleavage of other activities such as play and the fine arts from knowledge and technology.

The steady state of a society brought about through negative feed-back checks and balances on that society by the conservative elders would occasionally burst asunder due to internecine wars over leadership and for short periods of time positive feed-back reactions could take place to produce changes to the *status quo ante* so as to accommodate the innovations and impatient discoveries of a younger generation. This would allow the changes required by nature which the changeless society would have resisted too long. Intertribal wars would have also produced similar effects on static societies. War is hunting of ones own species after all which is never found in any other animal species.

Mind and Hand

If the hunting stage of man lasted for over hundreds of thousands of years, the agricultural stage lasted only some thousands of years. This shortening of a phase of the

evolution of human societies was due to the accumulation of those very things that the mind and hand of man had produced namely knowledge and technology. If language, both speech and writing was the catalyst which produced greater advances in knowledge then control of energy and power could have been the catalyst that generated advances in technology. Society as such would have become complex because of barter systems of exchange of man's labour and the differentiation of such labour by various castes scheduled to do some particular type of activity in that society.

The Industrial Revolution

Printing and the Gutenburg Press would have set the stage for the next development of man on the mental level. This catalysed the reformation and the renaissance in Europe in the 15th and 16th centuries with the development of modern science and this in turn, paved the way for the next revolution-the Industrial Revolution or the harnessing of physical energy in the form of steam for greater amounts of activity. This was ushered in, in the 17th century in Britain and Europe.

The burgeoning populations because of better agricultural practices and medicine, could be supported only by further industrial activities in order to suit the physical needs of the people for better conditions of life. It was not necessary that all the people enjoyed these better forms of life, as even in the agricultural phase, only some wanted it and obtained it at the expense of others. However an all pervading democratic awareness was also spreading and this was also playing a large part in the dissemination of this new culture.

The necessity for continuous industrial production threw completely out of gear the earlier phase of the method of transmission of the new knowledge and technology to succeeding generations. The leisurely agricultural life where people lived in communion with the environment and with the seasons of the earth was very harshly and quickly changed into a more mechanical type of life, very much like the machines themselves which were used to produce the physical needs of man. Man became mechanized like his machines and completely alienated from nature. The younger generation, in large numbers, had to be quickly transformed into a working force to work the machines and the mines. The education given to them was not tied to seasons and education had to be imparted as daily routines away from real life situations. Schools, like workshops and factories, had to be invented and the human resource development took place as on a conveyer belt. Some workers (teachers) teaching one thing and the next moment another teaching something else - like the assembly of a car on a conveyer belt in a factory. Students become a commodity produced in a factory to carry out the various functions of a complex society. Gone were the leisurely apprenticeship periods under groups of elders in community activities which was what obtained in an agrarian society.

Post Industrial Society

This regimented industrial society soon gave way after the second world war to the post industrial phase. To mark the start of this new phase in the evolution of human society the year 1945 was conveniently chosen as this was the year that the atom bomb was first used and which demonstrated in a very dramatic manner from a practical point of view the harnessing of this latest form of energy - nuclear power. As much as nuclear energy (but more so fossil fuel energy and electricity) ushered in the technological post industrial age, that same electricity was used to make a quantum jump with regard to knowledge and the processing of knowledge, that is the technology of computers and automation came of age and the two together brought in the post industrial age of information and information processing that we are in at the moment.

Human Resource Development with the New Technology

For the first time in human history this century has shown that knowledge can generate technology. Such technological breakthroughs due to prior human knowledge can be briefly given as radio and television technology, aeronautics, nuclear power generation, computer technology, genetic engineering and space technology. This is not a complete list only some of the major techlologies have been mentioned.

Although such startlingly new changes have taken place due to the paradigmal shifts in human knowledge one has to bear in mind that as in biological evolution where earlier forms of life can co-exist on this planet with higher forms of life, likewise, human societies at different levels of development do co-exist most often in the same country. But between countries also such different cultures can co-exist. The countries that entered the new technological age of the Industrial Revolution are the ones that are rich and innovative and progressive while those yet languishing in the agricultural phase like most of the newly emerging nations of the south are poor, backward and full of conflict.

Two major groups in a society or a nation that are clearly noticed are at different levels both mentally and technologically due to the different paradigms they believe in. The rural and the urban divide shows this division most dramatically in most countries. In that sense most countries are yet in an agrarian phase of development while others are in the industrial phase while yet others are in the post industrial phase. Each such culture also have different carrying capacities of their population and modern scientific societies have a bigger carrying capacity than the older and more primitive ones.

The type of human resource development or training in one type of culture need not necessarily suit that of another. The more primitive societies have to be changed drastically in order to bring harmony and peace to all of mankind. And that change is the acceptance of the modern scientific method in all activities of a society.

We in Sri Lanka are largely in the agrarian - phase, only the urban and sub-urban regions are getting industrialized. This I believe is the reason for the recent upheavals

in our country due to the intermix of two different cultures and the impact of the new industrial type of education imparted to children of an agrarian age. This is inevitable. Other countries have gone through these stages themselves with great turmoil and pain and tears. When such a phase change takes place the resultant upheavals are invitable. We have to bear up with such happenings and usher in the changes as soon as possible to minimise the duration of the period of transition. In a way it is happening right now in Sri Lanka particularly due to the effects of T.V. and other mass media of communication. In other words, the leap-frogging is taking place.

Anti-scientific stances even leading to barbaric and primitive savagery may be adopted by the agrarian oriented societies, very much like an individual will curl up in an infantile posture when something greatly traumatic affects him. Infantile regression is one mechanism by which animals (and man) recoil from traumatic experiences that beset them.

We have to be mature and face upto reality. For Sri Lanka, I think we have learned the hard way and already we are gearing ourselves to accept this challenge and get on to the higher phase of human civilization. Some persons particularly those steeped in an agrarian past will question me with regard to my definition of 'higher'. But let that pass.

Dual education - where by, the mind and hand both are being trained at the same time has been accepted by our leaders. I consider this a very great step forward indeed. Next, the heart or religion should be brought in to regulate the activities of both mind and hand and greater emphasis should also be placed on the development of aesthetic and sports studies. There must be a good holistic blend of all these activities of man if we are to live harmoniously with nature as our hunter ancestors did long ago. Of course we have come a long way since then in many ways, but we have to harmonize with nature the way they did if we are to survive on the earth without destroying it. We in Sri Lanka, have taken the lead in this direction, I believe, in spite of the turbulent wars that torment us at the moment.

One last word, I believe that curiosity oriented training and research must be encouraged - as new knowledge is obtained only in that way to produce the breakthroughs for new technologies to be produced. About 10 - 20% of the financial allocations for research training should be used for this approach.

But greater emphasis should be placed on mission-oriented or applied research and training. I believe that about 80% or so of the financial allocations should be for this approach. Mission - oriented research also is of two types, systematic or systems analysis where improvements in a given technology are made to improve it through systematic research and training. Real applied research however, is the search for applications of new scientific knowledge where break throughs in technology are made. Adaptations of some foreign technologies for our situation in Sri Lanka and the search for new technologies with our own raw materials is the other. Also over 3% of our gross National Product must be channelled for such activities.

We in Sri Lanka have been groping our way along these lines and I believe that recent governments have actually intuitively realized these truths and are taking the necessary steps to bring them about in to reality. Unfortunarely some individuals sometimes do tend to distort this picture somewhat for their own parochial interests but I am sure that society will correct itself as we go along. Honest, open and conscious criticisms of such attitudes and of such persons will quicken the transition.

Jathika Chinthanaya

A Jathika Chintanaya is not required for Sri Lanka or any single country. Only the *Human Chinthanaya* is required if we are to keep pace with world culture. We must have one world view - the human world view or Weltanshaung. But certainly to retain and maintain our cultural identitty we must have our own cultural activities and ways of doing things. But that should be limited to our aesthetic activities only. If such activities and thinking are against a world view accepted by all of humanity, then we shall have to change such cultural activities or modify them drastically as well, so as not to harm that world view. It is religion that gives the world view. Religious practices have to be modified also if they go counter to the modern world view - but sometimes basic religious ideas can if incorporated into the present world view elevate that world view to give a new paradigm for progress. Such a feedback is possible, I believe, with regard to Buddhism. This will produce a revival of both an ancient religion and a modern world view. The concept of Buddhism that can be thus incorporated into the modern worldview are : Anicca or change, democracy, compassion, conservation of nature and judging a person by his actions and not by any other criterion such as religion, nation, caste or family. I think however, that such basic concepts are already incorporated in the modern scientific world view although much of them may not be practiced.