SUSTAINABLE HUMAN DEVELOPMENT IN THE TWENTY-FIRST CENTURY: AN EVOLUTIONARY PERSPECTIVE

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Summary

Human development is a multidimensional and complex concept, partly a result of the complexity of human nature, the way humans interact with each other as individuals and social groups, and partly a result of how humans view their role in the ecosystem and the way they treat their environment. Over the course of time, humans have been gaining greatly in scientific knowledge, intellect, and material comfort, but not necessarily in the development of just institutions or in rational collective judgment. Human development requires more than scientific or material progress.

World development has been characterized by accelerated scientific and material progress combined with increased poverty, glaring inequity, and violence. These apparently contradictory developments could be clarified in the context of two paradigms. In the first, it is believed that unequal development and its associated ill effects are inevitable consequences of human nature, a "selfish gene." The second paradigm asserts that this prospect is not inevitable. Negative externalities of these "natural" evolutionary tendencies could be managed, with larger and more equitable gains to human society. Not all paradigms agree on human development objectives or strategies.

At the close of the twentieth century, four major forces were shaping human development and they will continue to influence its structure and sustainability through the twenty-first century. They are: scientific development, human capital formation, culture, and the globalization processes. Advances in science and technology proceeded

in two realms: the physical world and the living world. These scientific advances, although contributing significantly to human development, introduced puzzling questions, and many had negative consequences. The scientific revolution apparently generated a futile race between reduced natural immunity and increased exposure to the risk of disease, and the development of remedial measures to deal with these emerging consequences, an inefficient evolutionary process. Furthermore, recent advances in neuroscience and genetic engineering opened up possibilities of improving mental and physical human capabilities that are transmittable across generations, with social and environmental consequences that have not been fully examined. Technical decisions that influence the distribution of capabilities and opportunities require an ethical filter.

Human development in the present age is based on knowledge, its development and accumulation. In this knowledge environment, the role of *culture*, especially its diversity and adaptive capacity, is essential. However, the present phase of *globalization*, which institutionalizes open borders and unrestricted flows of information and foreign lifestyles without barriers to content, may deliver shocks that threaten the peaceful adaptive capacity of many indigenous cultures. Some societies may reject foreign ideas regardless of their potential social benefit, with great loss to human development.

Globalization is a cumulative process that started from the time civilizations began interacting and communicating. The present phase differs from previous phases. It is fueled by the accelerated pace of innovations that are cementing inter-dependence among states around the world, through the spread of information, finance capital, and regulatory institutions. Historically, periods of massive industrial consolidation and dramatic technological innovations have been followed by periods of political, social, and institutional reforms that come into conflict with democratic ideals. Sustainable human development in the twenty-first century is full of both promise and uncertainties.

1. Introduction to the Issues

> Order is not a pressure imposed upon society from without, but an equilibrium, which is set from within.
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> (J. Ortega y Gasset, 1927, quoted in Hayek, 1955)

This essay examines the state and nature of human development and identifies factors that determine its enhancement for the twenty-first century. A general goal for human development is to enhance the quality of human life. However, the concept “quality of human life” is not well defined. It is determined by a set of interrelated factors that cut across many disciplines with varied perspectives and paradigms. These include the prevailing culture, health status, economic performance, political and social conditions, the building of human capacity and capabilities, and institutional development. For example, in an environment characterized by enhanced quality of human life, it is expected that people will be able to lead long and productive lives. They are also expected to enjoy good health, have access to knowledge and educational opportunities, and be treated by all with respect, in a socially equitable and dignified manner. In the sphere of political economy, they are expected to have the opportunity to participate in governance decisions that affect their lives and the community in which they live; and to have the potential to earn sufficient income to supply themselves with ample nutrition,

shelter, and other material and aesthetic needs. Meanwhile, people are expected to maintain a sustainable environment and equitable social contracts across generations. In the present evolutionary perspective, a prevailing "culture" is characterized as a "weighted sum" of these context-specific factors.

However, these factors are not independent in their effects, nor do they act in harmony. For example, advances in medical science have greatly improved survival and health status in the developing countries. But they have also resulted in high rates of population growth, raising difficult challenges to development in many of these countries. Medical advances lead to extension in life expectancy at old age. However, excesses in such extension result in significant changes in the age structure and in the efficacy of related socio-economic and health institutions. In biotechnology, advances that enhance yield through genetic engineering have established this technology in major crop production around the world without careful examination of its net social benefit. Recent studies indicate serious unintended consequences to biodiversity, as the leading biotech corporations are discovering at present. The positive impacts of scientific advances on health, nutritional status, and life expectancy are qualified as net gains in measures of human development, but their negative externalities do not enter into these calculations.

These examples, among others, illustrate the complexity of measuring human development and achievement in the absence of a well-defined system of ranking. Indices of human development are not necessarily optimal, and their elements and weights are not constant over time; they should be assessed periodically. The social welfare consequences of some components of a human development index (HDI) may be nonlinear, or new knowledge about unintended negative consequences may be discovered. At best, HDIs are quantifiable approximations of a subjective and qualitative concept, the quality of life. For example, the United Nations Development Programme has published annually, since 1990, the Human Development Report (HDR), which includes rich information as well as a human development index (HDI). The HDI is based on three indicators: longevity, as measured by life expectancy at birth; educational attainment, as measured by a combination of adult literacy and the combined gross primary, secondary, and tertiary enrollment; and standard of living, as measured by real gross domestic product (GDP) per capita. Although a crude measure, it does serve the important function of focusing policy and academic attention on the wider aspects of human welfare not included in the standard GDP per capita. But the HDI should not substitute for careful analysis of the rich information provided in the HDR, and both undergo periodical assessment since the nature of human development is not static. It is continuously evolving.

Human development does not proceed independently of its environment. As humans alter their environment, the altered environment alters human destiny as well. It is for science to indicate the consequences and provide remedial and preventive measures. It is for a democratic system of social choice that includes a philosophy of human development to define its scope, assess progress, balancing competing concerns, and make allocative decisions.

2. Toward a Philosophy for Human Development for the Twenty-First Century

An attempt to examine the conditions and framework for a human development strategy requires a guiding philosophy that harmonizes and rationalizes the three universes of human culture: faith, science, and the arts. It should explore the synergistic nature of these basic elements of human culture, provide a ranking system of achievements in the various spheres of human actions, and provide a "balance" between an idealistic vision of human nature and social organization (Plato/Hegel), and one based on an empirical understanding of the dynamic interactions of humans with their external environment (Locke/Hume). The goal of such a philosophy is to provide balance and harmony in human affairs, leading to enhancement of the quality of life as well as to effective institutions and a sustainable environment.

Human intellect has advanced greatly, since the era of the great Greek philosophers, toward a consistent philosophy of human development. But there are many unsettled issues that persist, even as we enter the twenty-first century. To put the present state of human development into perspective, let us consider a brief historical review of how cultural evolution, with unprecedented versatility and adaptive capacity, substituted for evolutionary anatomical changes, and in turn is being replaced by a technophysio evolution.

2.1. From Biological Evolution to Cultural Adaptation

For hundreds of millions of years, living organisms and animals have been adapting to new environments or to new strategies for exploiting existing environments by the slow process of hereditary modifications of their body structure. Some animal species, within their genetic endowments, extend their inherited physical powers by using elementary tools or by co-operating in hunting or in defense activities. Humans, in the initial stages of cultural adaptation, used similar mechanisms to extend the power of their bodies to cope with an unaltered environment. But that early rudimentary human adaptive capacity, which was linked in the early stages of its development to evolutionary self-selection, evolved independently from evolutionary anatomical change, into a complex and powerful social mechanism that is termed cultural adaptation or cultural evolution. "Cultural evolution" is a distinct human trait. It requires the use of intelligence and social organization. It allows humans to adapt more efficiently to their environments. It also empowers them to change these environments to make them more congenial to human needs and desires, thus achieving unprecedented control over their own destiny and the destinies of all other living species, as well as the physical environment itself. Once this cultural versatility had appeared, evolution through adaptive radiation with respect to anatomical structures and physiological functions became a far less efficient strategy for dealing with environmental challenges than cultural amplification through inventions and technological progress.

Three basic qualities, acquired by humans as they interacted with their environment, were necessary to evolve in the direction of cultural adaptation. These are artisanship (the evolution of tool making into complex manufacturing and construction activities), conscious time binding (the ability to plan ahead and develop social institutions while benefiting from present and past experiences), and imaginal thinking (the ability to go

beyond reality, essential for planned achievement). These three qualities are the foundations of the three principal realms of the present human knowledge. Natural science and engineering are the outgrowth of artisanship. Social sciences are fundamentally ways of directing social behavior to avoid disaster and to improve the material state of humankind. The humanities are extensions of imaginal thinking. Societies that used these capacities more efficiently could acquire more food and defend themselves better against predators, and thus improve their chances for survival and reproduction.

There are two fundamental differences between cultural evolution or selection and biological natural selection that make the former far more flexible. The first is the speed with which cultural evolution can adjust to the environment. Biological natural selection proceeds more slowly and gradually. An alteration of a species that is viewed as sudden may actually take millions of years. Within less than 15,000 years, since humans started to acquire the attributes of "symbolic cultural evolution," the second phase of the cultural evolution discussed below, they were able to evolve into masters of their environment with a speed that has been greatly accelerating over time. It would probably have taken hundreds of millions of years to achieve these same results through the process of biological natural selection.

The second difference is the importance of education in the transmission of knowledge as opposed to gene transmission in the preservation of the evolutionary process. Education of human offspring and the preservation of the stock of knowledge, independently of genetic transmission through the biology of birth and death, are the key ingredients in the preservation and continuity of cultural evolution. Now it seems feasible, through the mechanism of cultural adaptation, to achieve dramatic changes in human development within one generation; an awesome responsibility for every human generation.

The ability of cultural evolution to develop, by nongenetic transmission, complex patterns of behavior and social organization and institutions was made possible as a result of the human invention of symbolic language. The perfection of symbolism has lifted learning and scientific development to entirely new levels of complexity and continuity. That perfection led human evolution to take the decisive step away from the use of signs as the *modus operandi* for communication, which in turn led to the development of mathematical and logical structures essential for the development of science and human intellect on the global level. The experiences of Helen Keller and Laura Bridgman, at the beginning of the twentieth century, illustrate that symbolism has made possible advances in human development and culture independent of the quality of sensory function. With feeble human bodies and a lack of essential sensory functions, being blind and deaf-mute, they were able to reach a high degree of mental development and intellect, once they had captured the symbolic use of words. Armed with symbolic skills, *Homo sapiens* became a formidable competitive species, as the demise of *Homo neanderthalensis* illustrates, but not necessarily a rational one. The evolutionary process is not necessarily linear. The *Homo sapiens* species, far from being the pinnacle of the hominid evolutionary tree, could be one more of its many terminal twigs. However, as the discussion indicates, *Homo sapiens* is developing a robust evolutionary niche that could sustain its presence.

2.2. Cultural Evolution, Symbolism, and Globalization

Without the invention of symbolism and its perfection, artisanship, conscious time binding, and imaginal thinking could not have evolved beyond rudimentary levels. The effect of cultural evolution and symbolism on human development has been enormous. By its very nature, symbolism includes the embryo of globalization. Symbolic thought is not attached to sensory data. Humans can relate through thoughtful debate based on logical structures: a more universal communication media, without the limitations of sign language and sense-based data. It took more than 3 billion years for many-celled animals to evolve on Earth, another 500 million years for apes to evolve, and an equal time for *Homo sapiens* to evolve: about 300,000 years ago. During that long span of living history, evolution, including the early development of nonsymbolic cultural evolution, was basically opportunistic and epigenetic. It was not able to produce a pattern of recognized civilizations.

Symbolic cultural evolution, on the other hand, seems to have evolved as recently as 15,000 years ago. Within that short span, great civilizations and cultures flourished, starting with Sumeria, followed by Assyria, Babylon, Egypt, China, Greece, and Rome, up to the present "Western" civilization with its unprecedented progress in science and technology. Some 5,000 years ago in the Middle East, writing was invented and the first cities were established. Within 700 years of these momentous events, the Egyptian Pharaohs had built their famous pyramids and had established the earliest menageries and botanical gardens for pleasure, prestige, and to satisfy scientific curiosity. The evolution of these civilizations did not proceed in isolation. Although path dependent, the development of these civilizations was greatly influenced by mutual interactions through trade, migration, explorations, and conquest. Pre-Socratic philosophy, for example, which laid the foundation for Western civilization, evolved through interaction with and learning from previously established civilizations. It is well established that Western philosophy started in the sixth century B.C. at Miletus on the Ionian seaboard of Asia Minor. Ionia was the meeting place of East and West; it was also the land of Homer. The first Milesian philosophers, Thales, Anaximander, and Anaximenes, were open not only to oriental influences (Confucianism, 500 B.C.) and Homeric tradition (700 B.C.) but to the mathematics of Egypt and Babylon and to the ideas and information that flowed along the trade routes passing through Ionia from the far East. Thales of Miletus (624–546 B.C.), considered the founder of pre-Socratic philosophy, traveled to Egypt to learn astronomy, geometry, and practical skills to do with the measuring and management of land and water. It is remarkable that the five-pointed ancient Egyptian star, named "sba" by Egyptologists, is the same as that used in the American flag. It also has similar spiritual connotations in early Greek and later Masonic mythology. The history of civilizations indicates a continuity of learning processes among societies. Symbolism had a major influence in facilitating connectivity among civilizations, and in reconciling the anthropologists' diffusion hypothesis of the unity of civilizations with the empirical question of how isolated societies develop similar tools and modes of behavior.

The historical development of symbolic cultural evolution was not smooth. There was both internal and external conflict. Internal conflict arose from a lack of harmony among the basic components of symbolic cultural evolution: natural sciences and

technology (artisanship), social sciences (conscience time binding), and the humanities (imaginal thinking). Initially, harmony was sought through faith. Major religions—Judaism, Christianity, Islam, Buddhism, Hinduism, Taoism, and Confucianism—appeared during that period of symbolic cultural evolution to rationalize the role and place of humans in society and in the cosmic order, and to provide cultural stability through harmony among the main elements of symbolic cultural evolution. For example, in recent history, a self-regulating, invisible-hand paradigm was developed by Adam Smith, following Newton's view of a harmonious cosmic order. It contended that micro behavior, when left to its own will, is guided by an inherent self-interest motive that converges atomistic behavior into optimal macro order. While providing the foundation for scientific economic analysis, the paradigm built a bridge between scientific development, market behavior, and established faith. However, advances in science and empirical knowledge, combined with "collective self-interest" that reduces individual mobility and motivation, have created tension in that synergy throughout the history of symbolic cultural evolution.

External conflict, partly a result of internal conflict, arose as a defense mechanism to safeguard as well as to diffuse what each culture viewed as superior elements of its way of life: its brand of socio-political organization and development path. Cultural diversity, instead of being viewed as offering human enrichment and progress, was viewed as a threat to the status quo and a call for socio-political alarm; a clash among civilizations seemed inevitable in this paradigm. However, the emergence and apparent inevitability of conflict seems to have been fueled more by changes in the internal dynamics of symbolic cultural evolution. Advances in science and technology led to the Industrial Revolution and the emergence of the present form of capitalism, in which material progress is the primary goal, progress that ultimately depends on the accumulation of resources. Global expansion became a necessity while opportunities were converging towards a zero-sum game status. Thus, although the past three centuries of symbolic cultural evolution have witnessed great advances in science, the arts, and material comfort, they have also witnessed great tension, wasteful wars, unemployed resources, and confused social priorities within and among nations and states.

As civilizations emerged, intellectual and religious leaders increased their efforts to inject human purposes and reason into the course of history, with varying degrees of success. There are optimists who believe that human societies are increasing their ability to chart and follow a purposeful course of change towards a better life for all. However, it seems that optimists are balanced by an equal number of pessimists. According to some authorities, "the inexorable laws of nature and evolution will eventually override purpose and cause the human species to decline and disappear, as other animal species have done in the past." In this pessimistic view, the future may not be secure, since as we begin to approach the limit of the earth's capacity we severely restrict our room to maneuver in response to change. It is true that many species, more than 90 percent, have disappeared over the course of life history. However, as a "generalist" species, not dependent on narrow specific niches, *Homo sapiens* should be a robust one. The history of symbolic cultural evolution, its *modus operandi* and its continuous search for harmony among its three fundamental elements indicate that it is a powerful, robust, and adaptive engine that should be able to guide humanity into a better future. To examine this survival potential, we attempt first to understand the

topography and course of that evolution. Every century seems to bequeath crises to the one that follows. What did the twentieth century inherit from the nineteenth century that affects human development and the quality of life? How did the twentieth century cope with its legacy, and what dilemma is it forwarding to the twenty-first?

2.2.1. The Inherited Burden of the Twentieth Century

The nineteenth century bequeathed to the twentieth an age of doubt and disharmony in established cultures. Without harmony among the three universes of the symbolic cultural evolution, the foundations of human philosophies and, by extension, those of culture and human development were shaken and their conclusions questioned. For example, in isolation, theological learning was seen as "lifeless embalmment of knowledge." Scientific knowledge, deprived of conscious time binding (social sciences) and imaginal thinking (faith, philosophy, or the arts), seemed incapable of providing a value system to steer individuals safely through the complexities of life and the negative externalities of technological change. Overall, old ideas were being challenged. New ideas were being born. Meanwhile, the growth of industry, technological invention, and the expansion of colonial power were altering the face of nations economically, socially, politically, and environmentally.

The nineteenth century was a period of contradictions: an age of hope and doubt, of culture and anarchy, of freedom and slavery, of democracy and exploitation, of nationalism and colonialism, and of the birth of seminal revolutions in thought on the one hand and the death of established ideas on the other. It was the century that spawned the likes of Bentham, Darwin, Hegel, Mill, Marx, Nietzsche, Einstein, and Russell, building on the works of Galileo, Descartes, Ibn Khaldun, Hume, Newton, Rousseau, Helvetius, Kant, Malthus, and Adam Smith, among others. On the one hand, it was a century of significant scientific discoveries, such as John Dalton's proof (1808) that matter consists of atoms, or James P. Joule's finding (1851) that energy is indeed conserved, or Charles Darwin's *Origin of Species* (1859). There were also significant inventions such as the telegraph, the automobile, the telephone, and electrification, among others. On the one hand, it was a marvelous century. On the other hand, it was one of chronic malnutrition, illiteracy, and poverty for the majority of humankind.

At the end of the nineteenth century, there were serious doubts about the viability and moral justification of the national and international socio-political order, as well as concerns about the economic and social conditions of the working class. Two crises in particular had been responsible for the skepticism about the nature of cultural evolution and the future of humanity: a crisis of "science and faith" and of "empiricism and rationalism." There had been earlier signs, even before the dissemination of Nietzsche's controversial philosophy, of a widespread decline in the belief in a divine creator whose authority could decide baffling questions of faith and morals (although Nietzsche wrote, apparently despairingly, that people would rather have the void as purpose, than the void of purpose). Natural sciences, geology, biology, and physics had a hand in this crisis. Rational scrutiny and empirical documentation discredited many claims regarding the age of the universe or the origin of humanity that had been accepted as matters of faith.

Empiricism is the view that knowledge of the world is based upon and derived from sensory experience. It claims that whatever is in the mind must be first in the senses. Empiricism is clearly the opposite of rationalism. The latter maintains that reason alone can provide knowledge of the existence and nature of things; reality is a unified, coherent, and explicable system. By the end of the nineteenth century, empiricism, as a philosophy, slowly supplanted rationalism to become the prevailing point of view. The *modus operandi* of empiricism has been characterized by its reliance on sensory data as the only source of knowledge, its refusal to accept anything but material reality, its subjective and relative stance on moral and psychological matters, and its skeptical perspective on the most essential issues underlying human existence. The result is that while "empiricism" loosened many dogmas and made room for diverse attitudes, it deprived many of a secure basis on which their culture, belief, and action rested.

Not all students of human culture adhere to the empiricist view. Some continue to hold that ideas are the foundation and the essence of all things. In their view, knowledge is based on the ideas we ourselves hold, as well as those held all around us. It is through these ideas that we discover our identities, the societies we create, the political and cultural institutions we construct, even the direction in which we take history itself. Just as faith, economics, or the subconscious functions are the means through which other phenomena must be explained in the systems of Aquinas, Marx, or Freud respectively, it is "ideas" that perform that function for "idealism."

2.3. From Cultural Evolution to Technophysio Evolution

By any account, the twentieth century was pivotal. It affected, in fundamental ways, the *modus operandi* of human cultural evolution, and will probably have lasting effects on the direction of human development. It witnessed, as had previous centuries, major social and political experiments and great advances in the natural sciences and technology that had significant socio-economic and political impacts. But the speed, scope, and diffusion of advances in science, technology, and regulatory institutions that took place during the twentieth century are unprecedented, and the process is accelerating with no end in sight. There were, in the course of that century, major conflicts and setbacks at high cost to human lives and welfare, including the two World Wars, costly regional, ethnic and religious conflicts, and a prolonged world economic depression.

There were also great technological and scientific developments and inventions; these have the potential either to wipe out the whole of human existence and civilization, or to improve the chances of human survival, material comfort, and knowledge base. There were, in the twentieth century, significant advances in economic techniques and political theory that affected the organization of government and governance, in which economic efficiency emerged as a main policy goal. The century witnessed the continual ascendance of reason and the control of atomic and biological warfare. There were great advances in disease control and health status, in food production, and in material comfort in general, through advances in biotechnology, communication, and space technology, among other scientific developments. The twentieth century witnessed the birth of worldwide regulatory institutions (although short of creating a true world government with full implementing power). These have been designed to

safeguard world health, labor rights, science, education and culture, world development and finance, and trade regulation, while other UN agencies and institutions were created to protect the world environment, human rights, and peace, among other purposes.

However, in spite of these scientific and organizational achievements, poverty persisted on a vast scale and the gap between the rich and poor, within and across countries, widened greatly at the close of the twentieth century. For example, a 1999 United Nations report indicated that of the 4.4 billion people in developing countries around the world, three-fifths live in communities lacking basic sanitation; one-third go without safe drinking water; one-quarter lack adequate housing; one-fifth are undernourished; and 1.3 billion live on less than US$1 a day. Nearly one-third of the people in the poorest countries, mostly in sub-Saharan Africa, can expect to die by the age of forty.

Accelerated advances in science and technology and in the knowledge base of the social sciences made classification, categorization, and specialization a necessity, thus reinforcing a propensity, inherited from Aristotle, for seeking definitions. Categorization of science tends to trade depth for understanding of synergies and to reduce interdisciplinary communication. This categorizing trend went beyond the sphere of science, especially in the first part of the twentieth century, to classifying people and societies into higher and lower orders depending on their color, beliefs, traditions, or economic status: a tendency that paved the way for the bane of racism compounded by injustice.

The nature of cultural evolution also changed qualitatively and quantitatively during the twentieth century. Of the three basic elements of symbolic cultural evolution, the universe of science asserted itself, especially in the second half of the century, as the dominant force setting the pace for the evolutionary process of humanity, and providing the necessary harmony. In one perspective, science is viewed as a power that transcends social forces and is driven more by its own internal logic and the objective facts of nature and less by social forces; it is transforming society into a global "technical" civilization. For others, advances in science and the direction they take are a reflection of the prevailing social system. Science is produced by scientists who "are neither saints nor devils but human beings sharing the common weakness of our species." In either perspective, human progress and development are being viewed increasingly as the self-generating outcomes of interactions between technological and biological development. This is a view that reduces the wider concept of symbolic cultural evolution into a technophysio evolution, a "form of human development that is biological but not genetic, rapid, culturally transmitted, and not necessarily stable."

Scientific development is moving the world closer to "one" human family. The concept of human races or groups differentiated by lags in anatomical evolutionary processes, which took hold at the end of the nineteenth century, was apparently buried as the twentieth century progressed. Around 1883 Francis Galton, a younger cousin of Darwin and noted mathematical biologist (biometry), coined the term "eugenics" upon reading the *Origin of Species*. The word served to describe the possibility of creating a perfect society, a "society in which human breeding would be taken as seriously as the breeding of domestic animals, a society in which the ideal of 'race improvement' would become the basis for a new ethics that would supplant Christianity." The eugenics movement

stimulated programs of research to establish its scientific basis; these were initiated by Karl Pearson and Ronald Fisher, both noted mathematical biologists. Fisher helped to establish a eugenics society at Cambridge University in 1911.

However, advances in anthropological research, the openness of Western education institutions to students from various social classes and races, and the emergence of a competitive global labor market, especially in the second part of the twentieth century, combined with advances in neuroscience, indicated that the premise of eugenics is unfounded. It is nurture rather than nature that accounts for most of the apparent "group" differentials in human achievement. Nietzsche's *Ubermensch* or "Superman" ("a new vast aristocracy based upon the most severe self-discipline, in which the will of philosophical men of power and artist-tyrants will be stamped upon for thousands of years" Russell, 1945, p. 764) is more universal and accessible to all *Homo sapiens*. In his acceptance speech for the prestigious Kyoto Prize, Mario R. Capecchi, the noted molecular biologist, reflecting on the struggles of his own life, tried to convey how genius springs from the most unlikely beginnings. Human society must find ways to recruit and nurture all its members regardless of social or economic background, since "unlikely beginnings can produce extraordinary lives." This is an essential perspective since, even as we enter the twenty-first century, there are some, especially in the policy field, who continue to adhere to the eugenics paradigm.

Nietzsche's *Ubermensch*, however, is not necessarily the ultimate goal of the evolutionary process, although, in some of his writings, Darwin seems to imply it: "all corporal and mental endowments will tend to progress towards perfection." But Darwin's view of "progress," like that of Malthus, was based on "the uncertain outcome of daily struggle, not the predetermined unfolding of a progressive tendency." There are other views of the evolution of life. For example, there are authorities such as Berlin, Popper, or Gould who doubt that progress defines the historical evolution of life processes. In their essentially atomistic view, history is not directional. It is rather a set of random processes, a "random walk" shaped by exogenous boundaries. Others believe in the directionality of history, a purposeful and predetermined chain of events that culminates in the whole of human society approaching a perfect organism, partly a result of underlying Hegelian processes. These are basic divergences. They reflect fundamental developments in the history of the philosophy of science. It was Aristotle who classified "causes" into four categories: material, formal, efficient, and the unmoved mover (or final cause, which played a pivotal role in his system). Aristotle believed in "the scientific importance of final causes, and this implies that purpose governs the course of development in the universe." That view has a "teleological" as opposed to an atomistic or mechanistic perspective, a perspective that evidently supports the thesis of the directionality of history mentioned above. But the term "teleological" has been applied indiscriminately to highly diverse phenomena ranging from the biological to inanimate phenomena, raising unproductive controversies in the development of a consistent philosophy of human development that persisted through the twentieth century. Bertrand Russell (1945) summarizes the controversy as follows:

> When we ask "why?" concerning an event, we may mean either of two things. We may mean: "What purpose did this event serve?" or we may mean: "What earlier circumstances caused this event?" The answer to the former question is

> a teleological explanation, or an explanation by final cause; the answer to the latter question is a mechanistic explanation. I do not see how it could have been known in advance which of these two questions science ought to ask, or whether it ought to ask both. But experience has shown that the mechanistic question leads to scientific knowledge, while the teleological question does not. The atomists asked the mechanistic question, and gave a mechanistic answer. Their successors, until the Renaissance, were more interested in the teleological question, and thus led science up a blind alley.

Recent analysis has indicated that the controversy is partly a result of inadequate scientific knowledge of biological processes, and partly a lack of clarity about the concept of teleology. The application of teleology to biological phenomena must be distinguished from its application to inanimate phenomena. Aristotle's teleological explanations relate more to biological phenomena. Similarly, Kant, although a strict mechanist with respect to inanimate nature, adopted a teleological explanation for living processes, a result of inadequate biological knowledge at the time, as Ernst Mayr indicated.

There is also a middle ground that views "human development" as the outcome of a process of maximizing survival probabilities subject to environmental and resource constraints. Survival probabilities lack certainty and predictive power, and do not necessarily reflect progress in human development. Scientific advances provide better understanding of the physical structure and thinking machinery of the brain, but not necessarily of the motivational forces of the mind that *run* its programs. However, there are signs of progress in understanding the brain–mind association. Evidently, the field of "nature–nurture" research has gone beyond biological determinism or the debate of biological potentiality versus biological determinism, towards genetic determination. But, given the enormous number of brain neurons and synapses that provide contacts between neurons, combined with the complexity of subjective and qualitative psychological phenomena, a scientific view of how the brain–mind works is difficult to attain, especially if approached through reductionism. There are limits to reduction; even in mathematics, the whole is always greater than the parts. Proceeding with "partial constructs" is more productive when dealing with complex systems. Many scientists accept parallelism in psychophysiological analysis as a workable assumption: the belief that there is one-to-one correlation (equivalence) between one's mental states and brain states. An assumption lacking empirical verification, at present, it (parallelism) is no more than an unjustifiable assumption of current science rather than a probable conclusion consciously based on empirical evidence. The gap between present scientific knowledge about the physical world (the brain) and the mental phenomena (the mind) is fundamental and dynamic since, as Gödel observed, "the mind, in its use, is not static, but constantly developing."

Others believe that advances in modern neuroscience could benefit from intertheoretic reductionism where the function of the brain and that of the mind could be better understood in the context of a "global" theoretical framework that encompasses the domains of both the brain and the mind. The two main problems facing those who seek the biological basis for the *conscious* mind, namely that the mind is observable only to its owner and, second, the conflict between observer and observed, are not unsolvable.

Biology in general and neuroscience in particular have been so remarkably successful at unraveling a great many of life's secrets, the current description of neurobiological phenomena is far from being complete. Consequently, it cannot be declared that the conscious-mind problem is insoluble because the brain has been comprehensively studied without finding the mind. Neither neurobiology nor its related physics have been fully studied. Some neurologists are confident that the gap between the mental states and the brain states will be bridged in the coming decades. The biological processes now presumed to correspond to mind processes *in fact are* mind processes and will be seen to be so when understood in sufficient detail.

Advances are forthcoming, however. Controlled experiments on the mammalian brain seem to be moving genetic engineering beyond plant and animal breeding towards genetic transmission of selective health and intelligence attributes in human development. These advances are certain to accelerate as findings from the Human Genome Project unfold. These findings are expected to open a new era of research opportunities in neuroscience with significant philosophical and policy consequences to human development. They open the door for an unending, built-in catalytic growth of interdisciplinary scientific knowledge. These findings also provide information waiting to be abused by unscrupulous insurers, employers, eugenicists, or social Darwinists.

There is also evidence from recent research on neural networks that the unprecedented power of present computers could be increased further through the development of bio-computers controlled by hybrid chips. These hybrid computers could approach the versatility of the human mind, while retaining the speed and discipline of electronic mechanism. Hybrid chips combine living nerve cells (e.g. neurons from leaches, lampreys, or spiny lobsters) with silicon circuits. Computing with neurons or DNA could be commercial reality in the first decade of the twenty-first century. The twenty-first century may witness advances in biotechnology that focus not only on disease control but also on learning processes and personality traits. The potential for scientific progress seems boundless. But the stability of the system and its long-term consequences for human welfare are uncertain. As Einstein, one of the great scientists of the twentieth century, reminds us, the rational calculus of techniques "may not be enough to solve the problems of our social life. The intellect has a sharp eye for the methods and tools but is blind to the ends and values." Over the course of history, there has been a conflict between science and ethics. Science treats people as material objects, and its rules are the physical processes that cause behavior through natural selection and neurophysiology. Ethics, on the other hand, treats people as equivalent, sentient, rational, free-willed agents, and its rules are the calculus that assigns moral value to behavior through the behavior's inherent nature or its consequences. History indicates that the dominance of the natural sciences over faith and imaginal thinking created human suffering as well as their own contradictions (the Marxist revolutions of the twentieth century).

If as a consequence of the emerging technophysio evolution, the sphere of science ends up encompassing conscious time binding and imaginal thinking, then faith and the arts, for example, have to adjust to scientific advances and discoveries. Such adjustment is illustrated by the apparently continuing tension between science and theism in the United States. In such a state of human affairs, "either scientists must be prepared to

fudge their data or all of us must be prepared to give up our values." However, "to give up" implies a thesis of discontinuity and radical heterogeneity of human culture. Such a thesis is not necessary to understand the historical course of symbolic cultural evolution, a course, as we emphasized earlier, that was never free from internal or external conflicts. Development itself, including advances in science, implies changes in established values (value endogeneity) in contrast to value heterogeneity (a socially tolerated variance around an established value system). Value endogeneity may not proceed without resistance, especially since scientific change has been proceeding rapidly, while change in values proceeds slowly, since the latter safeguard the established socio-political order and scheme of things in society.

The evolution towards a global scientific technical civilization would have been predicted *a priori* as an outgrowth of the very nature of symbolic cultural evolution. Symbolism provided the foundation for cumulative advances in the basic domains of cultural evolution, especially in the case of science and technology. It provided a universal medium for science and technology to advance, and to disseminate its accomplishments. Advances in the sciences, especially in communication and information technology, combined with changes in the international power structure, have accelerated the "globalization" process in the last part of the twentieth century.

The century started with doubt and skepticism, but ended with increasing certainty or belief in the power of science: in its ability to provide not only new and exciting opportunities for human development and enjoyment but also workable solutions that minimize negative externalities. But, in the absence of advances in the other domain of symbolic cultural evolution, certainty in the power of science is a lop-sided belief that is bound to destroy the internal equilibrating mechanism of cultural evolution whose internal multi-universe dynamics provides purpose and richness to human destiny. It is probably a major socio-political challenge for the twenty-first century, to develop a universal democratic system based on the principle of the rule of law (isonomy) that is able to evolve and be operational in the context of the emerging globalization environment with its economic and political power structure.

3. Human Progress and Prospects at the End of the Twentieth Century

Our review of the nature of symbolic cultural evolution, especially as it adapts to a technophysio evolution, illustrates that there have been, in the twentieth century, fundamental changes in its structural dynamics, with significant consequences for human development. Advances in science, especially in information, communication and biotechnology, and its emergence as the major force in symbolic cultural evolution, have influenced the main forces determining human development prospects in the twenty-first century. Main determinants include the evolution and diversity of cultures, demographic change and socio-economic development, education and learning innovations, the globalization of labor and financial markets, equity, gender, and sustainable environment. These seven sets of factors are examined briefly in the remainder of the paper, using the evolutionary perspective adopted in the present discussion.

3.1. Culture: Evolution and Diversity

In the present discussion, we make a distinction between "symbolic cultural evolution" and "culture." Symbolic cultural evolution is a dynamic process that continually attempts to maximize the survival probabilities of humankind using the fundamental domains of artisanship, conscious time binding, and imaginal thinking. Culture, in contrast, is a transient concept defined in space and time. It is the outcome of the complex and dynamic processes of the cultural evolution that, although uniform in general form, have produced different patterns of cultures depending on the constraints of artisan development and environmental endowment. The distinction between "culture" and the "symbolic cultural evolution" is essential, especially when attempts to infer moral conduct from observed cultural experiences are divorced from historical context. For example, for millennia, African societies developed a system of gender roles essential for survival: men specialized as game hunters for food and as warriors for defense; women, on the other hand, specialized as home keepers and as subsistence cultivators of small plots of land. The system evolved as optimal given the prevailing technology and resource endowments. However, when these societies were colonized, the colonial power needed labor to work in gold mines or in cash-crop cultivation (cocoa or cotton). The authorities prohibited hunting and introduced policies that made defense at the family and tribal levels obsolete. Men's time-honored vocations were dismantled, while women continued their traditional vocations with their roles becoming more visible and vital for family survival. It is tempting for post-colonial observers, unaware of the historical and anthropological background, to conclude that African men are exploiting women; the system represents unjust gender roles that are culturally set. Nothing could be further from the truth. What is being observed is a snapshot of a "culture in transition," of a society attempting to maximize its survival chances while adjusting to a changing set of exogenous shocks.

Analogous to Pinker's computational theory of the mind, symbolic cultural evolution provides humans with a powerful and flexible "software" program that, combined with their developed anatomical endowments that include sufficient redundancy (i.e. enough unutilized cells that can be engaged in additional activities), is able to provide varied solutions to complex survival challenges. There have been hunting/gathering, nomadic, agrarian, early and late industrial societies, with varied cultures. Cultures are not static. They are the outcome of the dynamics of symbolic cultural evolution and the unique and changing environment of each society, and as societies interact with each other. The plurality of "culture" is a natural outcome of human evolution. Plurality is embedded in the UNESCO definition of culture as "the whole complex of *distinctive* spiritual, material, intellectual, and emotional features that characterize a society."

Furthermore, like genetic diversity, plurality is an important factor for the vitality and sustainability of the global symbolic cultural evolution. As Arnold Toynbee indicated, civilizations in decline are consistently characterized by a tendency toward standardization and uniformity. Conversely, during the growth stage of civilization, the "tendency is toward differentiation and diversity." The vitality of the global symbolic cultural evolution and its potential contribution to human welfare may be enhanced when diverse cultures are allowed, not only to coexist, but also to interact freely and peacefully, discovering common values and heritage. The altruistic behavior that is

apparent in many cultures illustrates that cultures are not necessarily based on competitive behavior. They include co-operation as a basic element. However, not all altruistic behavior is derived from a system of ethics based on reasoning; most is based on instinctive behavior based on inclusive fitness. As Darwin emphasized, the social instincts never extend to all the individuals of the same species. The inclusive nature of co-operative behavior presents a challenge as to how an ethical system based on co-operation could evolve globally, especially in the present environment of global market competition. It is true that the shift from an instinctive altruism based on inclusive fitness to an ethics based on decision-making was perhaps the most important step in humanization. It is equally true that if we jointly prefer a co-operative approach to a competitive one, we have the ability to modify our society for the good of all. But can culture be engineered? Is such engineering desirable?

There is a revival of interest in the role of culture as a pillar and vehicle for human development. However, culture should not be viewed as a commodity, similar to other marketed commodities. The production and marketing of cultures go beyond the ancient Chinese debate in which Xunzi (298–230 B.C.) believed that goodness is not an innate faculty as Confucianism asserts. Humans had to be taught goodness, a theme followed by some social scientists more than two millennia later. Evidently, although Xunzi emphasized the social benefit of teaching (producing) goodness, he did not assign a market value for such learning. Attempts to engineer cultures have been costly. Witness the experience of the Chinese Cultural Revolution in the second half of the twentieth century. The commercial or authoritative view of culture seems to contradict the nature and origin of its dynamic evolution, while introducing difficult policy challenges in the arena of human development. It is one thing to understand the factors that promote freedom of thought and expression in the arts, faith, and the sciences and "invest" in the enhancement of that freedom. It is a different matter to use such knowledge to restrict imaginal thinking and enforce corporate "truth." Education and creative thinking should go hand in hand. However, the present globalization era, with its pervasive technical civilization, presents new challenges to the role of culture in human development. At present, according to social observers, the future of human development and its sustainability is being shaped by the conflicting trends of globalization and identity. The information technology revolution, and the restructuring of capitalism, have induced a new form of society: the network society. This new form of social organization, in its pervasive globality, is diffusing throughout the world, as industrial capitalism and its twin enemy, industrial statism, did in the twentieth century, shaking institutions, transforming cultures, creating wealth and inducing poverty, spurring greed, innovation, and hope, while simultaneously imposing hardship and instilling despair.

However, this is not necessarily a predestined road. We should not underestimate the power of "identity" in human evolution. But the idea of "networking" and "identity" has an origin in the analysis of class development and class struggle, a controversial subject in sociology. It has been argued that Marxist class theory failed because it did not anticipate the institutionalization of class conflict in industrial societies, which tended to reduce the incidence of conflict. Marxist class struggle lost its worst sting in the twentieth century. It has been converted into a legitimate tension between power factors, which balance each other. Capital and labor continue to struggle with each other. But they come to compromises, negotiate solutions, and thereby determine wage levels,

working hours, and other conditions of work. How will the culture of conflict resolution, developed in the industrial era, hold or evolve in the information and globalization age? This is a critical question for the twenty-first century.

3.2. Global Demographic Transition: Socio-Economic Consequences and Potential

Demographic change is an integral part of the adaptive mechanism of the cultural evolution that has been accelerating in its latter symbolic and technophysio phases. The historical evidence suggests that throughout the history of *Homo sapiens*, the long-run birth rate was kept as low as possible consistent with survival: as low, that is, as the death rate. Why? The answer seems to be that the hominids were exploiting a unique evolutionary niche by relying on culture, learning, and social organization as their mode of adaptation. The twentieth century witnessed basic demographic transitions that affected population growth, structure, and spatial distribution. The demographic transition is simply a shift of the birth and death schedules (reproduction and health behavior), from high levels at the early stage of the transition to lower levels at the later stage. However, the timing and speed of the decline of the two schedules are dissimilar, with fertility decline lagging behind that of mortality. The transition implies that demographic behavior and the environment are interactive. The speed and pattern of demographic behavior during the transition will vary depending on the specific socio-economic, cultural, political, technological, medical, and public health status, and the environmental and resource endowment characteristics that prevail in society. In turn, these characteristics will change as a result of demographic change.

3.2.1. Demographic Change: Alarm About Depopulation and Stagnation?

In the industrialized countries of Europe and North America both mortality and fertility, although initially not uniform across social groups, were declining early in the twentieth century, with fertility falling below replacement levels in some societies. In some European societies, fertility started a secular decline as early as the beginning of the nineteenth century, for example in France. These apparent secular declines raised policy and academic concerns about potential depopulation coupled with population aging leading to labor shortage, undesirable immigration, insolvency of social security systems, and economic stagnation.

In the second half of the twentieth century, negative population growth became evident in some industrialized countries. For example, in the mid-1980s, levels of fertility in West Germany implied a negative intrinsic annual rate of growth of −1.7 percent. If this negative rate were to be maintained for 200 years, it would shrink a population to one-thirtieth of its original size. As the realization of such a prospect sinks in, countermeasures will be put to work. In many developed societies, measures to increase the birth rate were introduced. However, some reviews of the causes and dynamics of below replacement fertility, and of the performance of pronatalist policies in industrial countries, concluded that some of these strategies amount to destroying the family in order to save it. Such concerns are probably an echo of those of Rousseau, Montesquieu, and Hume about the effect of modernity and its civil institutions on the robustness of natural institutions, including that of the family. There is, however, recent evidence

indicating that marriage and childbearing are being viewed as social capital, the demand for which is not declining with modernity.

The concept of "social capital" had its origin as early as 1916. However, it was only recently that it was given its wider use in the sociological and economic literature. Put simply, social capital may be defined as a set of informal values shared by members of a group that permits mutual co-operation and organizational efficiency with minimum transaction cost. Although apparently simple, the definition cuts across many disciplines. For example, a group could vary from a family, a social group, a country, to the global society, while co-operation may entail the enforcement of social contracts or rules for economic exchange. There are recent extensive surveys and critical reviews of the concept of social capital and its use in sociological and economic analysis. Some economists are concerned that the concept of social capital encompasses too much to be defined adequately for economic measurement and analysis. Some examined in depth the concept of "trust," an important component of social capital, and concluded that although important for market performance, it is difficult to interpret its evolution and stability in the context of economic thought and analysis; they questioned the economic investigation of trust: given that for the economist comparative advantage does not lie in discerning duty and morality—in seeing right or wrong—are there subjects that should be closed to us, subjects that simply do not allow an economic and game-theoretic analysis, are poisoned by it, and poison us in turn?

3.2.2. Demographic Change: A Window of Development Opportunities?

In contrast, in less-developed countries, where most of the world population resides, the pattern of demographic transition was different. Both fertility and mortality remained at high levels through the mid-twentieth century. Mortality started a relatively fast decline in the late 1950s, but fertility did not. As a result, population growth accelerated at high rates in the developing countries, raising concerns about imbalances between human needs and resource endowments. Many developing countries adopted stringent population policies to contain population growth, some with spectacular success, for example China and other countries in East Asia. By the mid-1980s, fertility started a sustained decline that accelerated in the 1990s, in almost all the developing countries. The nature of fertility decline varied across countries and social groups, and was affected by patterns of institutions and social organizations with different social implications. In some societies, the decline was led by delayed marriage. In others it was led by contraception techniques. These demographic patterns are shaping age structures across the developing countries well into the twenty-first century.

There are potential economic benefits for countries passing through the phase of delayed fertility decline. It presents a "one-time demographic gift": as the burden of dependency declines, potential saving increases and general health status improves, based on the biology of increased infant and maternal survival as a result of better birth spacing and reduced teen marriage. If these demographic benefits were to be combined with sound internal reform, the countries in question might enjoy a more educated labor force and the creation of productive employment to absorb the growing labor: a "quantity–quality" transition. The "quantity–quality" transition implies, over the longer term, a slower growth of the labor force with higher levels of human capital per worker.

It also implies a growing demand for skills. For these potential benefits to materialize, internal reform should include economic policies that pay closer attention to the efficiency and effectiveness of public organization and to the role of information in decision-making, and should direct savings to productive investments. Internal reform should also include socio-political policies that introduce transparency in governance, improve educational quality and relevance, and equalize opportunities.

There are other longer-term consequences of the demographic transition. The initial increase in the size of working age cohorts will translate, within a generation, into an increase in the elderly population, an increase that requires a larger transfer from a relatively declining pool of working cohorts. In the twenty-first century, population aging will be a worldwide phenomenon not confined to the developed countries. A failure by the developing countries to implement sound policies during this vital phase of the transition could have negative effects: since the population of working age will grow at high rates for at least a generation, lack of quality education will translate into non-competitiveness and inter-cohort conflict. Rapid fertility decline, combined with accelerated mobility and migration and the integration of societies into the global market of production, finance, and ideas, has significant consequences for family and community structure and behavior. Furthermore, advances in contraception technology have separated reproduction from sexual behavior with repercussions on family formation and stability, and the stability of social norms. The stability of established social contracts and intergeneration transfers is questioned, and, accordingly, the efficacy of national social policies. Meanwhile, the internal sovereignty of the state to implement social policies that reduce potential socio-political tensions is being diminished in the emerging globalization environment.

Most developing countries are not capturing the full potential of the demographic window of opportunity. Although some countries, especially in East and Southeast Asia, were able to take advantage of the demographic window of opportunity, many others have not done so. One reason is the lack of adequate internal reform, especially in education and in market and democratic institutions. The second reason is the volatility of the international finance capital markets in the emerging global environment, in which international regulatory institutions are in the process of experimental reform.

3.2.3. Migration and Human Development

Population movement is an integral part of symbolic cultural evolution processes. It is an outcome and cause of these processes. This section reviews briefly the various patterns of population movements. There may be exogenous changes in the environment, such as droughts, or humans may alter their environment as a consequence of negative externalities of their economic and social behavior. As a result, the carrying capacity changes relative to reproduction and some may leave their localities, sometimes on a mass scale, seeking better fortune. Conflict often arises as a result of human movements and settlements in new localities or countries, with adverse effects on both the environment and human development and welfare. Conflict generates additional movements. As mentioned earlier, the historical cultural evolution was not smooth. There were internal and external conflicts because of lack of harmony among its basic components. Major population movements occurred in the twentieth century as a result

of these age-old disharmonies, or of attempts by society or social groups to homogenize their own cultures or escape political or religious persecutions. There are also purposeful and positive population movements.

Part of the internal dynamics of symbolic cultural evolution is the emergence of the human drive for discovery and change. Humans seek new knowledge, attempt to extend their reach and improve their socio-economic status and welfare, with mobility and movement as a main mechanism. In this respect, voluntary human migration is viewed as investment in human capital and as a mechanism that provides for increased macro efficiency and welfare. The speed and extent of voluntary migration accelerated as a result of technological advances and the growth of industry and trade relative to agriculture. Rural–urban migration within countries accelerated, as did international migration, a result of the unequal pace of industrialization and development in different countries. At the close of the twentieth century, as the new globalization era evolved, there seems to be a tendency to reduce the aggregate scale of international population movements while changing its pattern towards skill selectivity, a return to the "brain drain." For example, in the United States, the potential for immigration of skilled workers was high, since ambitious, skilled young people from all over the world are frustrated by backward and inflexible economic and social systems. Immigrants are attracted by a dynamic economy and the possibility of upward mobility.

This tendency for skill migration is also partly a consequence of the enhanced and more secure movement of finance capital and trade, and partly a result of accelerated population aging, especially in the developed countries of Europe and North America. The full implications of these dynamics are yet to unfold, however.

3.3. Education, Learning Innovations, and Motivation

Symbolic cultural evolution depends on education and the accumulation and preservation of knowledge, rather than on genetic transmission, for its continuity. As Kenneth Boulding succinctly observed, it is knowledge that is evolving; humans are only agents in the evolutionary process. High levels of human capital are required to assure scientific progress and growth, maintain established knowledge across generations, and promote demand for the outputs of the technological establishment by generating skilled consumers able to purchase sophisticated products and services. The evolutionary perspective views the accumulation of human capital as necessary for the continuity of the scientific revolution. Education and human capital accumulation are also necessary for empowering the less-developed countries to catch up in the development process. However, as mentioned above, these are not sufficient conditions, especially in the context of the emerging global market. Two dimensions of human capital formation require attention. The first is the quantitative dimension of the quantity and quality of education. The second is more qualitative and psychological. It refers to the motivational aspects of human development.

3.3.1. Education Quantity and Quality

The twentieth century has witnessed increased awareness of the socio-economic importance of education. A skilled labor force is viewed as necessary for integrating the