Explaining the Role of Education in the Realization of Knowledge-Based Economy

Farshad Momeni¹, Hossein Abbasinejad², Naser Elahi³, Seyyed Mohammad Bagher Najafi*⁴

¹Assistant professor, Alameh University, Faculty of Economics  
²Associate professor, Tehran University, Faculty of Economics  
³Assistant Professor, Mufid University, Department of Economics  
⁴Lecturer, Razi University, Department of Economics

ABSTRACT

Globalization along with salient advancement of information and communication technology caused the emergence of a new economic era in human life, known as knowledge era. These developments, rapidly expanding, initiated from United State of America and some other countries in 1990s. Based on the perspective of human life improvement, knowledge-based economy provides significant new opportunities. Noting some characteristics of knowledge-based economy, the current study investigates the role of training in realization of knowledge-based economy. Theoretical framework of this paper is based on institutionalism. Required data were collected by employing documentary method. Results suggest that training is the most effective feature in realization of a knowledge-based economy. The usefulness of training in developing countries requires improvements in form and quality of training.

KEY WORDS: Knowledge, Knowledge-based economy, Institution

INTRODUCTION

Knowledge-based economy is a new era of human economic life. Perception and coordination with knowledge-based economy can be considered as a great origin of enormous social and economic achievements in human life, particularly for developing countries that are encountered with underdevelopment problems and failed to match themselves with the First and Second Waves of Industrial Revolution’s requirements and are deprived from its achievements. These countries achieve a second chance by starting this new economic era, which is almost like initiating a new game, to compensate their retardation and move forward to solve their numerous economic and social problems. Some developing countries like Singapore took the most advantage of the opportunities created by knowledge-based economy and have experienced significant economic growth.

Neglecting the knowledge revolution and its implications, on the other hand, can cause a fall far more severe than that, which developing countries experienced during the First and Second Waves of Industrial Revolution era. Causing a far more severe fall since developments in technology, science and globalization have greatly increased the speed of social and economical changes. Consequently, negligence costs of this economic revolution have grown dramatically.

Assuming the importance of knowledge-based economy and the necessity of its fulfillment (Momeni, et al, 2012), the present study investigates one of the main institutional implications, that is the role of educational institution in realization of knowledge-based economy.

Knowledge

Since the main element of knowledge-based economy is an application of knowledge, the concept of knowledge is briefly explained to clarify the issue. Here, the author seeks the answers of these questions: what is knowledge? What is the difference between data and information? What is technology? Why do we divide knowledge into various groups and levels? What are the different types of knowledge?

To have a better perception of the concept of knowledge, prior to discussing its definition, some concepts that are close to knowledge must be explained. This includes: data, information and technology. Preliminary results of scientific observations are known as data. Data is a set of numbers or words about realities that are not yet sorted and have not found any certain order. Once the data is organized and disciplined, it is called information (Porat, 1977: 2). Technology is a specific mode of knowledge that is concerned with how to do things. Providing a general definition of knowledge, Castells quotes Daniel Bell’s definition: Knowledge is a set of organized statements of facts or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form (Castells, 2002).

*Corresponding Author: Seyyed Mohammad Bagher Najafi, Lecturer, Razi University, Department of Economics, Phone: +98831-8384782. Email: najafi122@yahoo.com
Various types of knowledge from economic perspective

Knowledge classification based on economic perspective which has a special emphasis on its portability and exchangeability is one of the most useful classifications of different types of knowledge. In this classification, the types of knowledge that are important from the viewpoint of knowledge-based economy are separated and characterized. Based on this perspective, knowledge is divided into two categories which are explicit knowledge and tacit or implicit knowledge. Nonaka provided this classification for the first time (Nonaka, 1995: 8), following Michael Polanyi’s division of personal knowledge (Polanyi, 1958:61). According to Nonaka, formalized and codified type of knowledge that can be transmitted by means of formal and systematic language is called explicit or coding knowledge. In contrast, tacit knowledge is known as a type of knowledge which cannot be expressed by formal and developed tools.

Three points are noteworthy here. First, tacit knowledge is not yet documented and transferable, thus, it can be revealed just by those who use and control it. Among various types of knowledge that are mentioned in knowledge classifications, from epistemological point of view (Lundvall, 2008: 683), ”Know-what” and ”know-why” are mostly explicit, while ”Know-how” and ”know-who” are rather implicit (OECD, 1996: 12).

The second important point about these two kinds of knowledge is that tacit knowledge is more difficult to obtain and it releases slowly. Therefore, tacit knowledge is often the basis of competitive advantage (Coates and Wawick, 1999:2). The third point is that tacit knowledge is far beyond explicit knowledge in terms of volume, impact and therefore importance. Stiglitz likened explicit knowledge and tacit knowledge to an iceberg floating in water that usually only a small piece of the top of the iceberg is out of the water (Stiglitz, 1999:5). Explicit knowledge is like the top of the iceberg which is the smaller piece and tacit knowledge is like the larger part of the iceberg that is in the water. Dividing knowledge into two types, explicit and tacit, does not mean that we always face with either explicit knowledge or tacit knowledge. In most cases, however, both explicit and tacit knowledge exist for each specific topic.

Knowledge-based economy

Since World War II, political and military competition between West and East Blocs led to rapid development in technology. Due to military supports and the two Blocs competitive pressure, computer, internet and communication technologies had grown rapidly (Castells, 2002: 33 & 72). Outstanding progress of knowledge in the 1950s and 1960s led to two major changes in human life: Globalization and revolution of technology and knowledge. The rapid development of information technology provided scientific context for globalization and consecutive progress of science and technology, led to the revolution of knowledge and technology. Globalization along with scientific and technological revolution created a new economic and social era in human life. Such that in the 1980s several prominent theorists, especially Paul Romer (Kelly 1996), Machlup (1980-1984), and, Drucker (1988), predicted the rise of a new economic era in which knowledge would become the most important source of wealth (Baker & Ghuzal, 2002:2).

Knowledge, since the onset of agricultural age and afterwards with a greater speed in the First and Second Waves of Industrial Revolution, has constantly played an important role in economic activities. However, it was never considered as the most important factor of production. In agricultural age, land and after that in industrial age, capital and machines were considered as the main factors of production. But now in the modern economy, knowledge is the most important factor of producing goods and wealth. Thus, it is called the knowledge-based economy era.

The term ‘knowledge-based economy’ was introduced for the first time by the knowledge, technology and industry administration sector of OECD, during the time it was under Lundvall’s management (Godin, 2003:6). According to their definition, knowledge-based economy is the economy which is directly based on production, distribution, and incorporation of knowledge and information (OECD, 1996:7). In this economy, knowledge is an input of production, while it amends the productive relationships of Industrial age. The shifts in the role and importance of knowledge have dramatically changed social and economic aspects of life. So that, in countries in which science and information technology has more progress, the society is in transition from the industrial paradigm to a new paradigm that includes fundamental changes in the economic performance and principles of economics (Smith, 2000: 1).

Asia-Pacific Economic Cooperation (APEC) defines knowledge-based economy as an economy in which, knowledge is the driving force for economic growth, creating wealth, and employment, in all industries. One of the most important points of this definition is the emphasis on the human capital development with high standards. This development and capital accumulation is lifelong (APEC, 2003: 4). The best way to accomplish the already mentioned development is training. Thus, knowledge-based economy is linked with training. World Bank put an emphasis on the importance of knowledge and its key role in economic growth and people’s lives improvement. According to the World Bank, the importance of knowledge has increased because in its report on global development in 1998-9 a new indicator, based on knowledge and countries’ utilization of knowledge, was introduced to assess the level of development of countries. This means that World Bank has came across the fact
that one of the most crucial factors in determining the level of countries’ development is their utilization of knowledge which can be considered as a new added value criteria (World Bank, 1998). For instance, in the U.S. the share of ICT in nominal GDP has increased from 4.9 percent in 1985 to 8.2 percent in 1997 (Quah, 1998: 5). Moreover, the added value for knowledge-intensive services in U.S. in 2007 had reached 326,680 million dollars that was 66.2 times more than the same indicator in 1992 (122.671 million dollars). This indicator, in the same period, had reached 3.4 times and 3.2 times in Malaysia and Singapore, respectively (www.nsf.gov). Statistical evidence, as an example of an advanced economy, demonstrates an outstanding increase in the share of U.S. GDP. In the new advanced economy, in general, the crucial role of knowledge in creating added value is growing rapidly.

**Institution and its various kinds**

Institution is used in different senses in English (Davis & North, 1970: 132). The current study is based on Douglass North’s definition of institution. According to him, institutions are shared mental models or common solutions that are employed to solve recurring problems of social interactions. In this vein, institutions are the rules of game in the society, that is, any decision, choice, and social performance are formed based on institutions and their frameworks. Hence, accurate and profound perception of social phenomena and their causal, governing relationships are only possible through perception of institutions. In general, institutions include any restrictions that human being set to establish their mutual relationships. In some cases, the terms of institutions ban doing something and in other cases they license to carry out an activity, providing a permission to do that (North, 1998: 19-21).

1. **RESEARCH QUESTIONS AND METHODOLOGY**

   The present study encounters with two crucial questions that seeks to answer, these are:
   
   1.1. What are the main features of knowledge-based economy that are related to training?
   1.2. How does training affect the knowledge-based economy?

   Data were collected by using documentary or library research method. Descriptive-analytic method was employed to analyze the collected data. Theoretical framework of the current study is institutional economics.

2. **Features of knowledge-based economy**

   Knowledge-based economy has several features. Here five features are discussed. These five features are selected to illustrate the necessity of training and its priority for development planning, in order to fulfill a knowledge based economy.

2.1. **The importance of knowledge**

   So far, human’s economic life has encountered with three fundamental revolutions in social life: Agricultural Revolution, Industrial Revolution, and Knowledge Revolution. From economic perspective, one of the key and central characteristics of knowledge production model is its most important factor of production. In agricultural age, the most crucial factor of production was land and in the First and Second Waves of Industrial Revolution capital became the most important factor of production. Now in the knowledge revolution era, however, knowledge is the main factor of production and added value creation. Abundant evidence indicated that knowledge has a great impact on creating wealth and added value in three levels of individuals, firms and countries. At individual level, for instance, Bill Gates is one of the leading individuals in knowledge-based economy. Currently, Bill Gates is one of the richest men in the world. At the end of 1998, his net asset value was more than 83 billion dollars (Taro, 2005: 42). Ever since, he has remained as one of the richest men in the world. Moreover, in 1997, three American were among the 20 richest people in the world. These three earned almost all of their wealth through software. Their total wealth was 10 times more than the total wealth of three British men who produced more tangible goods (food, steel, etc.). Few other Americans who were among the 20 richest people in the world, in addition to these three, were working in computer industry. Among these rich people, two other Americans were eminent people of mass media. Among richest people, in October 1998, the wealth of those who were working in the software industry was nearly twice more than the wealth of those working in industries other than software.

   At firm level, in 1987, five firms (Dell, Cisco, Compaq, Microsoft, and Intel) had a capital market of 12 billion American dollars. In 1997, their total asset was more than 600 billion American dollars, which means that their asset reached 50 times in less than 10 years, with a growth rate of 45 percent. At the country level, in America the nominal GDP share had increased from 4.9 percent in 1985 to 8.2 percent in 1997 (Quah, 1998: 5). David Rothkopf investigated the issue of income distribution from the perspective of inequality expansion. His study was concurrent with the rise of information economy and knowledge economy. He found considerable evidence indicating severe changes in income distribution in this period. As an instance of the income of knowledge-driven companies, he referred to YouTube and stated that, dot.com millionaires are now anxious about who created and sold Youtube and earned 1.65 billion dollars (Rothkopf, 2010). Quoting New York Times, he said while the increase of the average of real income from 1990 to 2004 for the bottom 90 percent American families was only 2 percent, this amount for the top 1 percent families was 57 percent and with a significant difference this amount reached 85 percent for the top one-tenth families and 112 percent for the top one-hundredth American families. (Rothkopf, 2010).
Most of these new rich people benefited from knowledge-based economy. This evidence again confirms that knowledge-based economy provides outstanding rewards for those who employ it.

As mentioned earlier, knowledge-based economy provides significant economic rewards for those who perceive opportunities in time and make the best out of it, in all three levels of individuals, firms, and countries.

### 2.2. The importance of innovation

Innovation can be considered as one of the major elements of production, economic growth, and social changes in all periods of human economic life. Examples of impressive innovations can be cited even in the primary periods like innovation in drying and storing hay that enabled cities to live in areas with very cold winters. Nowadays, in knowledge-based revolution era, however, innovation plays more important role compared to the previous periods. In knowledge-based revolution era, innovation, aligned with knowledge, is one of the main elements of production, creation of added value and wealth. In general, knowledge increases human capacity for change and modification in the universe. Knowledge helps human to invent thousands of new kinds of drugs to cure diseases and to greatly shorten the distances between places and reducing the time required to achieve the goals. To sum up, one of the spectacular achievements of knowledge is its significant developments in expanding the scope and intensity of human ability in offering new innovations. These innovations, in turn, play crucial role in the creation of added value and economic growth. Thus, European Union emphasizes on the importance of innovation and its role in solving economic and social problems (Pohlman, 2005: 6). In America, innovations that are mostly based on technological advances have great impacts on economic growth. In the words of Gary Bachula former U.S. undersecretary of commerce Leading economists identify technical progress as the single most important factor in sustained economic growth, accounting for as much as one half of U.S. economic growth in the past 50 (Tofflers, 2006).

In knowledge-based economy, innovation is not a random event based on individual actions; it is not even a linear social process. Innovation is a social process of interaction (Jenson and others, 2007: 11). Hence, the innovation process involves a complex series of economic, social, political, organizational, and institutional factors with mutual effects. Laying the groundwork for the innovation process and providing its institutional and social infrastructure require identification and training of this complex process. Training has three more effects on innovation. First, it enhances human capacity of learning and his accumulated knowledge. Second, knowledge can increase innovation capacities (Nelson & Phelps, 1966) and create the innovation ability. Last but not least, training can teach new areas of valuable economic innovation to researchers and labor forces and help talented ones to solve economic and social problems. Hence, training has at least four effects on the level of innovation in general.

Figure 1.2: Examining the relationship between training and innovation
2.3. Shortening the life of knowledge

A key feature of knowledge-based economy is that it shortens the life of knowledge in knowledge revolution era. By the end of the nineteenth century, the growth of science and production of new scientific findings usually lasted for more than a century, indicating that no better substitution was found in the meantime. Since the beginning of the twentieth century, the rate of producing new scientific theories slowly increased. After World War II, with the onset of the Cold War era, America and Soviet governments competed with each other to dominate the opponent, carried out huge investments to achieve new scientific and technological discoveries as a means of dominance. These investments provided strong demands for research and knowledge production. With United States Department of Defense investments, computer, internet, and hundreds of other important technologies were invented (Castells, 2002; 33). Introduction of computer and new communication technologies like internet caused huge changes in media and communications means. The speed of data transmission greatly increased and its costs decreased dramatically. In this line, the speed of access to information significantly enhanced. This unusual phenomenon is known as Information Revolution or Information Technology (IT) revolution. Information revolution leads to speed up access to data and information that people need.

Along with information revolution, inventions in online virtual world led to significant research opportunities for scientists and researchers like designing and producing virtual laboratories which greatly enhanced the speed of experiments and extremely reduced huge costs of designing and conducting experiments. Producing processor and analyzer softwares, constructing online libraries, holding online meetings and similar other cases are all achievements of this era. All these changes together, on one hand, speed up human access to information and, on the other hand, sharply increase the ability of analysis and data processing. The combination of these two, led to the enhancement of man’s creation of knowledge and new scientific innovations. Therefore, since the final decade of the twentieth century, scientific advances are extremely fast.

The speed of creation of knowledge and new technologies is growing. Accelerating the creation of science and technology has some aspects. One of its consequences is the increase of knowledge and new technologies in theoretical field of economy and its practice. Decreasing the longevity of science and technology or in another words acceleration of aging science and technology is another consequence of this era. In current condition, according to statistics, the rate of knowledge and information production in six month is equal to all information that has been produced from the beginning of development of human civilization till the end of the twentieth century. As a result, average life expectancy of each technology which was a hundred and ten years by the end of nineteenth century decreased to less than a year at the end of the twentieth century. As another instance for increasing the rate of change in knowledge, it is noteworthy to mention that half of the skills that a computer engineer learns at the university become outdated until a year after his exams (Danish Ministry of Training, 1997: p.56).

2.4. Rapid changes in the job market

Andrew Grove is the founder and chief executive officer of Intel Corporation. With his leadership, this company has become the world’s largest constructor of computer chips on the threshold of new millennium, achieved the fifth position of celebrated companies in America and became the seventh most profitable company in the world (Grove, 2009: 13). In his book “Only the Paranoid Survive” investigated the methods and rules of management in the knowledge-based economy era. In this book, he considered constant change as the main feature of this period, changes that altered the fundamental features of economic life of individuals and firms. This changes itself can be "due to technological change or competition, therefore fighting with them with old methods is not effective” (Grove, 2009: 18).

The basic point is that technology constantly changes and alters everything along with itself. Successive waves of change have almost destroyed any kind of stability in economic world. Various aspects of the business environment and economy are changing. The emergence of successive changes in the employment environment is an important dimension of this phenomenon. Fixed income for a fixed job is one of the achievements of this Industrial revolution and its subsequent manufacturing. Due to being tied to physical space, this production pattern requires establishing constant, fixed and long-time manufactures, organizations and manufacturing firms. Due to these firms, jobs became stable and long-time. But now the manufacturing system has been changed. A large proportion of products, ideas and knowledge that are produced in libraries and laboratories in various formats like patent, licensing, etc... became available. For instance, in 2004, IBM Corporation earned 1.2 billion dollars only through transferring its scientific innovation patent (Tofflers, 2009:204).

Along with changes in the manufacturing system, organizations and manufacturing firms, career opportunities have also continuously changed. Tofflers stated that “in the new wealth creation system, most jobs and activities are temporary. Skills are organized in a temporary form based on their requirements and after doing the job the organization itself disappears” (Tofflers, 2009: 59).
2.5. Necessity for changes in management practices

After the Industrial Revolution, production gradually shifted to producing goods in manufactures. Manufacturing model is a defined production line that materials are entered into the line and at each level a predetermined stage of production process is performed. Production in this model has three characteristics. First of all, both the production line and its process are predetermined and cannot be altered by labor. Second, the technology of machine plays the most crucial role in the production process. As an instance, one can compare the efficiency of an automatic press machine and a worker with a basic instrument such as a hammer; both want to turn a cut sheet metal into a metal bowl. The difference in the performance is so great that they are not even comparable. Moreover, comparing a combine harvester with a worker, both trying to harvest a thirty-acre wheat farm, is another confirming example. The farmer cannot harvest the farm using a sickle until the end of the season, while the combine can harvest the farm in less than three days.

The third feature of this method of production is that due to special designs employing in producing machines and technology, the role of labor force skills has minimized. In this vein, minimum produced added value is taken into account for labor forces and as a result minimum wage may be considered for them. On the other hand, the role of the intellectual power of man in the production process has decreased. In a large factory, probably only the design engineering and one or two other units think and thousands of other workers just work in the factory. Since the production process is already fully deigned and specified, the factory does not need intellectual force, thoughts, ideas and innovations of its workers.

The manufacturing model is the result of Industrial Revolution. It created certain views in philosophy, social science, intellectual foundations, values, schools of thought and enterprising methods. One of these methods is the vertical management method. In this management style, which is designed in line with manufacturing production, only the top of the production pyramid think and make decisions, announcing decisions in an imperative way consistent with design of the production line and machines. The body and base of the pyramid usually have to work only and no one expects them to think, invent, and innovate.

Currently, in knowledge-based economy machines and labor force are not the main factor of production; rather knowledge and innovation play a significant role as major factors of production. Knowledge and innovation are products of human thoughts. This highlights the importance of human existence. Tacit knowledge is the main part of knowledge. Tacit knowledge is gained in several ways. Learning through doing and experiencing is one of the most important ways of learning this type of knowledge. Hence, in knowledge-based economy, labor force is no longer a strong controlled force or a single operator. However, it is a very rare source for producing tacit knowledge and innovation. The benefits that knowledge-based firms can obtain from the innovation of their staffs are much more than the advantage they can gain from their labor force.

By increasing the importance of innovation and its crucial role in creating added value, the position of research, development departments and organizations should quickly alter. Research organizations should gain a very important position. These organizations must employ more budgets, efficient forces and qualified managements. In search for new ideas, they should act like an agile hunter. The cost of a new idea or research and search for its possibility and benefits should be minimized by the researchers and staffs. The barriers of idea processing should be reduced as much as possible.

Turning knowledge and innovation to the main factor of production and added value creation demands a change in which vertical management model must be converted to horizontal management pattern. In other words, the decision-making pyramid in firms and economic organizations should become as close as possible to a circle. As a prerequisite for realization of knowledge-based economy, this change is such important that Stiglitz considers it as one of the basic prerequisites for knowledge-based economy fulfillment (Stiglitz, 1999: 50).

Based on his practical experience, Andy Grove, Professor of business management at Stanford University and the founder of Intel, put emphasis on the significance of this change in management model and decision-making system in the pyramid. As one of the main management lessons in knowledge-based economic era, he stressed that “We should be available for lower rank staffs. If they are given the opportunity, they inform you of news and findings which are out of the sight of expert staffs” (Grove, 2008: 40).

2.6. The importance of tacit knowledge

As we mentioned earlier, in knowledge-based economy era, knowledge achieves a significant importance and it becomes one of the main factors of production and added value creation. From economic perspective, knowledge divides into two major categories: explicit knowledge and tacit (implicit) knowledge. Tacit knowledge refers to the knowledge that is not yet written and therefore it cannot be transferred through study or common academic trainings. This type of knowledge is in the mind of a special individual or individuals. As regards, it is more difficult to obtain. From economic perspective, tacit knowledge is more important than explicit knowledge because of two reasons.

First, tacit knowledge constitutes a much greater volume of knowledge. The volume of explicit knowledge is very smaller than tacit knowledge volume. Stiglitz stressed this point by comparing the volume of knowledge to an iceberg. He pointed out “explicit knowledge can be likened to an iceberg” (Stiglitz, 1999:40). Explicit knowledge is
like the top of the iceberg which is the smaller piece that is clear and visible. Explicit knowledge is only a small part of the total volume of knowledge.

Another important aspect of tacit knowledge is that the competitive advantage of firms is mainly due to this type of knowledge. In the knowledge-based economy era, as a result, tacit knowledge is of great importance, since it is the main engine of economic growth providing major competitive advantages.

Knowledge-based economy has several features. The aim of this discussion was only to point out some of its features that are associated with learning. One of the fundamental properties of knowledge-based patterns of production and life is the central importance of knowledge, particularly tacit knowledge, innovation, and technology. Rapid changes in the job market together with the necessity of changing management styles are other features of knowledge-based economy. In the next section of the current study, we will explain the association between training and these features and also the impacts of training on them. The final result of these discussions aims to investigate the role and impacts of training in the realization of knowledge-based economy. In continue some of the reasons for the emphasis on the importance of training and its role in the realization of knowledge-based economy will be discussed.

3. Impacts of Education on realization of knowledge-based economy

For simplicity, here, those features of knowledge-based economy which are in association with education are divided into two categories and will be presented in two charts.

3.1. Incomplete information and the necessity of education

People’s choices are based on their information. Hence, information plays an important role in decision-making process and individual’s performance. In addition to its impact on the nature and quality of the selection process, people’s consideration of complete or incomplete information also influences on their perspective towards the issue.

Neoclassical school assumes that individuals have complete information. To strengthen the objectivity of the economic analysis, institutional school leaves the assumption of complete information and considers incomplete information. Due to the obvious principle that individuals’ choices and their decision making can be based on incomplete information, they are constantly faced with uncertainty.

Based on institutional perspective, to compensate the deficiencies, shortcomings and lack of confidence in decision making under conditions of incomplete information, people can employ two main solutions within one another. First, the acquisition of knowledge through teaching and learning and second the invention of institutions (North, 2005:17). Institutions provide a framework for selecting individuals and restrict the scope of their choices, helping individuals to decide more easily under the conditions of incomplete information, to control their uncertainty and to give an order to their decision. Order, learning, and training lead to an increase in man’s level of information and greatly reduce the information deficit. With more information, they can make a much more accurate decision with less error. Based on institutional economic framework, therefore, learning and training are key effective variables. North considered learning and training, particularly environmental training, as the origin of the emergence of institutions, institutional and social changes (North, 2004).

In this regards, learning and teaching institutions, that can lead to increase the level of information, improve the ability of decision-making in individuals and communities and lead to the realization of knowledge-based economy, are key essential variables here. This study employed institutional economic perspectives to modify Iranian economic structure and to realize knowledge-based economy.

3.2. Training as the essential condition for acquiring and transferring knowledge

In knowledge-based economy, training has a very privileged position, since in this economy knowledge is the most important factor of production and the main method of acquiring and transferring knowledge is training (Lundvall, 1997: 1). In this vein, training plays a key role in the knowledge-based economy. Training has impacts on the realization of knowledge-based economy in several ways which are discussed in details in the following sections.

The importance of training in the realization of knowledge-based economy is so significant that almost all researchers of this type of knowledge address the issue of appropriate training. World Bank researches is one of the best scientific efforts ever done that provides a model for policy making in line with the realization of knowledge-based economy. In its plan “knowledge for development” established in 1995, World Bank considered four main factors for determining economic performance of a country (World Bank, 1999). These factors are:

1. Economic and institutional regime  
2. Training human resources  
3. Innovation system  
4. Information structure

Several researchers have studied the relationship between training and economic performance from various aspects. Findings were consistent with the World Bank model. Nelson and Phelps (Nelson & Phelps, 1966) stated that training increases the capacity of innovation and has effects on implementation of new technologies. Introducing newer and more efficient technologies together with improving the economic performance are its achievements. This
continuous improvement in technology leads to persistent production growth. As noted, the World Bank considered training as one of the four major factors determining economic performance of a country. Thus, the realization of knowledge-based economy and its persistence in a country requires attention and investments, particularly in training. In other words, training is a key to the realization of knowledge-based economy and society.

3.3. The role of training in human development

Since Industrial Revolution, three major attitudes were expressed towards human status in economics. The first attitude which was popular before 50s had two main characteristics. First characteristic is that, human was only one of the factors of production and was homogeneous with other factors. Second, in the process of production, the main interest was focused on labor force and physical force, disregarding their intellectual, scientific creativity and innovation.

In early 1960s, the views towards human being changed. In this period, in economics, human were considered as capital sources. Schultz presented the theory of human capital. This hypothesis stated that the key to economic development is human himself and not material resources (Schultz, 1961). According to the human capital perspective, human was still considered as a developmental tool, however he was not a simple means of production anymore; human was considered as a capital through which the production could flourish. Consistent with what we already expressed, Amartya Sen stated that: “employing the concept of human capital, which is merely focused on expanding human productive capacity, is undoubtedly a great movement; however it needs completion, since human beings are not merely the means of production, they are the aim of this movement as well” (Sen, 2001: 329). Schultz also stated that, based on human capital perspective, the costs that individual or society spends for training in various forms cannot be considered as a type of consumption expenses. But rather, it’s an investment with a long-term outcome (Schultz, 1961).

In the final decades of the twentieth century, human development theory was proposed. With a significant qualitative mutation, this view paid attention to the fact that human is not only a developmental tool however he himself is the goal of development. In this vein, Tavneet stressed that “the human development is in fact a very broad concept that is defined to improve individuals’ opportunities which enables them to lead a longer, healthier, and more complete life” (Tavneet, 2011: 506).

Accordingly, it can be understood that why United Nations Development Program (UNDP) directly associated human capital to human potentials and quality of life. UNDP defined human development as the following, “human development is a process of enlarging people’s choices. The most critical ones are to lead a long and healthy life, to be educated and to enjoy a decent standard of living. Additional choices include political freedom, guaranteed human rights and self-respect- what Adam Smith called the ability to mix with others without being ashamed to appear in public” (UNDP, 2010:24).

Based on human development perspective, the development process should be in line with enhancing human capabilities and choices. Human’s capabilities and their right to choose are dependant to some variables including income, hygiene, skills and education. Meanwhile, training plays an important role since it has an impact on both individuals’ income level and the level of effort they put into hygiene. For various reasons which will be discussed in chapter five, the role of basic education is much more for developing countries. Sen argues that “the main impact of the Asian countries success was the erosion of this public belief that public education is a luxury item” (Sen, 2004: 28).

One of the most important aspects of education is in association with crucial matter of sequence or the right order of doing things. Overall, one of the main challenges of all administrative policies, especially in developing countries that their basic conditions are different from developed countries is to perceive and observe the right ways of doing things. If developing countries set and implement their economic and development policies without identifying and respecting the right way to do things and only by modeling the current policies of developed countries, which passed several stages of development, those policies cannot be effective, efficient and useful due to the lack of the necessary prerequisites. According to this viewpoint, there is a great emphasis on the importance of education, particularly public primary education. In their movement towards development, all developed countries solved the problems of public and primary education to provide the necessary conditions for continuing education and increasing individuals’ participation role in development process. It is not possible to step into the path of sustainable growth and development without providing qualified primary education, scientific and cultural foundation.

Training is one of the most important variables affecting the realization of human development. In knowledge-based economy, knowledge and innovation are the main factors of production and these two factors are the result of human thoughts. Hence, in this economic model, human and his intellectual abilities or in other words human development has a very great significant, since developing human basic abilities like creativity develops knowledge production and innovation. Human development, as noted above, is dependant to the level of education. Thus, the key role of education in the realization of knowledge-based economy through human development should be considered.

3.4. The importance of rapid transfer of the latest inventions to innovation

In knowledge-based economy, knowledge by itself has no influence on economic performance as long as it is not applied. For having an impact on economic performance, knowledge, inventions and ideas should be converted to innovation and be applied in practice. In this era, knowledge is the main competitive advantage. Indeed, the faster
ideas and inventions become practical, the sooner relevant individual or firm can benefit from their competitive advantages and gain more profit. Thus, firms should attempt to convert the latest knowledge into practice. The ability of converting ideas, knowledge and inventions to innovation and their can increase greatly under the strong influence of training and executives’ skills. So, in this perspective, training has a key role in realizing knowledge-based economy.

**Figure 2.2: The first group of knowledge-based economy features**

5. 5. **Laying groundwork for efficient continuous, and lifelong education**
Accelerating the speed of aging the existing knowledge and technology has significant social and economic impacts. The need for rapid replacement of knowledge and new technologies with existing knowledge and technologies to maintain its competitive and productive advantage is one of its economic effects. This means that we need a continuous, lifelong training for individuals and firms (Lundvall, 2008: 685).

5.6. **The necessity of increasing labor flexibility**
As mentioned in the section of rapid changes in the job market, in the new economy, changes in the business environment is a usual stable habit. Companies and firms’ lifetime is shortened and the longevity of career opportunities dramatically decreased. The more the economy advances, the less hope of finding a steady job for life appears. Individuals, firms and economics that cannot match themselves with these rapid changes of technology, innovation and competition are eliminated from business environment, losing the opportunities of employment and earning income.

One of the consequences of the rapid changes in the organization of firms and changings in employment opportunities for labor force is that only those who have the ability of matching themselves with these rapid changes
and its consequences can have job. This requires having a flexible power and plans for developing skills. Having such power needs great cultural trainings together with special skills. These trainings should prepare firms and individuals to deal with these changes both in thinking and required skills. Thus, training, in this path, is critical for helping economics and firms to survive and keep individual’s career opportunities.

5.7. Informing managers about the necessity of realization of knowledge-based economy

Economic reconstructing should be supported and funded by political communities. Because, in any country, politics has great impacts on economic activities. Formal institutions, various rules and regulations such as property laws were legislated by politicians and senior managers; this can be considered as its least impact. These laws have a decisive influence on the economic life of human societies in a way that in the human history, every single, significant step towards development was a key component of complete implementation of property laws (North, 2000).

Moving towards knowledge-based economy is a major social change which requires providing abundant prerequisites. Giving up the traditional models of production and business and moving towards a new world that is not yet fully known and paying the costs for its realization require a national and political determination. Politicians and senior managers of the society are in charge of making major decisions about the realization of knowledge-based economy in the society. They should have sufficient knowledge about the prospects of future economic activities in order to make decisions about moving towards this kind of economy and change management practices accordingly. Providing required information for politicians and senior managers needs training, both formal and informal. So, from this perspective, training plays a key role in the realization of knowledge-based economy.

**Figure 2.3.** The second group of knowledge-based economy features

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Prerequisites for the realization of knowledge-based economy

- Rapid changes in the job market
- The importance of tacit knowledge
- The necessity of change in managing styles
- The need for active participation in the creation of tacit knowledge
- The need for informing managers and politicians
- The importance of laying groundwork for participating in creation of knowledge
- The importance of training managers

Fundamental importance of training
5.8. Laying groundwork for participating in production of tacit knowledge

Following the explanation of the importance of tacit knowledge in the knowledge-based economy era, these questions arise, what are the most important ways of production and acquisition of tacit knowledge? And how can we increase the production capacity of tacit knowledge? In the acquisition process, tacit knowledge is learned through working and producing. In other words, tacit knowledge is acquired through the analysis of practical experience. One of the factors affecting the experimental observations and extracting scientific solutions is labor forces’ scientific expertise together with their basic technical skills. The better the labor force trained the greater ability they acquire for participating in the process of producing tacit knowledge. So, training is also important in terms of increasing the labor force abilities in the production of tacit knowledge.

1. Knowledge and effective education

In knowledge-based economy, knowledge plays a key role in the process of production and creation of added value. In addition, training is the most common methods of transferring knowledge. Hence, due to their effective role in people’s lives, the knowledge aligned with training is very valuable in this era. One of the fundamental issues of developing countries is training. The most important criterion for assessing and evaluating the level of training is its productivity and usefulness. Only when training is useful and productive, it can influence people’s real lives, reducing their problems and playing a positive role in line with achieving development goals. Institution in the developing countries like institutions remained from the colonialism (Myrdal, 1971, Ch:24) and institutions which are based on rentier income structure led to the spread of ineffective, improper training in these countries.

Development, particularly in the era of knowledge-based economy, is based on scientific curiosity and scientific belief. In contrast, the prevalence of non-critical training and retaining a certain amount of knowledge is one of the features of ineffective training in developing countries. To detect and differentiate the proper, effective trainings from ineffective ones and to avoid these improper trainings, training in developing countries should be seriously evaluated in terms of its content and approach.

As a result, the criterion of assessing the value of different types of knowledge and training is their role in increasing income, welfare and human development of a country. Hence, the importance of right selection of type and nature of training in terms of its association with welfare and human development of community members become more important.

In an overall classification, Professor Myrdal divided training into two categories: proper and improper trainings. He defined proper trainings as those which are in accordance with real issues and the benefits of a country. In contrast, improper training is a sort of teaching which does not comply with real problems and country’s benefits. While noting useless trainings, Myrdal emphasized on the economic trainings in developing countries. Addressing the economists of developing countries, he stated: “I wish them to have the courage to throw away large structures of meaningless, irrelevant and sometimes blatantly inadequate doctrines and theoretical approaches and to start their thinking afresh from a study of their own needs and problems. This would then take them far beyond the realm of both outmoded western liberal economics and Marxism” (Myrdal, 1957: 104).

As another example, Myrdal referred to a non-beneficial training that is at odds with development of public education in South Asia, particularly in India and Pakistan, which has remained from British colonialism in these countries. He added that spreading education in South Asia, changing people’s fundamental ideas and preparing them for development were not among the goals of the colonial governments. Their aim was to train obedient employees and agents (Myrdal, 1971: 385).

This colonialist goal led to a type of training that had two main features. First, education system and training environment were one-way and non-critical. As Myrdal stated: “the method of teaching in the pre-colonial era were, as we mentioned, all heavily weighted in the direction of making pupils memorize text, whether they understood them or not…. Teaching still tends to be dogmatic and authoritarian; it does little to encourage a questioning, critical attitude or an interest in self-education outside and beyond the school…. This legacy of authoritarianism has carried over into university teaching to a marked extend” (Myrdal, 1971: 385). In other words, “Teaching at all levels tends to discourage in independent thinking and the growth of that inquisitive and experimental bent of mind that is so essential for development. It is directed toward enabling students to pass examination and obtain the degrees. A degree, rather than the knowledge or skills to which the degree should testify, is the object pursued” (Myrdal, 1971: 385-6). In such condition, the second fundamental feature of educational institution is improper training.

Due to such considerations, Hussein Azimi stressed that creating interest and belief in students and strengthening their spirit of inquiry and curiosity towards knowledge is the main feature of the proper primary education (Azimi, 2012: 404).

Realizing the knowledge-based economy for developing countries is conditioned to proper trainings that are focused on the real problems of the country. Achieving a sustainable development, knowledge-based economy and its achievements, therefore, require reforming the educational process and received trainings in the country. An important question that arises here is that which criterions do determine the types of trainings in a society? Other
words, why did some individuals and communities focus on useful knowledge while others concentrated on the improper one?

In response to this question, Douglass North suggested a new attitude that is crucial for both industrial and developing countries with very different severity. By bringing up the example of GM against the Mafia, he proposed the main concepts of useful and useless trainings that are important for rentier economy. He believed that the institutional framework of the society has a determining role in the formation of various sciences, rewarded skills and people’s motivations for learning. In this regard, he mentioned two specific points:

1- The institutional framework determines the direction of acquiring knowledge and skills.
2- Moreover, this direction will determine the long-term development of the society (North, 1997: 128).

After all, the knowledge-based economy requires the proper education and learning. The proper training itself depends on the institutional matrix and incentive structure of the society. Realizing the knowledge-based economy, therefore, is possible through modification of the motivational institutional structure, economic structure and social rewards. Focusing on training sciences and useful skills makes the realization of the economy possible and leads to the knowledge-based society.

North also asserted that type of knowledge, skills, and knowledge that the members of the organization (every society in general) learn is a reward indicator or in other words, these are incentives that are inscribed in the institutional constraints (North, 1997: 123).

Iranian current economy is formatted in the framework of earning income through selling crude oil. This framework has dictated its features to Iran’s economy. Hence, the Iranian current economy is known as one of the world’s rentier economies.

Causing deviations in the socio-economic reward system for all kinds of economic trainings is one of the main effects of rentier economic structure in Iran. In Iran, about 100 billion dollars is gained from the sale and exploitation of the rent oil and gas annually. Gaining a larger share of this rentier cake is the simplest possible way of earning profits and income for firms. Therefore, firms do not feel that they need to employ presented knowledge in the universities and hire university graduates. Instead they struggle to acquire knowledge and skills that are useful in gaining a larger share of oil rent. This leads to the prevalence of rentier skills that is one of the main sources of promoting ineffective trainings in Iran. This emphasizes on the importance of modifying the form and content of provided trainings in Iran, in accordance with the requirements of knowledge-based economy.

In general, trainings should move from “maintain the core” to the “problem-oriented” and the belief in science should be passed to future generations as one of the major cultural values. Therefore the required cultural contexts for realizing the economy and knowledge-based society will be provided.

7. Conclusion

7.1. Since 1990s, a new economic era known as knowledge-based economy era, which was accompanied by significant opportunities and threats, has started. Using provided opportunities can help us in achieving high and sustained rates of economic growth.

7.2. The most important factor of production, in knowledge-based economy, is knowledge. From economic perspective, knowledge is divided into two main categories: explicit knowledge and tacit knowledge. Tacit knowledge is considered more important in terms of volume and impact, since it constitutes the largest volume of knowledge and supplies comparative advantages and competitive abilities of firms and economics.

7.3. The realization of knowledge-based economy is associated with training through several paths. Through these paths, training plays a key role in realization of knowledge-based economy. This certain paths include training, which is the necessary condition for acquiring and transferring knowledge. The realization of knowledge-based economy requires human development as its main perquisite, and training is one of the main factors of achieving human development.

7.4. In the knowledge-based economy, competitive abilities depend on rapid conversion of the latest knowledge and inventions to innovation and economic applications. The ability of conducting this procedure is in correlation with the trainings that individuals have about the latest achievements of science, inventions, and their applications.

7.5. In the knowledge-based economy, scientific findings become obsolete quickly and new scientific findings will be presented instead. To maintain their manufacturing and competitive powers, therefore, economic agents need continuous, lifelong trainings.

7.6. The realization of knowledge-based economy is a massive social change. Achieving such a transformation requires a serious national commitment, especially at the level of senior managers and making changes in laws, institutions and policies. To this end, politicians and senior managers should gain the opportunities provided by knowledge-based economists and should realize the necessity of its realization so that they can create the needed motivation for this huge change. Training is the main method of informing senior managers and politicians. Hence, as we stated above, training institution plays a very significant role in realization of the knowledge-based economy.
7.7. In the knowledge-based economy, knowledge aligned with learning and training has significant and fundamental role. From economic perspectives, their importance is due to the role they play in production, creation of added value, income and improvement of welfare. Based on economic viewpoints, since knowledge and training both have the same clear major goal which was noted, thus, every types of trainings that can be presented and knowledge that can be learned should be assessed, evaluated and selected in terms of this criterion to avoid wasting resources and the performance of absurd pointless acts.

7.8. To highlight the criterion explained in previous paragraph, Myrdal, and after him some other economists, proposed the concept of proper and improper education. Explaining education and its dependence to the motivational social-economic system by bringing up the example of GM and Mafia, North expanded the discussion and explained its association with the motivational social-economic system in line with trainings that has taken place in society.

7.9. The direction of knowledge that is learned in the society, economic structure and the created opportunities have a decisive role here. In countries where a significant portion of their national income comes from various economic rents like selling oil or other raw materials, this rentier structure determines the direction of the presented knowledge and trainings in the society through creating opportunities and reinforcements. This direction is different from production and creation of added value. Based on their trainings, in this direction, individuals and firms leave the actual production and move towards rent-seeking. In this regard, the association between trainings and the improvement in levels of efficiency and production in society will be terminated.

7.10. For being useful in promoting the level of production and welfare, in rentier countries, knowledge, conducted trainings and learning, and the motivational social-economic system and its created opportunities should be modified by taking necessary measures. This modifies the direction of presented trainings. Consequently, knowledge, conducted trainings and learning in the society become useful and effective. Thus, knowledge and trainings can play positive expected roles in production and improvement of welfare. Particularly in the knowledge-based economy, knowledge is the main factor of production. Here creation of added value and its efficiency can play a significant role in economic growth.

7.11. In modifying the direction of trainings, the various aspects of trainings including its content, form, relative allocated resources to education together with its different levels and the proper effective way of providing knowledge should be carefully considered, evaluated and reconstructed.

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