2.1 Introduction

The importance of educated manpower (human capital) as a source of progress and economic growth has long been recognized in the economic literature. Adam Smith (1776) was the first classical economist to include human capital in his definition of capital\(^1\). He included in the capital stock of a nation, the acquired and useful talents of individuals because human skills increase the individuals, as well as, the wealth of society. Alfred Marshall considered the investment in human beings as the most valuable of all capital. A country that cannot develop the skill and knowledge of its people and put them to effective use will not be able to prosper. But, the three key inputs into the economic process identified by classical economist were land, labour and physical capital. In practice, as the amount of land is generally fixed, economic growth was characterised as a function of labour and physical capital. In notational form, the output of an economy(\(Y\)) in any given time period (t) can be characterised as a function of the stock of labour (L) and physical capital (\(K\)) available at the time,

\[ Y_t = f(L_t, K_t) \]

The economic growth (\(\Delta Y\)) can in its simplest form be decomposed as:

\[ \Delta Y = \Delta L + \Delta K + R \]

where \(R\) is the residual of growth unexplained by increases in labour and physical capital. The usefulness of this equation diminishes when one considers that the residual item typically accounts for the majority of economic growth in any economy. Since the 19\(^{th}\) century it has been observed that the world income inequality has widened one of the reasons for the growth of the widened gap in different countries is due to the residual factor. In other words, growth accounting as per the equations

above provide few insights about why different economies are more successful than others\(^2\).

The concept of human capital was largely forgotten by economists until its re-birth in the early 1960s with the writings of Schultz (1961\(^3\), 1962\(^4\); Becker (1962\(^5\), 1964\(^6\)); and Mincer (1958\(^7\), 1962\(^8\), 1974\(^9\)). These economists rekindled this old concept by reaffirming its links with economic growth and by emphasizing its importance in explaining earnings differentials. During the same period, the development of neoclassical (Solow-Swan) growth theory failed to provide a framework for incorporating human capital as an engine of growth. Such a framework became available later with the work of Romer (1986)\(^10\) and Lucas (1988)\(^11\) and the emergence of a new endogenous growth literature, which stimulated the interest of economists in the role of human capital as a determinant of economic growth. In some of these models, human capital induces growth by stimulating technological advancement or by enhancing labour productivity. Recent empirical studies of economic growth also suggest that the skill and knowledge of a nation's population are important in determining its economic performance. For instance, a higher stock of human capital can allow a Less Developed Country (LDC) to cope up with the income levels of a

developed country rapidly through increased absorption of international technologies or capacity of imitation.

2.2 The Concept of Human Capital

Capital is typically defined as produced commodities, which are used in the production of other goods and services. According to the neoclassical theory of the firm, capital is one of the factors of production and represents the stock of previous investments made in the economy, which, in turn, requires the substitution of current consumption for future consumption. The difference between the current consumption and expected increase in future consumption is also included in stock of capital by the agents.

Human capital is the quality of human beings in respect of productive work. It concerns the capacity and ability to work. The capacity and ability of human beings to work is considered as human capital. Like physical capital, human capital helps in further production. Therefore, side by side with physical capital formation, human capital formation has also been playing a useful role in economic development. Since this form is embodied in human beings, it can be viewed at two levels: individuals and social. At the individual level, the improvement in the productive capacity enables one to earn more. The deployment of resources for improvement of the human factor has a social angle too. Since its formation it adds to the productive capacity of the society, it can be treated as an investment in the functioning of the economic system.

Human capital is represented by the aggregation of investments in activities, such as education, health, on-the-job training, and migration that enhance an individual's productivity in the labour market. More recently, this concept has been extended to include non-market activities.

Many studies are done about human capital, but the definitions are vary. It is often referred to as the hidden value of organization. Human capital is the qualities

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one brings into the job, one's capability to learn and the motivation to share information and knowledge. Human capital is the set of skills which an employee acquires on the job, through training and experience, and which increases the employee's value in the marketplace. Human capital is the knowledge, skills and abilities that allow individuals to produce goods and services. In short, human capital is the attribute of a person that is productive in some economic context. Often it refers to formal education attainment, with the implication that, education is investment whose returns are in the form of wages, salary or other compensation. These are normally measured and conceived of as private returns to the individual but can also be social returns. According to Wikipedia, (the free encyclopaedia), "human capital is away of defining and categorizing peoples' skills and abilities as used in employment and other wise contribute to the economy. Many early economic theories refer to labour as, one of the three factors of production and consider it to be a commodity – homogeneous and easily interchangeable. But other conceptions of labour are more sophisticated".

The term human capital first appeared in a 1961 in American Economic Review, by Nobel-prize winner economist Theodore W. Schultz, in his article (Investment in Human Capital). He argued that both knowledge and skill are a form of capital and that this capital is a product of "deliberate investment".

In fact, if thought of and treated as an asset, the people in the organization-the human resources from which human capital is formed, are expected to have greater value in the future than at the present time.

One of the most famous authors in the field of human capital theory is Gary S. Becker, who also won Noble prize in economics in 1992 told:

To most people capital means a bank account, a hundred share of IBM stock, assembly lines, or steel plants in the Chicago area. These are all forms of capital in the sense that they are assets that yield income and other useful over long periods of time. But these tangible forms of capital
are not the only ones. Schooling, a computer training course, expenditures of medical care, and lectures on the virtues of punctuality and honestly also are capital. That is because they raise earnings, improve health, or add to a person's good habits over much of his lifetime. Therefore, economists regard expenditure on education, training, medical care, and so on as investments in human capital. They are called human capital because people cannot be separated from their knowledge, skills, health, or values in the way they can be separated from their financial and physical assets.

Laroche and Merette (1999)\textsuperscript{13} suggested that five aspects of the broad definition of human capital outlined above warrant special consideration.

First, human capital is a non-tradable good. Whether innate or acquired, skills and knowledge are embodied in human beings. As long human beings remain non-tradable goods (no slavery), there exists no market that would permit the exchange of human capital assets.

Second, individuals do not always control the channels and pace by which they acquire human capital. When young, they can not make rational decisions about their needs for human capital, nor can they assess the potential of their innate abilities. Consequently, during the first years of life, human capital decisions are not made by its owners, but by their parents, teachers, governments, and by society as a whole through its educational and social institutions. As individuals become able to make independent decisions, they will internalize the decision process on human capital investments. However, since the owners' ability to invest further in human capital depends on past investments and on the social environment, the influence of their peers and the institutional context in which they live continually, shapes their acquisition of human capital, both in type and amount.

Third, human capital has qualitative, as well as, quantitative aspects. Although one can easily quantify an individual's total years of schooling or daily caloric intake, it can not be assumed that human capital investments are qualitatively homogeneous.

Fourth, human capital can be either general or specific. Knowledge and abilities are said to be general if it is possible to use them in a variety of activities and if they are easily transferable from one employer to another without any significant loss of value. Conversely, human capital is specific if it can only be used in a limited number of activities and if the dissolution of employment relationship between workers and firms represents considerable loss of value which can only be regained through costly investments.

Finally, the definition of human capital also contains the notion of external effects. These spillovers take into account the influence that individuals have on the productivity of others and of physical capital, as well as the fact that individuals will be more productive, for any given level of skills, in an environment of human capital highlights the determinant role that highly concentrated human capital centres, such as universities, cities, research centres, and agglomerations of high technology firms have in the development and advancement of knowledge, technology, and growth. Human capital also generates what can be referred to as social externalities. These externalities, which include, among other things, increased utility from living in a society with democratic institution, freedom of thought and speech, and more varied literary expressions and means of communication, enable individuals to live effectively in a society whose members share common goals. The pursuit of common goals, in turn, enhances mutual trust among individuals and strengthens social institutions. The collection of all these externalities has recently been termed social capital. There is theoretical and empirical evidence that societies with high levels of social capital can operate economic and social institutions at lower transaction costs than those with lower levels of social capital.
There are some economists' ideas about human capital:

- Human capital as the knowledge and skills that people acquire through education and training being a form of capital, and that this capital is a product of deliberate investment that yields returns (Schultz T.W. 1961).14

- Theory of human capital as a form of education that contributes to economic growth by attributing a proportion of economic growth not explained by increases in capital, labour and productive land to improvements arising from increased educational levels in the workforce (Denison E. F. 1962).15

- Theory of human capital as a form of investment by individuals in education up to the point where the returns in extra income are equal to the costs of participating in education. Returns are both private to the individual in the form of additional income, and to the general society in the form of greater productivity provided by the educated (Becker G. S. 1964).16

- Human capital as the amount of total stock of human capital that an organization, country or economy has. The economy with a large stock of human capital will experience a faster rate of growth (Romer P. M. 1990).17

- Human capital is the knowledge, abilities, capacities, experience and finally, it is regulation that education and training is making in a society (Sattarifar M. 1995).18


- Human capital is the knowledge, experience, skill and abilities of man power (Nili F. 1997).  
- By human capital we mean the time, experience, knowledge and abilities of an individual household or a generation, which can be used in the production process (Husz M. 1998).  
- Human capital as acquired human capabilities that are durable traits yielding some positive effects upon performance in socially valued activities (David P. and Lopez J. 2001).  
- Human capital is the term of economists often use for education, health, and other human capacities that can raise productivity when increased. (Todaro, M. P. And Smith, S. C., 2003).  
- In limited sense the mean of human capital is change in quality of man power arising from change in level of education and experience. According to this definition, human capital is one of the factors of product in production function, it is occasion create of increasing returns to scale. In extensive sense, human capital means knowledge and it's stock in economy. It is cause of external economies in production and increase productivity of factors of production (Komeyjani A. and Memarnejad A. 2004).

2.3 Importance of Human Capital for Economic Development

Human capital formation plays an important role in economic development. In fact, effective use of physical capital itself is dependent upon human capital. This is

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due to the reason that if there is underinvestment in human capital, the rate at which additional physical capital can be productivity utilized will be limited since technical, professional and administrative people are required to make effective use of material resources. Investment in human capital is important because it can remove many of the weaknesses of the labour force that act as obstacles to higher productivity, such as, poor health, illiteracy, unreceptiveness to new knowledge, resistance to change, lack of mobility to work hard. Improvements in the health, education and skill of the labour force invariably conduce to higher labour productivity.

Several studies made by Harbinson, Denison, Kuznets, Kendrick, Schultz, Becker, Bowman, etc. reveal that the one of the important factors responsible for the rapid economic growth of the United States of America has been due to the relatively more investment on education, health, research and training. They tell us that a dollar invested on education brings a greater increase in national income than a dollar spent on dams, roads, factories or other tangible capital goods.24 According to Soloman Fabricant, the increase in the total national product of the United States through increase in physical capital between 1889 -1957 equalled the increase through higher labour productivity. In Galbraith's words, "We now get the larger part of our industrial growth not from more capital investment but from investment in men and improvements brought about by improved men." Marshal regards education "as a national investment" and", the most valuable of all capital is that invested in human beings." Denison (1962)25 calculated that almost 23 per cent of the rate of growth of output in the United States during the period from 1930 to 1960 was due to the increased education of the labour force. When this analysis was replicated for the United States and Western Europe during the period from 1950 to 1962, Denison (1967)26 concluded that the diffusion of education accounted for as much as 15 per cent of growth in output in the United States, two per cent in the Federal Republic of Germany, 12 per cent in the United Kingdom, 14 per cent in Belgium, four per cent in

Denmark, six per cent in France, five per cent in the Netherlands, seven per cent in Norway, and seven per cent in Italy.

Arthur Lewis observed, there are great differences in development between countries which seems to have roughly equal resources, so that it is necessary to enquire into the differences in human behaviour. It is often felt that, though the exploitation of natural resources, availability of physical and financial resources and international aid play prominent in the growth of modern economies, none of these factors is more significant than efficient and committed manpower.

In fact, the human resources are solely responsible for transforming traditional economies into modern and industrial economies. The difference in the level of economic development of the country is largely a reflection of the differences in the quality of their human resources. The key element in this proposition is that of the values, attitudes, general orientation of the people. The socio-economic transformation in the economies is possible with the development of human resources which in turn leads to sustained economic development. Simon Kuznets established the relationship between economic development and change in the structure of labour force and skills. He pointed out that the process of economic development is with full of positive changes in the nature of skills and knowledge of people. As the production process become more complex in the course of time, technical specialisation increases. This technical change is also reflected in the technical skills of the labour force. The nature of economic production is also influenced by the level of development of human resources through visible changes in the structure and the pattern of consumption.

The significance of human capabilities was further analysed by Schultz as "capable people are the key to the abundance of a modern economy. They are the major source of economic growth. Economic growth is neither interesting nor rewarding if we neglect improvement in skills and knowledge of people." For Paul Streeten," better education, nutrition and health are beneficial in reducing fertility and raising labour productivity, enhancing people's adaptability and capacity for change.
and creating suitable social and political environment for stable government. Basic education, for example, improves the impact of health services and better health enables children to benefit from education. The effect of investment in sanitation facilities on health status depends on educational levels and these in turn will promote human capabilities to yield a return to the society no less than the return from physical capital."

The need for investment in human capital formation in such economies is more obvious from the fact that despite the massive imports of physical capital they have not been able to accelerate their growth rates because of the existence of undeveloped human resources. Of course, some growth is possible from the increase in the conventional capital even though the available labour force is lacking in skills and knowledge. But the growth rate will be seriously limited without the latter. Human capital is, therefore, needed to staff new expanding government services, to introduce new system of land use and new methods of agriculture, to develop new means of communication, to carry forward industrialization, and to build the educational system. In other words, innovation or the process of change from static or traditional society, requires very large doses of strategic human capital.

Michaelowa (2002) shows the impact of education at both micro and macro levels in the following diagram:

Diagram (2.1)

Impact of Education
Direct and indirect effects of education are shown in the above diagram. Key assumptions underlying the diagram: 1) education results in learning – it is not merely a "signal" of worker quality; 2) demand within the economy is sufficient to consume higher levels of output resulting from productivity gains; 3) monetary and fiscal policy are sufficiently responsive to meet the demands of a growing economy (to prevent deflation, the money supply grows at a rate equal to the growth rate of GDP).

Source: Michaelowa, Katharina (2000), "Returns to Education in Low Income Countries: Evidence for Africa."
Direct effects of education such as increased individual wages follow from the assumption that education results in learning that increase a worker's productivity. If workers are paid the value of their marginal product, it follows that better-educated workers should earn higher wages. Michaelowa has found a positive effect of mother's schooling on her children's health in developing counties. Healthier children may be more productive than unhealthy children and the result may be higher performance in school. Similarly, better-educated parents tend to make more informed decision with regard to family planning - the result being smaller family sizes. Smaller family size enable more parental involvement in a child's education (as parents' time is scarce). Increased parental involvement in a child's education may enable the child to perform better in school and encourage him or her to pursue additional years of education.

An individual's choice to pursue further education may improve the earnings of his or her neighbours. Michaelowa offers the example of an educated farmer who implements new agricultural techniques. Neighbour may observe the new methods used by the educated farmer and imitate them. Learning through observation is a mechanism by which such educational benefits may be spread within a community.

Linking a nation's growth rate of GDP to its stock of human capital is more difficult. Some empirical studies find human capital to be positive related to the growth rate of GDP; other studies find the linkage to be insignificant. Positive effects were found in the following studies: Barro (1991), Mankiw, Romer and Weil

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Insignificant effects were found in the following studies: Benhabib and Spiegel (1994), Islam (1995), Caselli, Esquivel and Lefort (1996), Pritchett (1999).

Benhabib and Spiegel (1994) used estimates of physical and human capital stocks to examine cross-country evidence on the determinants of economic growth. Their findings shed some doubt on the traditional role given to human capital in the development process as a separate factor of production. In their first set of results, they found that human capital growth has an insignificant and usually negative effect in explaining per capita income growth.

Temple (1999) showed that there is a correlation in one dataset, but it is typically hidden by unrepresentative observations. He told:

*Several influential papers have indicated that the cross-country correlation between increases in educational attainment and output growth is weak. In this note, I have put forward one reason simple cross-country regressions do not detect an effect of human capital. The effect could be hidden by a small number of unrepresentative countries, perhaps ones in which human capital accumulation has had little or no effect. It turns out that a subset of countries do indeed exert considerable influence on the overall results, and so hide the strong positive correlation*.
that can be detected in the majority of the sample. In a sample of 64 countries, there is clear evidence that output growth is positively correlated with the change in educational attainment, even when one conditions on physical capital accumulation.

Overall, this finding reinforces the importance of points made earlier in the cross-country growth literature. Simple application of OLS is sometimes an inappropriate way to estimate cross-country growth regressions, and results should always be accompanied by a careful exploration of sample sensitivity, given the likelihood of substantial parameter heterogeneity. This note demonstrates the point using data and specifications from Benhabib and Spiegel (1994). As the results indicate, it may be dangerous to draw far-reaching generalisations from growth regressions without investigating the likely extent of parameter heterogeneity in some depth.

Some Iranian economist such as Naderi (2003)\textsuperscript{39}, Komeijani and Memarnejad (2004)\textsuperscript{40} and Dejpasand (2005)\textsuperscript{41} find positive relationship between human capital and economic growth in Iran.

2.4 Comparison between Human and Physical Capital

Human capital is frequently treated in economics in a manner similar to physical capital. This section highlights the differences between human and physical capital that are relevant to public policy in knowledge-based economies. Human and physical capital differ with respect to property rights and marketability, accumulation, returns, financing, and taxation.

2.4.1 Property Rights and Marketability


\textsuperscript{40}Komeijani, Akbar, and Abbas Memarnejad (2004), Importance of Quality of Manpower and R&D in Economic Growth of Iran, \textit{Journal of Commercial Research}, Vol. 31, P. 1-31.

Physical capital is tangible; something that can be easily seen or touched. It includes machinery, factories, plants, patented processes, raw materials, inventories held by producers or traders, and means of transportation and communication. Furthermore, physical capital can be easily sold and transferred from one owner to another. As noted earlier, human capital is inseparable from the human being and its ownership is restricted to the individual in whom it is embodied. Unlike physical capital, the stock of human capital is not marketable: only the services that emanate from this stock are market goods.

2.4.2 Accumulation

The accumulation of capital in a given period, regardless of its forms, can be defined as the difference between the production of new capital and the depreciation of its existing stock. However, the processes by which human and physical capital are accumulated differ with respect to decision making, depreciation rates, and technology used to produce the two forms of capital.

**Decision process:** The decision process in the production and accumulation of human and physical capital involves decisions under uncertainty by individuals and firms. While the decision about physical capital is typically made by investors or managers, the production of human capital involves decisions by different agents over an individual's lifetime, including parents, educators, and peers. This interdependence in the human capital decision results from the fact that every investment in human capital builds upon the existing stock. If an individual's abilities were not developed at a young age, then he/she would confront limited opportunities for human capital accumulation during adulthood.

**Accumulation of Capital:** The accumulation of human and physical capital exhibits important similarities: for both it requires time and involves foregoing current consumption for an increase in expected future production and consumption. The accumulation of human capital, however, possesses a social aspect that is much less present in the production of physical capital. Indeed, human capital is developed and
accumulated through the interactions of individuals and ideas, thereby making it a social activity (Lucas 1988). This inherent feature of human capital implies that the process by which it is produced and accumulated is more labour-intensive than that for physical capital. Furthermore, since human capital is formed by the interactions of human beings, it is subject to spillovers and externalities, which have the potential to alter drastically the learning and accumulation processes. This social dimension of human capital has important implications for public policy related to institutions such as families and other social organizations.

Human and physical capital also differ in terms of mobility. Since the stock of human capital is non-tradable, its mobility depends on the owner's capacity to move and adapt to change, as well as, on regulations over domestic and international labour movements. For physical capital, its marketable nature, as well as, increased globalization and industry restructuring have increased its mobility. These differences have led to some specialization of inputs within the economy. Physical capital tends to be concentrated in goods and services that are more tradable, such as manufacturing goods. Human capital is used more in industries, such as the public sector and the service industries, which trade less on world markets. Thus, the process by which society acquires human and physical capital differ with respect to their factor intensity, their mobility, and their specialization.

Depreciation: Time depreciates human, as well as, physical capital. The latter also depreciates when it is either consumed or used up. Knowledge, abilities, and technology embedded in both types of capital become obsolete when and ideas and technology become available. Human capital also deteriorates when it is idle, since inactivity impairs the skills that individuals have acquired throughout their lives. This process can be partly reversed, however, when human capital is again put to use, a feature, that highlights the endogenous aspect of human capital depreciation. While a component of human capital depreciation is directly related to external shocks, ageing, and involuntary unemployment, another component results from an individual's conscious decision about the use of his/her knowledge and skills in a productive
process. Physical capital depreciation may also have an endogenous component
determined by the owner's conscious decision about the utilization of a particular
machine, but its relative importance is negligible given the existence of markets for
used equipment.

From the investors' perspective, human capital depreciates precipitously at the
time of retirement and is reduced to zero at the time of death. However, from society's
perspective, the death of individuals who had invested in human capital does not
imply a total loss of that capital, as part of their knowledge would have been
transmitted to other generations through personal contacts and the production of
goods, services, and ideas prior to their death. This feature does not apply to physical
capital since it is always possible to sell and transfer physical capital assets from one
person to another. A sum invested in human capital ceases to yield a return after the
investor's death, at the latest.

2.4.3 Financing

Lenders are more willing to lend for physical than for human capital
accumulation because the former is marketable and constitutes a better type of
collateral. Physical capital can easily be sized, sold, jointly owned, and transferred by
sale or by inheritance, while human capital is intangible and can not be disassociated
from its owner. This makes private financing for the acquisition of human capital
harder to obtain. Market failures in the private financing of human capital combined
with liquidity constraints resulting from income inequalities and a lower propensity to
finance human capital investments would yield a sub-optimal level of human capital.
To alleviate these liquidity constraints and the potential inefficiencies resulting from
market failures, governments have established programs which partly subsidize the
financing of investments in human capital.

2.4.4 Returns

The returns to human and physical capital tend to behave differently. When
individuals invest in physical capital, they are return-takers, that is, the owners accept
the returns dictated by the market and cannot influence them. On the contrary, human
capital has a lifecycle perspective that guarantees higher returns to young investors because they have a longer horizon over which they reap the benefits of their investments and also because early learning facilitates later learning. Given this lifecycle characteristic and the absence of markets for the stock of human capital, investors in human capital are more return-makers as the timing, the amount, the quality, and the maintenance of their human capital investment will dictate what the market will be willing to offer for their services. As a consequence, returns to investments in human capital are more variable across investors than are returns to investments in physical capital.

2.5 Human Capital Formation

Many studies investigations carried out in the western countries have shown that output has increased at a much higher rate than can be explained by an increase in physical inputs such as, labour and physical capital. The reason is that the quality of human beings as a productive source has been consistently improving due to improvement in education and skills, availability of health services, etc. Therefore, side by side with physical capital formation, human capital formation has also playing a useful role in economic development.\(^\text{42}\)

Human capital formation refers to the process of acquiring and increasing the number of persons who have the skills, education and experience which are critical for the economic and the political development of a country. Human capital formation is thus associated with investment in man and his development as a creative and productive resource. According to Schultz, there are five ways of developing human resources.\(^\text{43}\)

(1) Health facilities and services, broadly conceived to include all expenditure that affect the life expectancy, strength and stamina, and the vigour and vitality of the people.


(2) On-the-job training, including old type apprenticeships organised by firms.

(3) Formally organised education at the elementary, secondary and higher levels.

(4) Study programmes for adults that are not organised by firms, including extension programmes notably in agriculture; and

(5) Migration of individuals and families to adjust to changing job opportunities.

According to professor Meier, "human capital formation is the process of acquiring and increasing the number of persons who have the skills, education and experience which are critical for economic and political development of a country." Human capital formation includes investment for education, improvement of health and training of the workers in specialised skills. Human capital formation is the most essential phenomenon in the economic development of a country.

The non-human capital is indeed an instrument of creating wealth, while the human capital is regarded essential for creating the capacity to produce wealth. As a means of production, the human capital not only uplifts the productivity in different sector but also creates further a favourable environment for the investment in the economy, so as to utilise the full capacities of the physical capital. So, the human capital is more important than the non-human capital for the economic development of the country.

The principle ways whereby human capital formation can play its role in furthering economic development may be spelt out in terms of the following aspects of the economy:

**Process of Change:** The first and the foremost contribution that human capital formation can make in economic development is to promote change in the total environment of the underdeveloped countries. This change is such which will
disseminate the entire human and natural set-up of the country concerned. As such it will profoundly influence the economy and make it development-oriented. Process of change will affect aspirations, attitudes and motivations of the people. People will accord high priorities to economic matters and put in the requisite efforts for the same. They will start leading a higher standard of living. Another aspect of the economy concerns the structural change from a static or traditional society to a modern society. Government will require additional staff to implement the process of change. Managerial, technical and personal trainees in accounts, clerical work etc., will be needed for carrying effectively the process of industrialisation. In agriculture too, there will be the need for a variety of manpower to introduce new systems of land-use and new methods of production. Numerous skills are also needed for the development of transportation, communication etc. and so on and so forth. Human capital thus performs a key role of modernising the emotional and material environment of tradition-bound society.

**Physical Capital:** Another key role that the human capital formation can play is the one in respect of physical capital. As a matter of fact, physical capital becomes more productive if the country possesses sufficient human capital. Underdeveloped countries are strongly committed to the programmes of constructing roads, dams, power houses, factories pertaining to light and heavy industries, hospital, schools, colleges and a host of other activities associated with development planning. For this, they need engineers, scientists, doctors, nurses, veterinarians, agronomists, technicians, technical supervisors, managerial and administrative personnel, scientists, accountants, statisticians, economists, company secretaries, cost accountants etc. If there is a dearth of this varied type of human capital, physical capital can not be productively utilised. Thus, the failure of human capital to grow at the rate of physical capital has been responsible for the low absorptive capacity of the latter in lees development countries. Hence, the need for investment in human capital becomes of paramount importance in such countries.
**Raising the General Standard of Living:** the development of human capital formation is also essential for raising the standard of living of the people in underdeveloped countries. This is possible when education and training make fuller and rational utilisation of surplus manpower by providing larger and better employment opportunities in rural and urban areas. These, in turn, raise incomes and living standards of the people.

**Greater Returns:** investment in the human capital formation is also important in the sense that the returns on this type of investment far outweigh its costs. It has been found that a given investment in human capital formation yields larger returns. There is a lot of improvement in the field of health, nutrition, education, training, skill etc. For example, expenditure on training of the workers increases their productivity which ultimately leads to overall increase in production of the country. In the same way, investment in nutrition increases stamina for work and life-expectancy of labour force.

**Removal of Backwardness:** human capital formation is crucial for the removal of backwardness of the underdeveloped countries in several ways. Firstly, it can play an important role in making the existing resources yield larger output. This can be done by improving upon the labour efficiency of those countries where it is very low. Secondly, mobility of labour force can be increased. In this way, they can get better jobs and increase in income. Thirdly, it may lead to increase in the knowledge of the workers. Fourthly, it may lead to use of modern technology which is a must for the removal of backwardness in underdeveloped countries. Fifthly, human capital formation is of special significance at the early stage of development when physical capital formation is more urgently needed. This is in contrast to the experience of developed countries which require human capital formation at later stages of their progress. The underdeveloped countries require technologies and capital goods from the early stage of development. Finally, the backward countries are faced with two diverse manpower problems. They lack the critical skills needed for industrial sector, and have a surplus labour force. The existence of surplus labour force
is to a considerable extent due to the shortage of critical skills. So these diverse problems are interrelated. Human capital formation aims at solving these problems by creating the necessary skills in man as a productive resource and providing him gainful employment.

**For Accelerating Rate of Economic Growth:** investment in human capital formation is also important for accelerating the rate of economic growth in underdeveloped countries. For example, in spite of massive imports of physical capital from developed countries, the underdeveloped countries have not be enable to accelerate their rate of economic growth because of the existence of underdeveloped human capital. Human capital formation is needed for maximum utilisation of capital and non-capital (natural) resources of the economy.

### 2.6 Human Capital Indicators

Human capital is broadly defined as "the capabilities or capacities, both innate and derived or accumulated, embodied in the working-age population that allow it to work productively with other forms of capital to sustain economic production." In addition to indicators associated with this more conventional definition of human capital, the group's mandate encompasses indicators related to the enhancement of individual productivity outside the labour market in non-market activities, as well as, indicators that reflect the broader value of and concerns about the education and health. However, human capital formation is a multi-faced and dynamic process. There are many factors that determine a country's human capital stock.

Education and human capital are not identical, of course, since human capital is acquired by many other than formal education. And education dose not always result in the creation of human capital; studies have revealed some huge differences in the quality of education around the world. But there are usually no other measures of human capital available for economists to use.\(^{44}\)

2.6.1 Indicators of Human Capital in the Education Area

In the education area, it is suggested that the average educational attainment of the working age population (or labour force) be adopted as the first summary indicator of the sustainability of human capital in the education area. Additional years of education normally produce more knowledgeable and skilled workers, a situation where average educational attainment is declining is not consistent with the sustainability of human capital. It is true that years of education has certain characteristics of an input indicator rather than an output indicator of human capital and that the effectiveness of a certain number of years of schooling may vary across countries and over time due to differences or changes in educational quality. However, the problems associated with adopting an input indicator such as educational attainment as a proxy for sustainable human capital are much less severe than would be the case if a true input indicator such as educational expenditures was adopted.

The advantages of the use of years of average education attainment as an indicator of trends in human capital sustainability include its transparency, its wide availability over space in Canada from the national level to census tracts, as well as, internationally for almost all countries and over time for many decades, and its accessibility from a large number of sources, including censuses, household surveys, and administrative records. As already noted, one disadvantage of average educational attainment, as an indicator of human capital sustainability is the possibility of declining quality of educational credentials. A high school diploma in present, may or may not represent the acquisition of as much knowledge as it did 50 years ago.

The second proposed indicator of human capital in education area is the standardized test result for literacy and numeracy such as the International Adult Literacy surveys pioneered by Statistics Canada and the OECD. A decline in the test scores of the working population (or labour force) would indicate a fall in the average quality of human capital and hence an unsustainable situation.
The advantage of literacy tests is that they represent a true outcome indicator of human capital quality over both time and space. Disadvantages include the lack of historical data for countries. The small number of countries for which comparable data are available; the limited possibilities for disaggregating of the population because of small sample size, and the high cost of obtaining the data.

2.6.2 Indicators of Human Capital in the Health Area

The first indicators proposed as a proxy for the sustainability of human capital in the health area is the Health Adjusted Life Expectancy (HALE) of the total population (calculation of a HALE for only the working age population or labour force poses statistical problems). A decline in the HALE would be an indication that the size of the current population may not be sustainable.45

The HALE is a classic summery indicator. Its greatest strength is that it captures the impact on the population of all the determinants of health. One disadvantage is that unlike life expectancy, it is relatively difficult to calculate, as it requires detailed data on health status to make the disability or health adjustment. Therefore, it may not be available for long time periods and on a consistent basis for a large number of countries. However, as trends in the HALE appears similar to that of overall life expectancy, for periods and countries where the HALE is not available, overall life expectancy may possible be used as an approximation. Data on overall life expectancy are available for almost all countries for long time periods.

The second indicator proposed to track the sustainability of health component of human capital is self-reported overall health status. Like the HALE, a decline in health status of the working age population of labour force indicates deterioration in the ability of this population to engage in economic production and hence represents a decline in human capital and a trend toward unsustainability.

45 Center for the study of living (2001), Proposed Framework on Human Capital Indicators, Prepared for the National Round Table on the Environment and the Economy’s.
Self-reported health status is an outcome indicator. Research shows that it is an excellent indicator of the true health status of individuals. The proportion of the population who rate their health as very good or good approximates the population who in fact have few health problems. One disadvantage of self-reported status is that this information requires health surveys of the population so there may be limitations on the availability of comparable data over time and across space.

### 2.6.3 Existing Indicators of Human Capital

On an international basis, OECD has published a large number of health and education statistics mainly for the purpose of cross-country comparisons; the World Bank has compiled a list of indicators for human capital and intellectual capital as part of its competitiveness indicators; and the United Nations has developed a set of indicators for monitoring human development. In a recent attempt to develop a set of indicators for human capital, Ruggeri and Yu (2000) developed a new framework within which four dimensions of human capital are identified and a list of indicators is selected for each dimension.

#### 2.6.3.1 The United Nations (UN)

In 1990, the United Nations Development Programme initiated publication (UN 1990) that contains a mixture of social and economic indicators called “Human Development Indicators.” The purpose of these indicators is to determine how the process of economic growth “translates – or fails to translate- into human development in various societies,” where human development is defined as "the entire spectrum through which human capabilities are expanded and utilized." We presented a list of human capital indicators from Human development Report 2000, United Nations, as below:

- **Education indicators:**
  - Adult literacy rate

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Youth literacy rate
Primary and secondary enrolment rate
Children reaching Grade five
Tertiary students in science
Public education expenditure as a per cent of GNP
Public education expenditure as a per cent of total government expenditure
Public education expenditure for pre-primary and secondary levels of education
Public education expenditure for tertiary levels of education
Public expenditure on education
Adult literacy rate
Combined primary, secondary and tertiary gross enrolment ratio

Health Indicators:
Infants with low birth weight
One-year-olds fully immunized against tuberculosis and measles
Oral rehydration therapy use rate
Pregnant women with anemia
Tuberculosis cases
Malaria cases
Total number of people living with AIDS/HIV
Adult rate of AIDS/HIV
Annual average cigarette consumption per adult
Doctors per 100,000 people
Nurses per 100,000 people
Life expectancy at birth

2.6.3.2 The World Bank
The World Bank's database of "competitiveness" indicators is a collection of 49 indicators to quickly assess economic performance and the environment for
competitive business development in many countries. These indicators reveal aspects of competitiveness or the conditions for achieving competitiveness for firms and industries in a particular country. The indicators have been collected from various sources. They are organized in five broad categories: overall performance, macro and market dynamism, financial dynamism, infrastructure and investment climate, and human and intellectual capital. Given our mandate, we report only the indicators for human and intellectual capital. As with the indicators from the UN, this list focuses mostly on the utilization of formal learning achievement, though it includes elements that affect the competitiveness of a country. Our selected indicators are presented as below:

Human Capital
- Literacy rate
- Enrolment in primary, secondary and tertiary education
- Secondary technical enrolment
- Life expectancy at birth

Intellectual Capital
- Science graduates
- Scientists and technicians
- Research and development expenditures
- Patent applications
- Patents granted

2.6.3.3 The OECD

The OECD has made a major effort in recent years in the collection and reporting of comparative statistics in the areas of health and education. As an example, we present a list in below from 1986 OECD publication “Living Conditions in OECD Countries: A Compendium of Social Indicators.” As with all previous lists, this list shows a selected set of indicators related to health and education.

Health
- Life expectancy at birth

49 World Bank (1999c), World Development Indicators, Washington D. C.
Life expectancy at age one  
Life expectancy at age 20  
Life expectancy at age 40  
Life expectancy at age 60  
Trends in perinatal mortality rates  
Perinatal mortality rates by age of mother  
Average number of disability days per person per year  
Average number of bed-days per person per year  
Percentage of the population restricted in daily activities because of long-standing health conditions  
Percentage of the population with certain types of functional disability  

Education and Learning  
Trends in average years of regular education  
Average number of years of regular education  
Distribution of the population by highest International Standard Classification of Education (ISCED) completed  
Percentage of the population with a level of education below "ISCED2 completed"  
Percentage of the population with a level of education below "ISCED3 completed"  
Percentage of the population with at least some university or equivalent education level  
Percentage of the population having participated in adult education  

2.6.3.4 Ruggeri and Yu  

Ruggeri and Yu (2000) have outlined a framework for selecting indicators for human capital in which they identify four dimensions of human capital: (a) potential, (b) acquisition, (c) availability and (d) effectiveness. The main purpose of their study was to identify factors that determine both the quantity and quality of the effective use of human capital.

of human capital in various stages as represented by the four dimensions. For each
dimension, they separated the indicators into two groups: process indicators and
outcome indicators.

Potential Human Capital Indicators

Process Indicators
- Cost of raising a child to age 18
- Poverty rate of families with children aged 0-5
- Public spending/child age 0-5
- Labour market programs
- Health care programs for mother and child
- Parent's education level

Outcome Indicators
- Children aged 0-5 as percentage of the population
- Mortality rate of children age 0-5
- Indicator of child development at age five

Acquired Human Capital Indicators

Process Indicators
- Teacher-pupil ratio in elementary and secondary schools
- Annual rate of return education
- Spending on public labour market programs
- Spending by enterprises on training

Outcome Indicators
- Literacy rate
- High school graduates as percentage of Grade 12 enrolment
- Educational attainment of the population aged 25-64
- Percentage of graduates with science degrees
- Adult participation in education and training
- People with university degrees as a proportion of labour force

Available Human Capital Indicators
Process Indicators
- Wage differentials
- Unemployment rate relative to the US
- Elements of immigration policy

Outcome Indicators
- Net migration of individuals aged 0-19 per 1000 people
- Net migration of individuals aged 25-64 with post-secondary education
- People with university degrees as proportion of the population age 25-64
- Crime rate

Effective Human Capital Indicators
Process Indicators
- Employers' attitudes toward employment
- Health status of the population
- Proportion of GDP spent on R&D

Outcome Indicators
- Unemployment rate
- Unemployment rate of adults aged 25-64 with post-secondary education
- Absence rates
- Index of job satisfaction

2.7 Problems of Human Capital Formation

The growth of western European countries and the United States of America has been based more on investment in physical capital than in human capital in their earlier phases of development. But in the case of underdeveloped countries, the need for human capital in the form of educated persons in different vocations is greater to provide the missing components in the initial stage of their development. The major problems in human capital formation in developing countries are:
(a) Rapidly growing population.

(b) Mounting unemployment in the modern sector of the economy, as well as, widespread underemployment in traditional agriculture.

(c) Shortage of persons with the critical skills and knowledge required for effective national development.

(d) Inadequate or underdeveloped organisations and institutions for mobilising human effort; and

(e) Lack of incentives for persons to engage in particular activities which are vitally important for national development.

(f) Lack of manpower planning.

(g) Lowering of academic standards.

In fact, without an improvement in the quality of human factor, no progress is possible in an undeveloped country. As aptly emphasized by professor Schultz, "it as if we had a map of resources which did not include a mighty river and its tributaries. The particular river is fed by schooling, learning on-the-job, advances in health, and the growing stock of information of the economy".