



Role of Education In Innovation For Economic Development - A Case Study

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ABSTRACT

The structure and nature of the economic order in future will be increasingly influenced by market forces, which are mainly governed by knowledge, more specifically technological knowledge. In this technological era, even wealth is measured mainly in terms of knowledge-based systems. Intellectual property and human capital will be assuming lot of significance. Following the world trend of liberalization, privatisation and globalization, international interactions and co-operation would increase along with greater competition for resources like competent, committed, multi-skilled and flexible manpower. Along with regional and international cooperation, the competitive advantage of a nation will be determined mainly by the quality of human resources. Quality of human resource is determined by the output of the educational system. Therefore, education is all set to become the main instrument for development and transformation. Also, economic development, HRD, and education are mutually linked and reinforced to influence each other.

Complex links among education, HRD and development have been analyzed variously. The direct relationship between schools and labour market is termed as the 'external efficiency' of education (Psasacharopoulos G, 1984). High level of external efficiency of education expects a perfect match between demand and supply of labour in the market, not only quantitatively but also qualitatively. Increase in demand for labour results from expansion of economic activities, which in turn, leads to economic development. Economic development would change the nature of education and bring out new knowledge. In recent years, new theories of growth have emphasised the importance of accumulation of knowledge in fostering technological change, and thus, achieving faster and more sustained economic growth.

Today's rapidly growing economies depend on the creation, acquisition, distribution, and use of knowledge. The principal institutional mechanism for developing knowledge is the formal education system. Education helps to generate new ideas, and also refines human behaviours and habits required for research and development (Ram Binod Singh, 2002).

This research paper is a case study to explore the linkage between education and economic development. To explore the link between Education and Economic Development two case studies have been prepared: cases of Mauritius and Singapore. Out come of the study clearly shows that there is direct link between level of education and level of economic development

Keywords : Knowledge , education economic Development

Introduction

The concept of economic development has undergone a lot of change after realisation of the importance of environment, technology and education. Literature on development economics mainly focuses on human welfare and sustainable development, which are the building blocks of modern institutional economics. In these, human resource development (HRD) and human behaviour in general and economic behaviour in particular act as the key factors of human capital in a nation.

In the present knowledge based economy knowledge and knowledge creation constitutes the commanding element of all the economic development activity. Therefore, education system has gained the multiple role of providing strong resource base and institutional frame for facilitating the welfare-oriented sustainable development.

In the competitive economy, economic order is constantly being influenced by market forces, which are mainly governed by knowledge, more specifically technological knowledge. In this technological era, even wealth is measured mainly in terms of knowledge-based systems, and in this context, intellectual property and human capital will be assuming lot of significance. Following the world trend of liberalization, privatisation and globalization, international interactions and co-operation would increase demanding greater competition for resources like competent, committed, multi-skilled and flexible manpower. The competitive advantage of a nation will be determined mainly by the quality of human resources.

Quality of human resource is determined by the output of the educational system. Therefore, education is all set to become the main instrument for development and transformation of economic development. The present study explores the linkage between Education, Human Resource Development and Economic Development focusing on Singapore and Mauritius as case examples.

Objectives and methods

Influence of knowledge producing industry on economic development has been well recognised in the various studies conducted in different part of the world. Hence, education system is in the centre of all factor networks of development.

An extensive review of literature suggests that no authoritative and comprehensive empirical study has so far been conducted on this theme. Hence, an effort is made to explore and understand role of educational institutions in innovation for economic development and assess the impact of education in Human Resource Development

The Study intends to answer the following research questions:

- (1) What are the major contribution of the educational Institution in local economic development
- (2) What is the impact of education on Human development and which in turn has an impact on employment.

Research methodology

This study is descriptive research. Data and information for the study is collected from the secondary source of information such as books, periodicals and websites for the purpose of understanding the key concepts and theories

Theoretical back ground

Complex links among education, HRD and Economic development have been analyzed variously. The direct relationship between schools and labour market is termed as the 'external efficiency' of education (Psasacharopoulos G, 1984). High level of external efficiency of education expects a perfect match between demand and supply of labour in the market, not only quantitatively but also qualitatively. Increase in demand for labour results from expansion of economic activities, which in turn, leads to economic development. Economic development would change the nature of education and bring out new knowledge.

Knowledge' in Economic Theory

Now a days we live in a 'knowledge society' in which knowledge is the most important means of production, not capital, raw materials or labour (Drucker,1993). Knowledge is a fluid mix of framed experiences, values, contextual information and expert insight that provides a framework, for evaluating and incorporating new experiences and information. It originates and resides in the minds of those who know. (Devenport and Prusak, 1998).

There is an increasing institutional awareness of the importance of accumulation of knowledge in fostering technological change and thus achieving faster and more sustained economic growth and development

All developing nations of the world have been striving hard for lubricating the process of knowledge creation, capturing, acquisition, dissemination, documentation, sharing and application. There are two basic kinds of knowledge: tacit and explicit. Tacit knowledge always resides in human minds, where as the 'explicit' knowledge' is already codified and documented (Nonaka and Takeuchi, 1995).

The real challenge in knowledge management is the capacity and infrastructure (physical, technological and intellectual) of a nation in capturing the tacit knowledge. The process of 'knowledge creation and sharing' happens in the following four ways (Nonaka and Takeuchi, 1995):

1. Tacit to tacit (Teacher-student interactions and interactions with the 'communities of practice').
2. Tacit to explicit (publications).
3. Explicit to tacit (reflective observation and extending the knowledge base through wide reading habits).
4. Explicit to explicit (collecting, linking and editing already published material through cross- fertilisation).

The new concept of economic growth model was initiated by Robert Solow in his two classic papers (1956, 1957). In Solow's model of technological progress, there are four variables: output, capital, labour and knowledge. Output is produced from capital, labour and knowledge. Knowledge is produced from knowledge alone; the knowledge-producing industry has zero costs and zero revenue. With a given input of knowledge, there are constant returns to the other two inputs, capital and labour, which are private goods. (KJ Arrow, 1999). Along with Solow ,many other experts like (Lucas, 1988; Grossman and Helpman 1991; Romer 1986) had given new insights into knowledge as factor of production.

Knowledge as a Factor of Production

Now days, knowledge is the most important means of production, as compared to capital, raw material or labour. In a society based on knowledge, the knowledge worker is the single most important asset (Drucker,1993). Rapid changes due to globalization and development of information technology are the main reasons for this development. Sustainable development requires not only knowledge but also ability to generate

new strategically valuable knowledge and creativity. This implies applying 'knowledge upon knowledge' (Harrison, 2000).

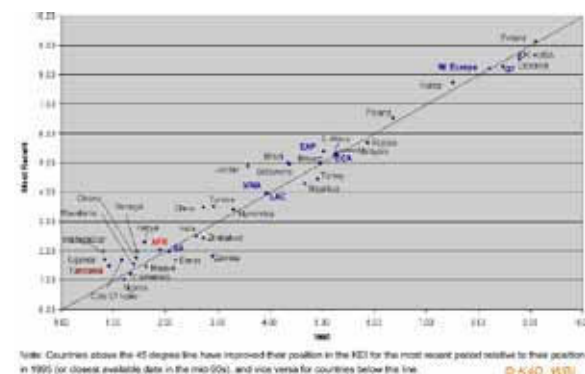
In the growth process, knowledge is an input as well as an output. Ideas can be put together to create new ideas (Weitzman, 1998). Importance of knowledge as a factor of production has not been recognized for a long time owing to its special characteristics. Knowledge is a public good with property rights that are rarely enforceable. It is not quantifiable and priced. It is sometimes codified, but more frequently tacit and implicit. All measures of knowledge are indirect, either input to or outputs of its accumulation (Nonaka and Takeuchi, 1999). Accumulations of knowledge, disseminating knowledge, developing and applying knowledge are the different aspects of knowledge management (Diestraten, 1996). In the liberalized era, knowledge flows internationally along with trade. In this context, developing countries need to be agile enough to derive benefit out of it.

To monitor its new emphasis on knowledge, the World Bank has created a Knowledge Economy Index (world Bank Institute 2004). According to Knowledge Economy Index (KEI), economic performance of the county is measured on the following four parameters

- (1) The favourability for knowledge development within the economic and institutional regime
- (2) Education
- (3) Innovation
- (4) Information and communications technology.

As Figure 1 shows that most of the under developed countries like African countries, Nigeria, Cameroon, Malawi, Tanzania, are on the bottom of the index, scoring less than two out of a possible ten points. South Africa, Botswana, and Mauritius record scores near the middle. Counties like USA, UK, Korea, Finland, West Europe are on the top the index are the most developed countries in the world. This clearly indicates that there a direct link between level knowledge index and economic growth.

Figure 1: KNOWLEDGE ECONOMY INDEX



Spreading of knowledge results in the production of new goods as well as new methods of producing goods. Once the knowledge product is in the market, its methods of production can be spread through several routes. The main routes of diffusion are imitation, public agencies, trade meetings & discussions and the formal education system. Formal education system is the principal mechanism through which knowledge is created and disseminated.

Education is not merely information. It is the formation of the mind; it is an exercise to make it more cautious, creative and innovative. Education is often perceived as the aggregate of all the processes by which a person develops abilities, attitudes and forms of behaviour with practical value to the society (Bhagat, 1989). It includes moral development. If moral development is neglected, the greater technological development and economic growth may not lead to welfare. Hence, there is a need to integrate culture and spiritual growth with

science and technology advancement. Knowledge, skills, attitudes, values and habits (competencies) formed in such a system would be a powerful resource for sustainable development.

Education has a special value in the emerging knowledge society. It contributes directly as well as indirectly to the wealth of a nation. Education contributes immensely to overall social development. The level of education in a society (proportion of population receiving some education) has also been found to be positively correlated with decline in fertility, improved child health, reduced infant mortality, and social and gender equality (World Bank, 1997). This has wide ranging implications for developing countries.

Education is seen as a principal means of increasing the quality and quantity of human capital available in the economy (Schultz 1988). Education offers great opportunity for employment and economic returns, and so, reduces poverty. Therefore evolving an appropriate education and skill formation system is essential for sustainable and prosperous nation-building.

Role of Education in Economic Development

Education plays a vital role in economic development and is a prerequisite for rapid economic development. Education stimulates economic growth and improves people's lives through many channels: by increasing the efficiency of the labor force, by fostering democracy (Barro, 1997). A balanced education system promotes not only economic development, but productivity, and generates individual per capita income. (Ilhan ozturk, 2000)

The role of education in economic development has been well established by the researchers (Sodhi, 1985 and Singh, 1974). At the micro level, the direct and indirect role of education through value-orientation in economic development has already been established (Bhagat, 1989). Education is also vital to sustain competitive markets and viable democracy.

The linkage between education and economic development has been well established by studies conducted across the world (Dreze and Sen, 1995). Education increases individual productivity, as measured by the well-documented link between educational attainment and personal earnings (Psacharopoulos, 1994). At the national level, education plays an important role in fostering economic growth. As knowledge is key factor of production the growth of economies depend on the creation, acquisition, distribution, and use of knowledge and this requires an educated and skilled population. In addition, there is growing evidence that, perhaps, half or even more of the aggregate economic growth is driven by increases in factor productivity rather than by factor accumulation in either capital or labour (Easterly and Levine, 2002).

Different levels of education will have different degrees of influence on economic development (Psacharopoulos, 1994). Different levels of education are viewed in terms of literacy, basic education, secondary education, and higher education.

Literacy is one of the fundamental factors responsible socioeconomic and political developments of a country. Literacy is a qualitative aspect of population and is an indispensable means for attaining effective social and economic development. It significantly contributes to human development and poverty reduction. It is a major component of human resources development, and thus, basic to any programme of economic and social transformation (UNESCO.ORG).

The link between literacy and economic development is well established in the literature. In a study of 88 countries for the period 1960-63 and 1970-73, it was found that an increase in literacy from 20 to 30 per cent has resulted in increase of GDP ranging from 8.0 to 16.0 per cent. (Rashmi Agarwal and

Talmeez Fatma Naqvi, 2002).

The direct link between rate of literacy and economic development is evident in the international scenario. The Table 1.1 indicates the direct relationship between literacy rate and GDP of different countries in the world.

Table 1.1: Relationship between literacy rate and GDP

# No	COUNTRY	Literacy rate	GDP
1	USA	99.8	41,399
2	SINGAPORE	92.5	28,368
3	MORITIUS	84.3	12,898
4	SOUTH AFRICA	82.0	12,161
5	INDIA	61.0	3,320
6	PAKISTAN	48.0	2,653
7	BANGALADESH	41.1	2,011

Source: www.wikipedia.org

Empirical research on impact of elementary education on growth has proved that increase in the average primary schooling of the labour force has a substantial impact on productivity.

At the macro level, elementary education benefits the society immensely. Educated parents send their children to school; elementary education leads to perpetuation of benefits from one generation to another (Sinha, 2004).

A study on agriculture of 31 countries shows that 4 years of elementary education makes a farmer more productive than the farmer who has no formal education at all. In agriculture, primary schooling affects productivity positively, especially when technology is changing rapidly (Rashmi Agarwal and Talmeez Fatma Naqvi 2002). In a country-specific time series study, Self and Grabowski (2004), investigated whether education had a causal impact on growth in India and found that primary education had a strong impact on growth.

In the present globalised economy secondary education plays a vital role in economic growth. In many countries the increased demand for workers with secondary schooling has been associated with skill-based technological change

Many studies have documented that a large pool of workers with secondary education was indispensable for knowledge spillover to take place and for attracting imports of technologically advanced goods and foreign direct investment (Borensztein, de Gregorio, and Lee, 1998; Caselli and Coleman 2001; Xu 2000). In a study on education and technology gaps in Latin America, de Ferranti et al. (2003) found that the bulk of the difference in computer penetration between Latin America and the East Asian "tigers," with their significantly wider computer coverage, could be explained not only by differences in the share of trade with countries of the Organization for Economic Co-operation and Development (OECD) but also, and most important, by the proportion of the workforce with secondary schooling.

Thus Secondary education makes significant contribution for the development of social capital and economic development. Secondary education is also a key link between primary and tertiary education.

In the knowledge economy, tertiary education plays a vital role in innovation for rapid economic development. Tertiary education helps for economic growth in several ways. It promotes employment prospects, better earnings and greater ability to save and invest. Higher earnings for well-educated individuals will result in increase tax revenues for the government and decrease deficit financing of the state. It may further enhance the consumption, saving and investment. These benefits may result in better health and improved quality of life, which in turn lead to life expectancy improvements, thereby enabling individuals to work more productively over a longer time boosting their lifetime earnings. Individual gains

can also benefit society as a whole (David Bloom, David Canning, and Kevin Chan, 2005).

With regard to the benefits of higher education for a country's economy, many observers attribute India's leap onto the world economic stage to its decades-long successful efforts to provide high-quality, technically oriented tertiary education to a significant number of its citizens (JBG Tilak, 2003).

A study conducted by T.C Lin, (2004) in Taiwan on impact of higher education on country's economic growth. It was found that a 1 per cent rise in higher education stock (as defined by those who had completed higher education, including junior college, college, university, or graduate school) led to a 0.35 per cent rise in industrial output, and that a 1 per cent increase in the number of graduates from engineering or natural sciences led to a 0.15 per cent increase in agricultural output. (David Bloom, David Canning, and Kevin Chan, 2005). Wolff and Gittleman (1993) showed that university enrolment rates are correlated with labour productivity growth. The number of scientists and engineers per capita is also associated with

Report published by UNIDO (2003).

Table 1.2: Linkage between education, economic development and Human Development Index (HDI)

Country	Adult literacy rate % of 15 age and above	Primary secondary tertiary combined enrolment ratio %	GDP % (PPP US \$)	Education index	Human Development Index HDI value
OECD	---	87	23,363	0.94	0.905
Central & eastern Europe & CIS	99.3	79	6,598	0.92	0.781
Latin America & Caribbean	89.2	81	7,050	0.86	0.777
East Asia & Pacific	87.1	65	4,233	0.80	0.722
Developing countries	74.5	60.0	3,850	0.70	0.655
South Asia	56.3	54.0	2,730	0.56	0.582
Sub Sahara Africa	62.4	44.0	1,831	0.56	0.468
Least developed countries	53.3	43	1,274	0.50	0.448

Source: www.hdr.undp.org

Thus Education is indispensable to economic development. More and better education stimulates not only economic development, but enhances productivity, and generates individual income per capita income

To explore the link between Education and Economic Development two case studies have been prepared: cases of Mauritius and Singapore.

Case of Mauritius

Mauritius is Small Island in the Indian ocean. As Mauritius was under the British colony till 1968, its education system was largely based on British education system and had faced lot of problems in the field of higher education. Enrollment of students to schools during 1960s and 1970s was below 1 per cent and high graduate unemployment led to student unrest in 1979 (University of Mauritius, 2004). After country became independent 1968, Mauritian Government initiated drastic changes in education system and invested huge resources both physical and Human. Primary education and secondary education was made free and compulsory. Further wide range of higher education courses are made available at the University of Mauritius. In developing higher education system Mauritius has given importance for improving the quality as well as the quantity of its higher education. The University of Mauritius has extended collaboration with other universities in the region to provide world class education. The focus of the higher education system of Mauritius was mainly on the development both skill and knowledge to enhance the employability of the graduates for better employment and rapid economic growth.

The special effort of Mauritian Government has resulted in impressive progress in the field of education. Its gross tertiary enrolment ratio rose from 1 per cent in 1985 to 15 per

cent in 2004 (University of Mauritius, 2004).

economic growth. In a study of six developed countries, De Meulemeester and Rochat (1995) showed that higher education had a strong causal impact on economic growth in Japan, United Kingdom, France, and Sweden, but no impact in Italy and Australia. The study concluded that higher education is necessary for growth but not sufficient. The social, political, and economic structures and the technological level of the society in which the educational system operates plays an important role in use accumulated knowledge of graduates for economic growth ((Jean-Luc de Meulemeester and Denis Rochat 1995).

Another study conducted By H.Jenkins (1995) reveals that there is direct between different levels of education and productivity. Further study concludes that level higher education stock increased by 1 per cent, results in increase in the annual output between 0.42 and 0.63 per cent.

Linkage between Education, economic development and human development is highlighted in the Human Development

cent in 2004 (University of Mauritius, 2004). The number of students graduating annually from the University with a Bachelor's degree rose from less than 40 in 1989 to over 400 in 2004 (UIS-2005)

Before the reforms in higher education, nearly seventy five percent of Mauritian students studied abroad. The improvements in education have helped to slow down this brain drain and this has resulted in large benefits to Mauritian society, such as earnings for students, increase in tax revenues for government and improvement of education system as whole

(Pedro Belli, Qaiser Khan, and George Psacharopoulos -1999). The harmonious relation maintained by the university with the government, the private sector, and civil society has to remain focused on the needs of the economy. All this has contributed to the consistent and constant increase in the economic growth rate for Mauritius.

In Mauritius the university curriculum is designed as per the requirement of the Industry. The University offers courses in all the major disciplines such as – agriculture, engineering, law and management, science, and social studies and humanities. The focus of each faculty is on the country's development requirements (including an emerging emphasis on financial and technological services). The Faculty of Engineering, and textile technology have played a vital role in economic growth. In recognition of the broad skills base needed in modern engineering, faculty of engineering also trains students in economics, accounting, information technology, and communication skills.

To address issues of poverty, the University has created the Centre for Applied Social Research, whose recent studies include surveys on social exclusion and a report on the attitudes of unemployed people to working in the country's Export Processing Zones. The University of Mauritius developed collaborations with international bodies such as UNESCO and the World Bank to monitor social and economic develop-

ment and this has resulted in development of the economy in several ways

A percentage increase in gross enrolment at high school and higher education level resulted in more than proportionate increase in per capita Gross National Income (GNI) in Mauritius is highlighted in the 1.3.

Table 1.3: National income and level of education in Mauritius

	1985	1990	1995	2000	2004
Per capita GNI(US \$)	1050	2,300	3,360	3,690	4,460
Gross enrolment ratio-High school	48.6	52.2	61.8	77.6	85.4
Gross enrolment ratio-Higher education	1.1	3.4	6.1	7.5	17.2
Average of schooling (population aged 15 & above)	5.42	5.57	5.79	6.00	8.5

Source : www.worldbank.org/edstats

It is observed from the Table 1.3 , that education and National income have shown parallel growth during the period 1985-2004.This clearly indicates education has a direct impact on the level of National income which is reflected in the better standard of living.

Case of Singapore

Education has been a driving for economic development of Singapore's economic ever since it attained self-government in 1959 and full independence in 1965. Realizing the importance of education in economic growth, the Singapore Government has invested heavily in education and training, both at the universities and in polytechnics vocational and technical education.

During the early phase of economy development from 1960 – 1970, Singapore faced the problems of unemployment, low level of education, post war baby boom and communist labour agitation. The economic prerogative was therefore, to create employment, by enhancing the level of education. To lay the necessary foundation for developing basic vocational and technical skills rapid expansion of primary and secondary education including technical education and training was undertaken. Along with developing schools rapidly emphasis was also train the teachers. Initially the emphasis was on quantity, rather than quality and on primary and secondary education, rather than tertiary.

. After 1980s an increasing emphasis was given for developing the skills, knowledge through quality education and training in schools, universities, polytechnics and Vocational Training Education

From 1990 onwards when Singapore moved, to next phase of development the link between education and national development became closer. Low level of skill and education of the labor force resulted in low wages and less career progression , and this was not sustainable in the long run, given the wage competition from other countries. To develop employability and to provide right kind of work force in right number emphasize was given to equip every child with information technology skills during their education.

As Singapore moved towards a knowledge-based economy, emphasizes is given more on the maximal development of talents, abilities and lifelong learning. To match the requirement of rapid industrial needs Singapore's education system had transformed from survival driven education to efficiency driven education to the current ability driven education during the last four decades.

The experience of Singapore illustrates that the relevant knowledge and training imparted in the educational institutions, is the driving force for development of individual and the economy as a whole. While the emphasis is on encouraging individuals to participate in available educational programmes, the objectives and standards are set according to what is seen as the needs of a future economy. In other words, the education and training system does not react to current needs but is planned to support future needs which are targeted by economic planners (Dr. N. Varaprasad, 2004).

Table 1.4 presents details about average year of schooling and per capital income in Singapore during 1985-2000

Table 1.4: level of education and per capita income in Singapore

Parameters	1985	1990	1995	2000
Per capital income (US\$)	6,850	11,850	23,240	24,740
Average year of schooling	6.10	5.96	6.72	7.05
Primary education (as a % of total population)	10.2	16.5	24.3	25.2
Secondary education(as % of total population)	11.00	10.00	9.9	9.9
Tertiary education(as % of total population)	2.4	1.6	2.7	3.7

Source: www.worldbank.org/edstats

Table 1.4 shows that excepting in the case of secondary education there has been a direct link between the expansion of different levels of education and increase in per capita income. This case study further confirms that education is one of the fundamental means of improving standard of living of the people by improving their capacity to generate better income.

Conclusion

Several studies conducted in different part of the world have concluded that colleges and universities are most successful in influencing economic growth when they are attuned to the economic structure of their local economies However not all observers agree that higher education and economic growth are obvious . Research by Richard.k.Vedder (2004) has questioned whether spending more on higher education necessarily provides larger returns for the local economy and observed that spending on higher education often fail to achieve faster economic growth.

The analysis of the two cases on Singapore and Mauritius clearly highlights that that education is the most important factor for economic growth of any country. It is clearly visible in both the cases that refinement in education system has brought a change in the growth of the country.

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