EVALUATION OF THE READINESS OF SRI LANKA TO BE A MEMBER OF GLOBAL KNOWLEDGE SOCIETY

CRITICAL KNOWLEDGE FACTOR ANALYSIS OF SRI LANKA

By

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The dissertation was submitted to the Department of Computer Science & Engineering of the University of Moratuwa in partial fulfillment of the requirement for the Degree of Master of Business Administration.

Department of Computer Science & Engineering
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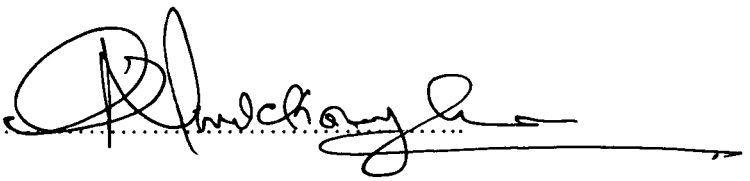
Declaration Form

I hereby declare that;

I have sincerely endeavored to produce a research report of outstanding academic quality with age long importance to the economic development of Sri Lanka. I have produced this document by myself without having outside assistance except from the people and documents I quote and also I have not copied this report from other papers or documents available, except where I have explicitly stated. I also certified that the work in this dissertation in part or whole has not been submitted for any other academic qualification at any institution.



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Abstract

Utilization ICT and Knowledge in economic applications are becoming the most important assets by outperforming traditional capital intensive, technology intensive or labor intensive comparative advantages of any country. The power of this transformation can be recognized in terms of its impact on knowledge sharing, dissemination and utilization in socio economic behaviors of any country. When the knowledge and knowledge outcomes are having major impact on all the human activities, then that economy can be identified as a Knowledge Society. This study was conducted to evaluate the nature, status and competence of Sri Lanka as a developing country to face this rising wave of Knowledge Society and potential to regain the economic development that has been there as better economy in South-East Asia. Study used a benchmarked indicator framework by developing both quantitative and qualitative indicators to evaluate the pre-requisites to be a knowledge society and outcomes of a knowledge society. According to literature review and comprehensive analysis more than thirty (30) indicators study found that In South-East Asian region Rep. of Korea is the best knowledge society while Singapore, Malaysia, and also India are showing great potential of be competitive global knowledge societies. Rather than having emerging enthusiasm on mobile technology and modern CDMA technology, Sri Lanka still does not show any specific urgency, adaptation or greater enthusiasm to be a knowledge society in terms of knowledge creation, dissemination and utilization of knowledge in economic activities. There are no identifiable solid interrelations between each pre-requisite and also between the outcomes in Sri Lanka. They were trying to develop as isolated sections. That was the reason why that, social factors such as health and general education are at satisfactory level in Sri Lanka but economic performances far away from emerging Asia. By implementing recommended strategies of the study Sri Lanka is expected to make economic interlinks between every section of the country that would be compulsory to be a competitive global knowledge society.

Acknowledgement

The report covers an area that is very novel to Sri Lanka and had very little attention from researchers in Sri Lanka. Due to the novelty and lack of previous work those related to the topic in Sri Lanka and available studies are vastly incompatible with Sri Lankan context I came a cross ample of blind tunnels during this study. During this complicated journey I have had invaluable support from various people. Without their sincere support I would unable to complete the task sufficiently. I would like to express my sincere thanks to some of the individuals who gave me remarkable support on this effort.

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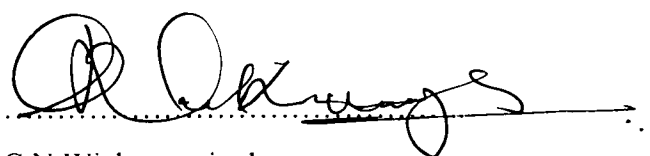

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Chapter 1 - Introduction

Over the period of last two decades we were experiencing dramatic changes in the economic world. Never-ending developments of Information & Communication Technology (ICT) make the world smaller than ever before. In this dynamic transition, usage of ICT and Knowledge in applications are becoming the most important assets by outperforming traditional capital intensive, technology intensive or labor intensive comparative advantages of any country. Adjoining with these changes a new culture is emerging with prospects of having an impact on all aspects of human life. Information and knowledge hold the promise of alleviating many problems confronted by human society, if only they could be equitably shared.

The power of this transformation can be recognized in terms of its impact on knowledge sharing, dissemination and utilization in socio economic behaviors of any country. Knowledge and knowledge outcomes are having major impact on all human activities that economy can be identified as a Knowledge Society. Acquiring and dissemination of knowledge is a fundamental pre-requisite for human progress and it is essential to empower the underprivileged sections of the society. The transmission of knowledge and Information has undergone dramatic change with the advanced ICT; ICTs should not be considered simply as tools that make conventional life easier. Rather, they are increasingly becoming an integral part of people's everyday lives and of organizations. The emergence of global knowledge societies can be viewed as both an opportunity and a challenge. It is an opportunity for societies which can quickly employ ICT effectively and a challenge to those that cannot do so, especially developing countries that had not got benefits from the momentum created by industrial, technological and information revolutions in the history. According to the findings of preliminary literature analysis, in global knowledge societies there will not be developing countries but countries who have ignored the importance of knowledge societies. As world development report 98/99, most of the East Asian countries were developing countries in 1960s and currently are emerging as dynamic economies [1]. In 1960s Sri Lanka is considered as relatively a better economy in South-East Asia but currently becoming one of the lower developed economies in Asia. This study is going to evaluate the nature, status and competence of Sri Lanka as a developing country to face this rising wave of Knowledge Society and potential to regain the economic development as a better economy in South-East Asia.

Structure of this report is as follows. Chapter 01 of this report will describe the background to the study, preliminary findings, research problem, objectives, scope and the limitation of the study, chapter 02 will discuss the existing work done and literature review, chapter 03 will explains the research design and methodology and chapter 04 will do the detailed analysis of the indicators and variables of the study. Finally the Chapter 05 will present the overall conclusions and recommendations of the study.

1.1 Background to the Study

Sri Lanka is known as a developing country with quite conflicting economic performances compared with neighboring countries in both South and East Asia (Figure 1, 2). Historically the governments justified this inconsistence economic performance by giving reasons as the civil conflicts, lack of natural resources and political instability. But when the shorter political life cycles, civil conflicts and diminishing nature of the natural resources become the mega trends in the world, above reasons are not going to be the valid reasons anymore. Some countries those who were well bellow the Sri Lankan Economic standard, implemented effective economic reforms and came up with economic stability, India, Rep. of Korea, Singapore and Indonesia are good examples for that. Since the last decade Sri Lanka also implemented liberalization of government monopolies, encouraged direct foreign investments and improved ICT infrastructure in great extent, but sustainable positive results are yet to be achieved. Social indicators such as Human Development Index, Literacy rate, population below poverty line etc. of Sri Lanka have shown high ratings among South-East Asia, also according to International Telecommunication Union's (ITU) Digital Access Index (DAI) and Economist Intelligence Unit's E-Readiness Rankings, Sri Lankan ICT standard is rated higher as middle access country also it is the second highest in South Asia region. (Table 1, 2). But compared to East Asian countries, which were at the virtually same economic standard, Sri Lanka is at very low level from ICT. Due to the established agrarian civilization, it seems that majority of the citizens and policy making authorities are still trying to give their attention for the agriculture while other South-East Asian countries like Rep. of Korea, Malaysia, Thailand and even India change their focus on manufacturing and especially on service sectors.

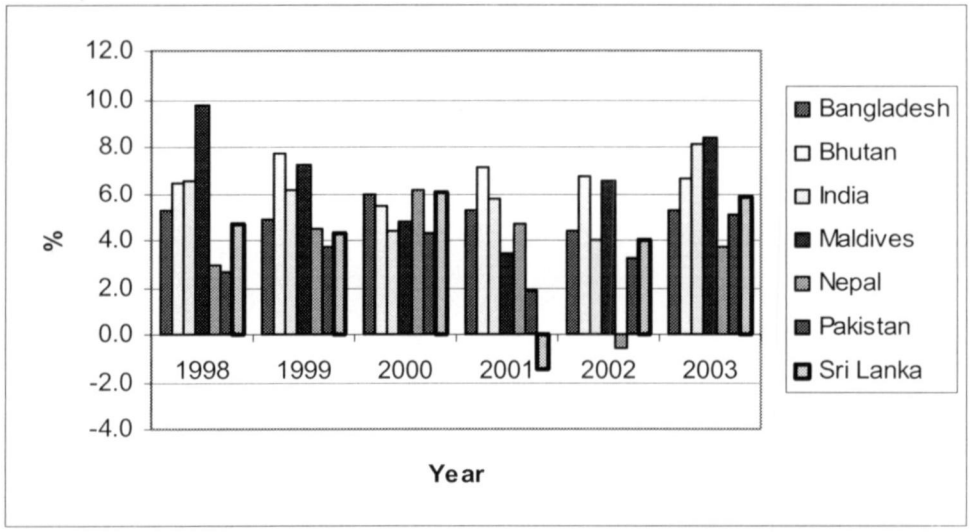


Figure 1: Sri Lankan GDP Growth behavior compared with South Asian Countries 1998-2003 (Source: Key Economic Indicators - 2004)

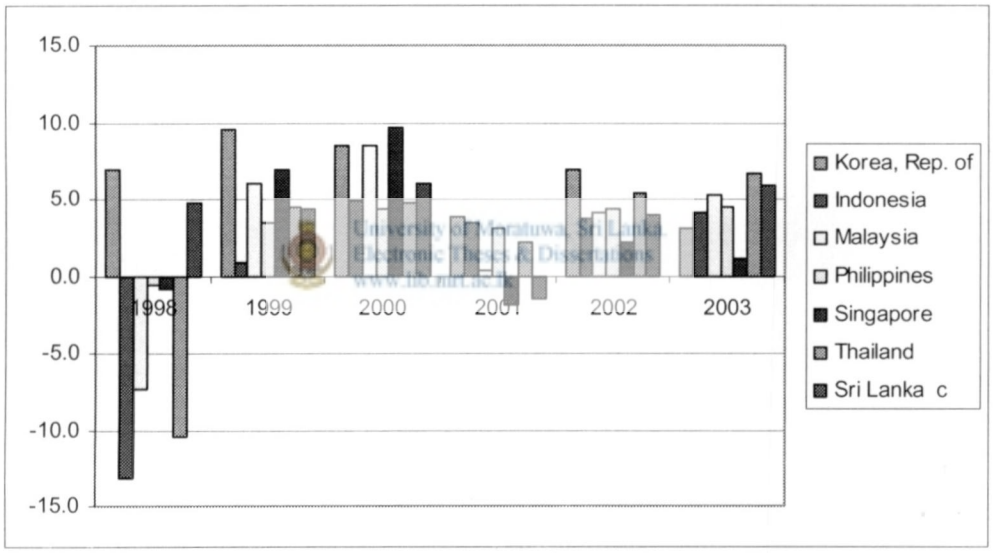


Figure 2: Sri Lankan GDP Growth Behavior compared with East Asian Countries 1998-2003 (Source: Key Economic Indicators 2004)

Table 1: Key Social- Technological Indicators of South Asia

	South Asia						
	India	**Pakistan**	**Bangladesh**	**Nepal**	**Bhutan**	**Maldives**	**Sri Lanka**
Human Development Index	0.595	0.497	0.509	0.504	0.536	0.752	0.74
Literacy Rate % - Male	68	57	50	62	61	97	95
Female	45	28	31	26	34	97	90
Pop. Below poverty line %	26	33	50	42	41	25	25
E-readiness Rankings*	46	62	N.I.	N.I.	N.I.	N.I.	52
DAI Ranking Score**	0.32	0.24	0.18	0.19	0.13	0.43	0.38

Source: Economic and Social Statistics of Sri Lanka 2004- Central Bank of Sri Lanka

**The 2004 e-readiness rankings, Economic Intelligence Unit*

*** World Telecommunication Development Report 2003, ITU*

Table 2: Key Social- Technological Indicators of East Asia							
	East Asia						
	Sri Lanka	**Singapore**	**Rep. of Korea**	**Malaysia**	**Thailand**	**Philippines**	**Indonesia**
Human Development Index	0.74	0.902	0.888	0.793	0.768	0.753	0.692
Literacy Rate % - Male	95	96	99	91	97	95	93
Female	90	88	96	83	94	95	83
Pop. Below poverty line %	25	-	4	8	13.1	34	18
E-readiness Rankings*	52	7	14	33	42	49	59
DAI Ranking Score**	0.38	0.75	0.82	0.57	0.48	0.43	0.34

Source: Economic and Social Statistics of Sri Lanka 2004- Central Bank of Sri Lanka

**The 2004 e-readiness rankings, Economic Intelligence Unit*

*** World Telecommunication Development Report 2003, ITU*

Without receiving much attention from policy makers, gradually Sri Lankan economy is also moving in line with the economic transition that is taking place all around the world. Historically Sri Lanka was known as an economy that heavily relied on agriculture. During the period of 1960s contribution from agriculture to GDP in the country was more than 35% (Table 03). But in 2003 trend has been totally different and the agricultural contribution was less than 20% (Table 04).

Table 3: Structure of GDP by major economic activities (% Distribution) 1959-1968										
	1959	**1960**	**1961**	**1962**	**1963**	**1964**	**1965**	**1966**	**1967**	**1968**
Agriculture	38.8	38.3	40.4	39.9	40.9	39.8	36.7	35.8	37.1	36.2
Industry	17.0	16.5	16.3	16.6	16.8	16.6	16.5	17.2	17.6	18.6
Services	44.2	45.2	43.2	43.5	42.3	43.6	46.8	46.9	45.3	45.2

Source: Adapted from Economic and Social Statistics of Sri Lanka 2004, Central Bank-Sri Lanka

Table 4: Structure of GDP by major economic activities (% Distribution) 1993-2003											
	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Agriculture	20.8	20.0	18.7	22.4	21.9	21.1	20.7	19.9	20.1	20.5	19.0
Industry	27.1	27.7	28.1	26.4	26.9	27.5	27.3	27.3	26.8	26.3	26.3
Services	52.2	52.3	53.1	51.1	51.2	51.4	52.0	52.8	53.1	53.2	54.7

Source: Asian Development Bank Key Economic Indicators 2004

Also the impact of Industrial sector on the Sri Lankan economy is not improving and during last decade average contribution was moving around 27% of GDP while China, Indonesia and India having steep increase in industrial sector. GDP contribution of services from 1993 to 2003 clearly showed well over 50% margin and it is continuously growing. When South Asia is taken as a whole, Sri Lankan trend is more significant than the rest (Table 05).

Table 5: Changes in GDP structure in South Asia and Sri Lanka						
	South Asia			**Sri Lanka**		
	1986-1990	1991-1996	1997-2003	1986-1990	1991-1996	1997-2003
Agriculture	34.7	28.4	26.1	23.0	20.9	20.4
Industry	23.1	23.6	23.9	26.5	27.1	26.9
Services	42.5	44.6	47.2	50.5	52.0	52.7
Source: Asian Development Bank Key Economic Indicators 2004						

Countries that came across economic changes in this nature are currently achieving highest economic advantages through utilization of technology and knowledge in their economic activities. Rep. of Korea, Singapore, China and India are at the top as emerging countries. But Sri Lanka is still lagging behind with inconsistent economic growth. What are the reasons behind this stagnation, how Sri Lanka can overcome from this and what are the strategies need to be applied are not yet been specifically answered by research studies in Sri Lanka.

As per Drucker when a country is moving away from the production economy to a service economy the production workers will become a social problem and intellectual workers will be more valuable than any other assets. Therefore the knowledge workers are becoming vital important [2] and that leads the way a society to become a Knowledge economy. Knowledge creation, advancement, utilization and dissemination are the major knowledge functions in knowledge society. Knowledge creation and advancement depend on innovations and the human resource capabilities of the society, utilization depends on the economic and social usage of knowledge. Knowledge dissemination depends on the availability and accessibility of the communication media and education system with in the society.

Peter Drucker mentioned about the concept of knowledge society in 1967, but the real revolution took place in US in early 1990s. Developed countries those who became knowledge societies did not shift towards that in isolation, it took many years to achieve that status. Thinking patterns of the people in a Western country and a South Asian country like Sri Lanka are different due to their respective exposed culture. U.S.A and Japan are dominating in technological innovations. Most of the Nobel Prize winners and patent right owners are coming from these countries. Their higher education systems, ICT usage in economic activities and opportunities for educated people have significantly influenced to become a knowledge society. Since Sri Lanka can not compete in world

economy with low cost labor and quality infrastructure facilities sooner or later Sri Lanka need to develop its own identify in global knowledge economy.

1.2 Problem Statement

Development of sustainable national level policies and method to implement them uninterruptedly are been unanswered problems of Sri Lanka. Due to high politicized government affairs do not have encouraging long-term goal to achieve as a nation. To be a competitive Knowledge society would be the ultimate goal of Sri Lanka in this transition era. Currently in Sri Lanka there is a interest on ICT and ICT education among policy developing authorities but not the knowledge society. ICT is the engine of the modern economic growth but car does not run only with the engine, to operate the engine there should be skilled driver and he should have to drive the car. Like wise ICT alone is not a matter but knowledge and how it applied in economic activities is equal important in a society. In 1960s Sri Lanka, Pakistan, Ghana and Republic of Korea had similar income and after 40 years per capita GDP in Korea grew to couple of times more than others. Most of the studies identified this significant improvement of Korea happened mainly not only their high utilization of ICT, but also due to knowledge gained through higher education, utilize them in economic activities and ultimately became a knowledge society. Important influences of ICT, innovations, education and knowledge as factors of economic growth in Sri Lanka have not been identified. The genuine impact and dependency of one section on another is not being clear at macro level. Long-term sustainable economic and social wellbeing is not yet focus of the policy makers. Currently in Sri Lanka, ICT, Education and economic development are considered as isolated sections and trying to solve short-term social problems such as unemployment, low ICT literacy and low English language skills in the country without considering the fact that these are problems arising from interrelated and complex process. This study is going to evaluate every dimension of ICT, strength of ICT utilization in economic activities, Education system and utilization of knowledge in economic and social levels with other knowledge factors in order to identify the status, weaknesses and then develop strategies to show the path way to Sri Lanka to be a competitive member of global knowledge society. Hence the central theme of the study is originated from the question of to what extent Sri Lanka is ready to be a global knowledge society and how we can gain stable economic development in long-run.

1.3 Objectives of the study

Objectives of the study are identified as follows,

- Primary Objective of the study would be
  - To evaluate the nature of the three dimensional factors in knowledge society: Knowledge creation, dissemination and utilization in relation to Sri Lankan context.
- Secondary Objectives would be,
  - To develop Benchmark indicators to identify weaker links between essential attributes and available attributes in Sri Lanka that needs to be improved to become a knowledge society.
  - To develop long-term strategies for Sri Lanka to be a competitive member of knowledge society.

Each objective is focused towards solving central research problem of the study and detail discussion of how to achieve these objectives will be discussed in chapter 3: research design and methodology.

1.4 Importance of the Study

Since Sri Lanka is moving away from agriculture and industrial production, requirement of intellectual workers need to be improved and attention should be given to the concept of Knowledge Society (or Knowledge Economy). So far little attention was given towards the micro level factors of the knowledge management in Sri Lanka, such as factors affecting to implementation of knowledge management in an organization. Through Knowledge Management, organizations are trying to break up knowledge from individual personalities in order to reuse that knowledge with others. According to this concept business knowledge should be platform independent. It should not be gathered in CEO's or GM's head. It should be stored in a place that can be reused, shared and compared without interacting with that particular individual who had the original knowledge. Based on ICT capabilities, Knowledge Management can store and re-use past experiences, patterns and analytical methods that were applied earlier. Using ICT capabilities others can re analyze what has happened earlier and how early specialists solved the problem and by doing that learn how to act or react against similar type of problem at present. Therefore the specialized knowledge is going to be very important in the future. Most of the time, specialized knowledge is received from the outside world and qualifications. At

least it will give the passport to be specialists in relevant field. Hence the education system that create knowledge workers and ICT facilities that give the access to knowledge sources and dissemination at national level are important to implement effective knowledge management.

Sri Lanka is a country who missed the opportunities to gain competitive advantage of industrial revolution, technological revolution and also the IT revolution. Knowledge revolution is the hottest opportunity that Sri Lanka can gain competitive advantage as an economically wealthy country. So far there is no published comprehensive macro level research in Sri Lanka that covers every aspect of knowledge activities in relation to Sri Lankan context. Today Rep. of Korea, Singapore, China and India are challenging world traditional knowledge giants like U.S.A., UK, Japan and European Union primarily due to knowledge and utilization of ICT in economic activities. Forty years back above mentioned emerging countries were at the same level or below the Sri Lankan economic standard. Finding a solution for the stagnation of Sri Lankan economy is national level necessity and this study mainly focuses on that. Hence this study has an age long value to Sri Lankan economic development. "Country can not plan the future, but country can only foresight the future" [3]. The richer understanding of what might happen, rather than setting out what will happen, is an essential feature of foresight. This study constitutes a systematic attempt to observe long-term future of Sri Lankan economy, technology and society, in order to generate knowledge to affect economical and societal development. Outcomes of this study can be used by policy makers in Sri Lanka to develop long-term plan for the future development of Sri Lanka. National education specialists, economists, ICT specialists, business companies, students and largely all the citizens of Sri Lanka can also be benefited from the findings of this study. They can use this study as a first step of the knowledge society foresight in Sri Lanka. Not only Sri Lanka any developing country can use the indicator framework that is going to develop as benchmark indicators to evaluate their readiness to be a knowledge society. It will give the national level approach that go beyond the more narrow and short-term exercises towards the sustainable economic growth in the future.

1.5 Methodology

This is a macro level qualitative research that uses inductive reasoning. This is basically a qualitative research that uses relatively less complex and common statistical tools such as simple regression, Pearson's correlation coefficient, growth rates, percentage vales and

readily available indices such as Human Development Index for data analysis. Due to the macro level scope of the study sampling techniques are not applicable and period of analysis is basically varied from 1990 to 2005. Major indicator framework of the study was developed primarily based on the work of Eurofound on "Foresight of European Knowledge Societies" but by and large the framework is adapted to the Sri Lankan context due to unavailability of statistics. Because of the macro level scope of the study every indicator is evaluated by using only secondary data provided by local and international statistics providing organizations. Within the framework of present study background requirements for Knowledge creation and dissemination in Sri Lanka are identified as pre-requisites and utilization of knowledge in social and economic activities are identified as outcomes. To evaluate both pre-requisites and outcomes several indicators will be used and due to the diverse scope of each indicator different analytical methods will be used. Data will be presented in tabular form, bar graphs, pie charts, and trend lines. Analytical methods of major indicators will be described in detail in the chapter 03 of this research.

1.6 Limitations of the Study

There is no such comprehensive published research in relation to knowledge context in Sri Lanka; therefore the official statistical authorities in Sri Lanka have not gathered most of the knowledge based factor statistics, such as Research & Development expenses at national level. Due to unavailability of existing literature in Sri Lanka most of the literature and variables identified through international studies conducted in developed countries and some of the South-East Asian countries. Those findings are not well-matched with the Sri Lankan context but present study attempts to minimize the conflicts arising due to this by adjusting them to suit to the Sri Lanka, but some unavoidable factors may influence to the results. Due to the macro level nature and wider scope of the study existing statistics that provided by the international and local authorized organizations were not empirically evaluated for their validity and assumed that those organizations generated those statistics after conducting reasonable studies and with fair amount of responsibility. Therefore any error that occurred with those statistics may have influence to the findings of this research.

Chapter 2 -Literature Review

This chapter will describe the existing literature and work done to justify the importance and relevance of the study's core concept of knowledge society especially in Sri Lanka as part of Southern Asia, to thoroughly analysis the related concepts, to evaluate the already identified relationships between ICT, Education and Socio-Economic development in other parts of the world, also to evaluate the existing knowledge indicators and lay the foundation to develop the benchmark indicator framework of the study.

2.1 Emerging Importance of Knowledge in Global Economy

No century in human history has been such radical and swift social transformations as the twentieth century [4]. This is the most dynamic era of mankind, the changes occurred during last 50 years are more influential than the lifetime of the earth. Transition period from 20th century to 21st century generated new ways of looking at economic development. Traditional factors of production such as natural resources and low cost labor are not going to be the deciding factors of developed and under developed countries in the future. Knowledge is critical for development, because everything depends on knowledge. As far as knowledge being universally accessible there are no excuses for nonperformance. In the future there will not be poor countries but there will be ignorant countries [4]. Countries that postpone these realities will fall behind those that move faster and the unhappy consequences for their development prospects will be hard to remedy. As per Drucker this concept will be true for individual companies, individual industries and individual organization in any kind or even individual. In 98/99 World Development Report clearly pinpoint the importance of knowledge as a factor of economic development. People must transform the available resources to produce the things they need, and that requires knowledge. If we want to live in a better tomorrow than today, if we want to raise our living standards as a household or as a country- and improve our health, better educate our children and preserve our environment we must do more than simply transform more resource, we must use those resources in ways that generate ever-higher returns to our efforts and investments [1]. According to that report most technologically advanced economies are well aware of the importance of the knowledge and they are generating new wealth from innovations. For example, some countries rearrange their strategies to become a knowledge society. "We have reached a consensus in Scotland; we have to build our economy on knowledge because we cannot compete on low wages..." [5]. Starting as low-income economies in the 1960s, a few

economies in East Asia managed in few decades to bridge the entire income gap, that separated them from been as the high-income economies of the Organization for Economic Co-operation and Development (OECD), meanwhile many other developing economies stagnated [1]. It clearly mentions the need for developing countries to increase their capacity to use knowledge. Some are catching on, but most need to do much more, much faster, to increase their knowledge base, to invest in educating their people and to take advantage of the new technologies for acquiring and disseminating knowledge.

The knowledge economy has transformed the demands of the labor market in economies throughout the world. In Industrial countries, where knowledge-based industries are expanding rapidly, labor market demands are changing accordingly [6]. If the industrial sector is expanding demand for high skilled workers, particularly high-skilled ICT workers will increase, and the same time, demand for lower-skilled workers will be declined. This means the skills and competencies of the people who entered the labor force should be aligned with the long- term economic tendency of that particular country.

2.2 Knowledge and Knowledge Society; Conceptual Conflict

There are two levels of knowledge; explicit knowledge and tacit knowledge [7]. Explicit knowledge is an articulated knowledge- the world speak, the books that read and the data that compile. The greater knowledge is tacit knowledge and that includes intuition, perspectives, beliefs and values that people form as a result of their experiences. Social scientists analyze the concept of knowledge and its impact on society with a perspective of concerning about the importance of tacit dimension of the knowledge. Tacit knowledge is created inside the human mind with the help of stimulations from the environment. According to Polyni, tacit knowledge is something that we do unconsciously and most of the time we are not aware of its existence [8] and knowledge is acquired through education and interaction with the environmental objects. The prime movers in the process of organizational knowledge creation are high skilled persons of an organization. In an organization, tacit knowledge is made up of the collective mindsets of everyone in an organization. Professionals are continuously committed to recreate the world in accordance with their perspectives. This commitment is very important to the knowledge creation and three main factors that induce individual commitment in an organizational setting; Intention, Autonomy and Fluctuation [9]. According to Nonaka's argument Intention depends on Individual, Autonomy depends on organizational structures and

management, finally Fluctuation is all about macro level environmental factors. Therefore sustainable knowledge creation and knowledge sharing (KC & KS) depends on the individual (I), Organizational Environment (OE) and infrastructure and cultural value system of the External Environment (EE) [10]. By the fact that social scientists analyze the concept of knowledge in a micro level, the importance of macro level variables are not being ignored, strengthening the macro level factors that have influence towards the knowledge creation and knowledge sharing will give the stimulations to organizational level as well as the individual level knowledge activities. Therefore if any country need to be a Knowledge Society they must construct the stimulating macro level environment that rouse the tacit dimension of the skilled professionals of the country.

Emerging importance of knowledge based economies or Knowledge Economies created some misconceptions as well, in fact the definitions for knowledge society, knowledge Economy and Knowledge Based Economy seems to be conceptually same but at present, there are no generally accepted views for those concepts. Peter Drucker the author who invented the concept of Knowledge Economies way back in 1960s defines his concept from nature of the economic activities. According to his thoughts when the first half of the 20th century blue-collar workers grew rapidly due to industrial improvements took place especially in US, UK, West Germany and Japan. During that era their GDP was dominated by industrial sector. He defines this as an Industrial society [4] and today it is diminishing and knowledge work is becoming more and more important. Drucker mentioned that developed countries are going for paradigm shift towards "Knowledge Society" [2]. The concept of "knowledge societies", "knowledge economies" and "knowledge based economies" are denominators of same phenomenon. Knowledge society is an economy, in which the generation and exploitation of knowledge play the predominant role in society's economic activities [11]. According to him there are attributes that shows clear differences between knowledge, industrial and mercantilist economies when moving from one society to another. It has changed the required work and worker of the society.

Major deference between knowledge work and manual work is that knowledge work is information-based and manual work is material based [12]. A manual work process, no matter how much skill and knowledge is required of the worker, consists of converting materials from one form to another. Hence the results of manual work processes are tangible and can be identified as physical product. When it comes to country level economic performance agricultural or industrial outputs are tangible, but

when it comes to services that is not tangible and can be measured only in monitory terms. When the economy is moving away from the agriculture or industrial production towards the knowledge products or relative contribution from the knowledge products to Gross Domestic Product (GDP) is increasing, then that economy is emerging towards new paradigm that dominated by knowledge work. A knowledge-based economy relies primarily on the use of ideas rather than physical abilities and on the application of technology rather than the transformation of raw materials or the exploitation of cheap labor. It is an economy in which knowledge is created, acquired, transmitted, and used more effectively by individuals, enterprises, organizations, and communities to promote economic and social development [1].

But some organizations use to identify another intermediate type of society structure as Information Society. It has been defined as "a society that makes extensive use of information networks and information technology, produces large quantities of information and communication goods and services, and has diversified content industry [13]. An information society focuses on a rather restrictive economic or infrastructure agenda, with little attention given to social and human aspects. As per UNESCO definition Knowledge Society goes beyond of an Information society by ensuring that all persons, without distinction, are empowered to create, receive, share and utilize information and knowledge for their economic, social, cultural and political development. It clearly mentioned that "it is critical that ICT should be regarded as tools to progress and not as ends in themselves". Hence Knowledge Society depends upon ICT for infrastructure but the analysis of knowledge societies need not only restricted to evaluation of ICT infrastructure and utilization and it should go beyond that.

2.3 Knowledge Society and ICT

The creation, dissemination and utilization of knowledge are essential for development and the introduction of ICT is a precondition for developing a knowledge society [14]. Identifying the importance of ICT in economic activities is valuable to evaluate the behaviors of most dynamic countries in this era. China is the most dynamic country in the world now and according to World Bank special report; "China and the Knowledge Economy seizing the 21st Century" says that ICTs are likely to have a large impact on China's markets, services, employment opportunities, education, investment and growth [15]. Rep. of Korea is also known as a blooming country which has identified the importance of ICT as a key economic factor [16]. According to an example cited in the

World Development Report -1998/1999, Ghana and Rep. of Korea started off with almost the same GNP per capita in 1960s. Thirty years later Korean GNP per capita has risen more than six times, Ghanaian was still hovering at the same level. Half of the gap could be explained in terms of the "traditional" factor inputs, the other half, according to World Bank experts, was attributed to "Knowledge" as a factor of Production [1]. Even Singapore, Taiwan and India have high involvement in knowledge based ICT related industries (Software and Hardware) and they are gaining more wealth than other countries in Asia. Hence in today's emerging countries, ICT infrastructure and strategic implementation of ICT are becoming common economic factors in development. Although Sri Lankan firms have made headway in offering IT based services to a variety of international customers, counterparts in India, Israel, Ireland and other countries have progressed far ahead than Sri Lanka over the last several years. Revenue generated by Sri Lanka on software exports is currently estimated at US$80 million. The local software industry believes that Sri Lanka can achieve US$ 1.0 billion in total ICT related export services by 2012, with the right mix of infrastructure, support from academia and establishment of a policy environment conducive to ICT growth. [17]

Attempts to identify the role of ICT in economic development have long history. The Jipp curve was the first attempt to quantitatively explore the interplay between telecommunication infrastructure and economic development. It is a statistical tool that uses simple regression to develop reference curve. At the invention of Jipp curve in 1960s it indicated the existence of a strong correlation between the level of development of telecommunications infrastructure in a given country and its economic wealth. Jipp curve was developed using two factors, first was measured by tele-density: number of main fixed lines per 1000 inhabitants and second was per capita income. Cross-country data can be plotted as a scattered diagram and a reference curve is created to identify where the particular country stands. Jipp was concerned with finding the extent to which telecommunications can foster development and conversely [18]. Interpretation of Jipp curve said that "if the point representing the telephone density in a country is below the curve, rapid expansion of the telecommunication infrastructure should occur soon as this country suffer from under equipment and conversely, if the point is above the curve, one might expect a slow down in the expansion of the infrastructure[18]. It shows the strength of the relationship rather than explaining whether telecommunication leads to development or whether development leads to improvement of telecommunication, and

hence Jipp has its own limitations but it is a useful tool to identify the relationship between GDP and relative status of the Tele-density of a given country.

After the computer, Internet and mobile technology revolutions, number of cellular phone users, Internet and e-mail penetration rates were rising as the key measurements of ICT infrastructure and as factors of economic development all around the world. Rise of the E-Commerce, M-Commerce, E-Government, E-Learning and their branches and versions are taking world away from the fixed-line telephone usage. Therefore most of the institutions such as International Telecommunication Union (ITU) and Economist Intelligence Unit (EIU) rank world economies based on availability, affordability and utilization of ICT infrastructures, especially giving more attention on Internet and mobile technologies. More realistically with the rise of the Knowledge Societies, the status that was there for the fixed line telephones as a medium of knowledge dissemination became obsolete. Hence the traditional fixed lines Jipp curve is not the best tool to measure the ICT infrastructure in knowledge society and Jeunhomme recently pointed out modern measurements for the Jipp curve. Among other variables he clearly mentioned the importance of mobile phone usage as an input to measure the tele-density.

Limitations arising in relation to GDP from country to country were the major barrier to Jipp analysis. Cross-country comparison of Per capita income in terms of common currency (US$) is not an acceptable tool to measure economic wealth, due to the differences of currencies. To eliminate that World Bank introduced a new conversion rate that can be applied for any country. The international dollar values, which are different from the U.S. dollar values of GDP, is obtained using special conversion factors designed to equalize the purchasing powers of different currencies. This factor, the Purchasing Power Parity (PPP) is defined as the number of units of a country's currency required to buy the same amounts of goods and services in the domestic market as $1 would buy in the United States [1]. Because the same international price averages are used for every country, cross-country comparisons reflect differences in quantities of goods and services free from price-level differences. PPP estimates tend to lower the per capita GDPs in industrial countries and raise the per capita GDP in developing countries. Therefore without using traditional currency rate based per capita GDP, use of PPP per capita GDP will give better comparison among different countries. Due to the universal acceptability in this study also Jipp curve is going to be used to evaluate modern ICT by using PPP per capita GDP.

Despite the fact that modern ICT is spread all over the world, still more traditional media such as television, Radio and printed media have role to play in developing countries [19]. Television receivers rate in Asia are much higher than the Internet penetration rate. But especially in South Asian countries where majority of the community is rural by nature and live under the poverty level. Hence the radio is still the most pervasive, accessible, affordable and flexible mass medium available, especially in developing world [21]. In Afghanistan, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka have community radio programs to disseminate knowledge and entertainment in their local languages [22] and that indicates the importance of traditional media in developing knowledge societies in South Asia. Hence this study is going to measure the conventional media as well and it will give better picture of ICT in South Asia.

2.4 Knowledge Society and Education

For individuals and for countries, education is the key to creating, adapting, and spreading knowledge. Basic education increases people's capacity to learn and to interpret information. But that is not enough, higher education and technical training are also needed to build a labor force that can keep up with a constant stream of technological advances. Due to formal primary education most of the social problems can be solved. World Development Report 1998/99 highlighted that surveys show educated men and women are more likely to be aware of the AIDS, in Tanzania 20 percent of women with four to seven years of schooling are using condoms during sex with casual partners but only 6 percent of uneducated women are using that. In Philippines, the provision of maternity clinics and increased numbers of doctors were found to reduce child mortality mainly the children of educated mothers. These findings imply that basic skills learned in primary school go a long way towards improving the lives of poor children and adults. In emerging Knowledge society, education has to play different role in economy. So far Sri Lanka and most of the countries identified education as a part of social welfare. But recently knowledge and the accumulated stock of human capital are inputs in the production of new knowledge and wealth [23]. With the new information based technologies demand for skills for diffusing, interpreting, and applying knowledge are continuously increasing and hence the tertiary education has an important role to play in modern economies. Basic education is necessary to increase peoples' capacity to learn and to use information On the other hand, technical secondary-level education, and higher education in engineering and scientific areas is necessary for technological

innovation [24]. Over the last fifty years, the income gap between rich and poor countries has grown. Between 1950 and 2000, annual per capita income in OECD countries tripled from US$ 7,300 to US$ 23,000, while income in Latin America only doubled, from US$ 3,000 in 1950 to US$ 6,200 in 2000. This is largely due to widening gaps in knowledge and technology. The North part of the world has continued to generate new technologies and statistical studies suggest that this drive contributed to at least half of economic growth; but still most of the South has been unable to take full advantage of them [25]. According to him as late as 1950, the United States was perhaps the only country where the median school-leaver was a high school graduate. By the time, countries in Europe seeing the rapid rise of the United States as an economic powerhouse learned their lesson, the United States had expanded its investments in tertiary education, and most European countries have only recently begun closing this gap. Perry further explains that, many East Asian countries were quick to see the importance of investing in education: Korea, for example, has secondary and tertiary education indicators that are already better than many European countries. But in much of Latin America, this recognition has come more slowly. Technological change in the twentieth century has been increasingly biased in favor of skilled workers and appears to be the strongest force driving the increasing skilled/unskilled wage differential in industrialized countries. There is some evidence that this is partly a result of the information and communication technology (ICT) "revolution".

After identifying the importance of Knowledge as a key factor of the economic growth next question is what kind of knowledge should be improved by the country. Peter Drucker defines the knowledge based on the work need to be done. He explains this through example; "The neurosurgeon's performance capacity rests on formal education and theoretical knowledge. Absence of manual skill disqualifies one for work as a neurosurgeon. Manual skill alone, no matter how advanced, will never enable anyone to be a neurosurgeon. The education that is required for knowledge work is the education that can only be acquired in and through formal schooling; it cannot be acquired through apprenticeship" [4]. According to him systematic learning through formal schooling is very important and the education will become the center of the knowledge society, for the knowledge of the knowledge society is fundamentally different from what was considered knowledge in earlier societies. Drucker clearly mentioned that the "in the knowledge society knowledge basically exists only in application. If the knowledge cannot be applied in day-to-day life then it will not be knowledge in application and that will not

add value with in the knowledge society. Most of the developed countries move away from being production economies. They move towards service economies that white collar jobs are dominating. Drucker pointed out some people within the organization, production workers, who work with physical objects; others work with intangibles as professionals with higher educational qualifications in their field who are Knowledge Workers [2]. Drucker further said that, "Knowledge Workers are moreover specialists. Their own field may be quite narrow. But in it they know more than the boss-and they know it...". Drucker's definitions narrow down the concept of knowledge worker, to a person with specialized higher educational qualifications in their related field. Drucker said to Forbes that "The vice president of marketing may have come up the sales route and know a great deal about selling. But he knows little about market research, pricing, packaging, service, sales forecasting. The marketing vice president therefore cannot possibly tell the experts in the marketing department what they should be doing" and also the Laudon family restricted the concept of Knowledge Worker to top level professionals with creativity. "Knowledge workers are people, such as engineers or architects, who design products or services and create knowledge for the organization." [26]. Both these definitions favors for the specialized formal education of the knowledge worker, and the argument was 'engineer is the best knowledge worker to do engineering work, no one will not be able to advise him'. Hence the higher educational qualifications in a specialized field are demanded by the knowledge society. To facilitate these requirement enrolments in higher education is being increasing in developed countries. In Finland 84%, US 72% and Norway 68% enrolled in tertiary education. Not only developed countries, emerging country like South Korea has 72% enrolment [27]. But still Higher education it self does not lead the way to be a knowledge society and knowledge on its own doesn't transform an economy. It is a matter of application.

As world development report 98/99 described thousand inventors in India illustrates that almost 90 percent had a university degree, more than half had some graduate training, and nearly 30 percent had earned their doctorates. In some countries majority of R&D expenditure comes from universities. Even in India, Malaysia and Philippine universities contributed to the economy by engaging in agricultural R&D efforts. But especially higher education in science and engineering fields are more demanding and according to the World Bank have much higher impact on economic development of developing countries that had rely heavily on agricultural and primary products. Thus universities serve multiple roles not only enhancing the skills of future

workers but also producing new knowledge and adapting knowledge produced else ware. Most analysts agree that education and training were critical in sustaining Korea's economic growth over a remarkably long period.

Education is likely to play an increasingly important role in South-East Asia over next decades. The reason is that past development strategies have primarily relied on exports of labor- intensive and low-skilled products, but there now seems to be a need to upgrade production and exports [28]. He pointed out that Southeast Asia, the region accounted for as much as 64 percent of final global assembly and 44 percent of total global employment but the region only received 13 percent of the industry's wages because high-skilled activities are maintained in Europe, Japan and the US, and low-skilled activities are located in Southeast Asia. The ministry of education and higher education of Sri Lanka is of the view that Sri Lanka as a nation is lagging behind in the development of Information Technology in relation to many countries of comparable economic growth and social environment [29]. As per policy document integration of IT education with the formal curriculum in school education has not taken place as yet. In this backdrop IT is not offered as a subject in the school curriculum. Hence the government of Sri Lanka is trying to provide state of the art knowledge of IT to Sri Lanka's younger generation to prepare them to face the challenges in the 21st century with the vision of "A new generation of Sri Lankans empowered with Information and Communication Technologies". But still there are not published studies on showing the nature and the importance of Education for Sri Lanka to become a knowledge society.

World Bank suggests that, preparing workers to compete in the knowledge economy requires a new model of education and training, a model of life long learning [6]. Changes in the knowledge economy is so rapid, therefore firms can no longer rely solely on new graduates or new labor market entrants as the primary source of new skills and knowledge. It further said that if developing countries do not promote lifelong learning opportunities, the skills and technology gap between them and industrial countries will continue to grow. A lifelong learning framework encompasses learning from early childhood to retirement. It includes formal, non-formal and informal education and training. According to this report structured education through formal institutions, vocational training through technical colleges and on the job training, and also the learning coming from the interactions between members and incidences of the society contributed to the knowledge creation and dissemination of any society. Importance of

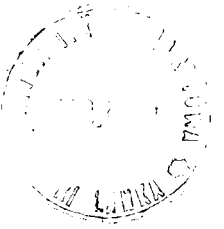
primary, secondary or tertiary education cannot be measured only through the enrolment, and an enrolment rate does not guarantee the economic benefits of relevant education level. World development report 1998/1999 pinpoints the greater importance of basic education for the economy. "Basic education increases people's capacity to learn and to interpret information and for adapting knowledge for local conditions and its effects on economic productivity and on other aspects of life such as health....." [1]. World Resources 1998-99 highlighted that, one multi-country study has indicated that a 10 percent increase in life expectancy raises the national economic growth by about 1 percent per year [19]. It further explained the importance of basic level education and social service rather than higher education and health services to the economy; "it has been estimated that the social rate of return of all developing countries averages 24 percent for primary schooling, 15 percent for secondary schooling and 12 percent for postsecondary schooling". But new information-based technologies are more demanding in skills for diffusing, interpreting, and applying knowledge. Tertiary education and technical training produce people who can monitor technological trends, asses their relevance to the country's prospects and help develop an appropriate national technological strategy. The report mentioned that high and fast growing university enrolment do not guarantee rapid economic growth. Knowledge creation and sharing is not an isolation process, but heavily affected by the organizational and macro level environment. People learn from the environment from their childhood, hence people in different countries behave and learn things differently [10]. Countries need systems where knowledge can be advanced, disseminated and transformed in to goods and services. Recent work in Innovation stresses that adopting existing technology is unable to do without cost. Countries need to develop an "absorptive" or "national learning" capacity which, in turn are hypothesized to be functions of spending on research and development (R & D). Not only to develop new science but also to know where the frontier is and figuring out what adaptations are necessary as the second phase of R&D [30]. This paper further explains how developing countries can overcome their problems through innovations and making required adjustments to existing technologies. To do that the education system should create capable people to innovate. Education and training systems needs to be created, supported by regulatory bodies that will bridge the formal education system with the needs of students, the labor force and society as a whole but without certain essential complementary inputs, even the best education system cannot

lead the economy to growth. These complementary inputs include a healthy investment climate, a stable macro economy and fewer state monopolies.

The survey conducted by Eurofound in 2004; Advancement of Knowledge Societies: comparing Europe, the US and Japan indicators of education were Pupil / teacher ratio (preprimary, primary, secondary), Number of teaching hours per year in public institutions (by level of education), Everyday computer availability at home, Everyday computer availability at school, Everyday computer usage at home, Everyday computer usage at school and General computer availability in schools. Eurofound's work covered substantial range of modern education by considering the fact the ICT in schools as key indicators. But to conduct such a comprehensive study in Sri Lanka or South Asia is not going to be easy due to the lack of official national or regional level statistics. But according to Sjoholm's study on Educational Reforms and challenges in Southeast Asia, the state of a country's education can be evaluated from inputs into education such as public expenditures on education and the number of teachers, and from outputs of educational efforts, such as enrolment and literacy rates and by doing this he was able to eliminate the statistical barriers. Present study is going to use both these studies in order to develop indicators to evaluate education status of Sri Lanka.

2.5 Knowledge Society, Economic Growth and Human Development

World Resources 1998-99 report clearly mentioned that "Economic growth is an important factor in reducing poverty and generating the resources necessary for human development and environmental protection [19]. According to that report there is a strong correlation between GDP per capita income and indicators of development such as Life expectancy, infant mortality, adult literacy, political and civil rights. It further said that economic growth does not guarantee human development broad-based health and educational services are also vital to raising overall living standards. On the other hand the report explains the main reason for low economic growth of some Asian and Latin American countries as continuous dependency on exports of primary commodities. Countries such as Brazil, China, Korea, Indonesia and Mexico are declining dependence on agriculture and moved towards manufactured exports in order to gain benefits of globalization. To convert primary commodities in to manufactured products countries' labor force require more knowledge and skills and primary level schooling it self is not enough.



2.6 How to Measure Knowledge Societies

In South Asia or Sri Lanka there is no published research papers that comprehensively and statistically evaluated the nature of all knowledge factors and also there is no much country level published reports by covering all aspect of Knowledge Societies. UNESCO's "Measuring and Monitoring the Information and Knowledge Societies; a statistical challenge" mainly concentrate on the ICT related indicators by concerning ICT as a main driving force of the Knowledge Society [13]. It indicates that many countries in developing world still use the older technologies of broadcast such as radio and television as a means to development within the context of knowledge societies but the report primarily focus on the newer technologies. World Bank's "Constructing Knowledge Societies: New challenges for tertiary education" focuses only on tertiary education and it discuss about the nature and path way to improve tertiary level education as a way absorbing knowledge [31]. Majority of work done by formal authorities mostly focus on one aspect of the knowledge society and did not give much attention to Sri Lanka as a emerging knowledge society. Hence they did not indicate the overall impact and interlinks between each variable and context of Sri Lanka. European Foundation for the Improvement of Living and Working Conditions (Eurofound) created a framework that covers almost all the aspects of knowledge societies in Europe, US and Japan [3] and it gives much clear picture regarding knowledge society, thus it will be used in this study as an indicator frame work. Detailed discussion of the methodology will be done in the research design and methodology chapter.

Chapter 3 - Research Design & Methodology

This chapter will discuss the conceptual framework and the research methodology adopted in the study.

3.1 Research Design

This study is an inductive research that applies cause and effect type of rationale to generate a conceptual framework (Figure 3) and its validity and the relevance is going to be discussed within this section of this chapter.

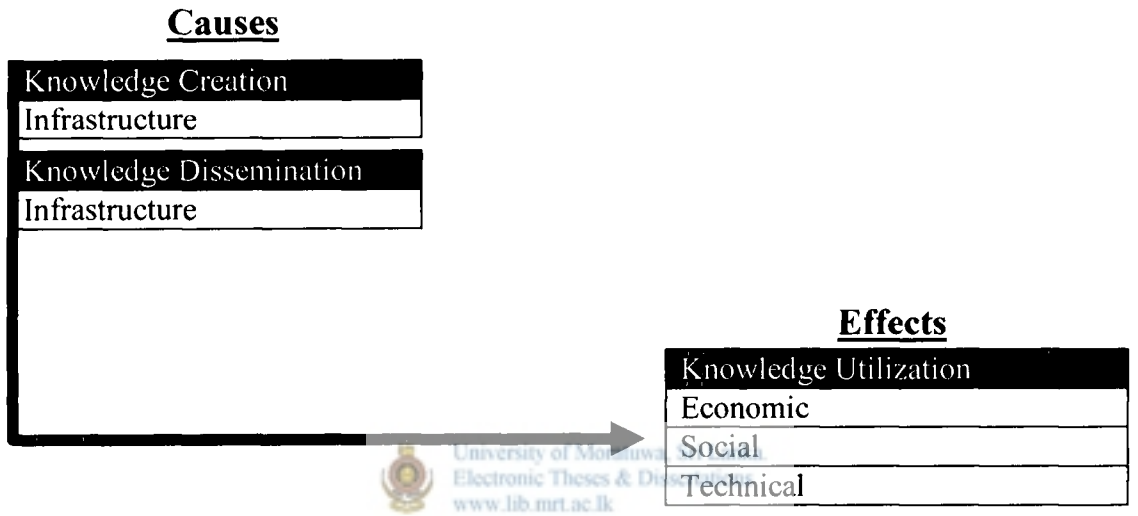


Figure 3: Conceptual Framework for the study

As preliminary analysis of emerging importance of Knowledge in Sri Lanka which was described at the introductory chapter, Sri Lanka is able to compete with even most of the newly developed countries in South-East Asia due to high social and health standards. However the economic performance does not match with the human development and social standard. Further Literature review indicated that, by generating standard ICT and educational infrastructure base and utilizing them to generate new knowledge in scientific, technological and basic economic applications, any nation can gain better economic wealth.

Based on preliminary findings, present study is hypothesizes that there should be correlation between ICT and education infrastructure, knowledge utilization and nations' economic well being in Sri Lanka that yet to be exploited and problem of Sri Lanka is the ignorance of these correlations. Yet this study is not design to do a comprehensive

statistical hypothesis testing but is going to do more widespread qualitative analysis with basic level of statistical calculations to identify the reality.

In this study knowledge societies' functions are categorized in to three main categories; Knowledge creation, Knowledge dissemination and Knowledge utilization, but due to the un-researchable broadness and interplay between each category data analysis would not be done by using this conceptual categorization. For an example in practice education can be identified as knowledge disseminating factor but one might think that would be the foundation of knowledge creation. In order to eliminate possible controversial issues workable research design is basically developed to keep the compatibility with the Eurofound's indicator framework [3] still it would be able to measure every aspect of knowledge creation, dissemination and utilization.

Eurofound's indicator framework divided the knowledge society measurements in to two,

- **Prerequisites Analysis:** that measures the infrastructure and resources, Socio-economic and political inputs for knowledge society
- **Outcomes Analysis:** measures the knowledge outcomes

Then they sub divided the prerequisites and outcomes in to measurable sub sections by covering ICT, Education, employment, R&D and most of the key indicators (Figure 4). To evaluate each sub section more than one indicator were used. By doing that Eurofound was able to foresight the knowledge societies in Europe.

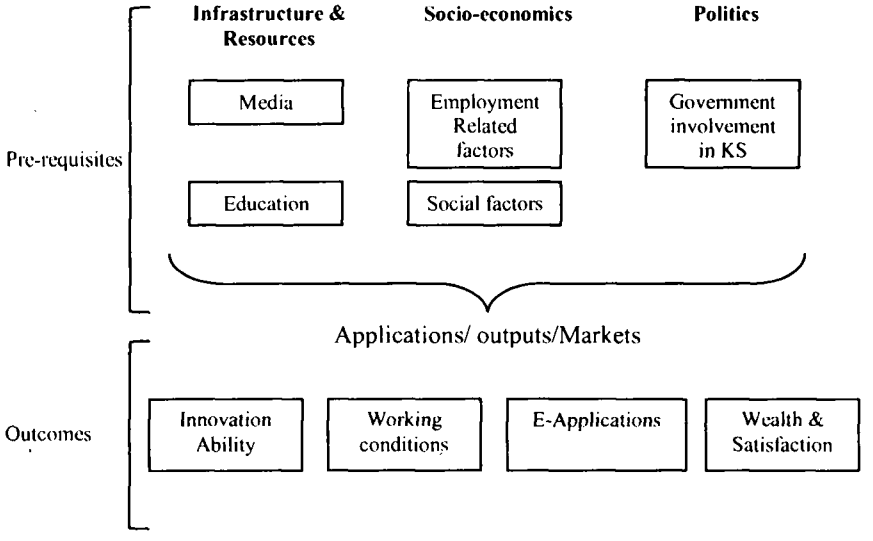


Figure 4: Indicator Framework of Eurofound's Advancement of Knowledge Societies 2004.

Even though Eurofound's work used different terminology the core framework was still basically the same with present study. Knowledge creation and dissemination indicators that are defined by this study were measured as pre-requisites by Eurofound's study and then pre-requisites were evaluated by using modern and traditional indicators. Knowledge utilization was evaluated by using outcomes or rather impacts of knowledge factors on economic, social and technical perspectives (Figure 04). Hence this study's cause and effect relationship is generally compatible with Eurofound's indicator framework.

Due to the novelty of the knowledge society concept in Sri Lanka, available statistics in local authorities as well as the international authorities are not comprehensive enough to analyze same set of indicators that had been used by Eurofound. Due to this limitation some modern indicators used by the Eurofound would not be able to use in this study. Modified indicator framework that is going to be used in this study is shown in figure 05 and key indicator variables that are shown in table 06 are developed based on this indicator framework.

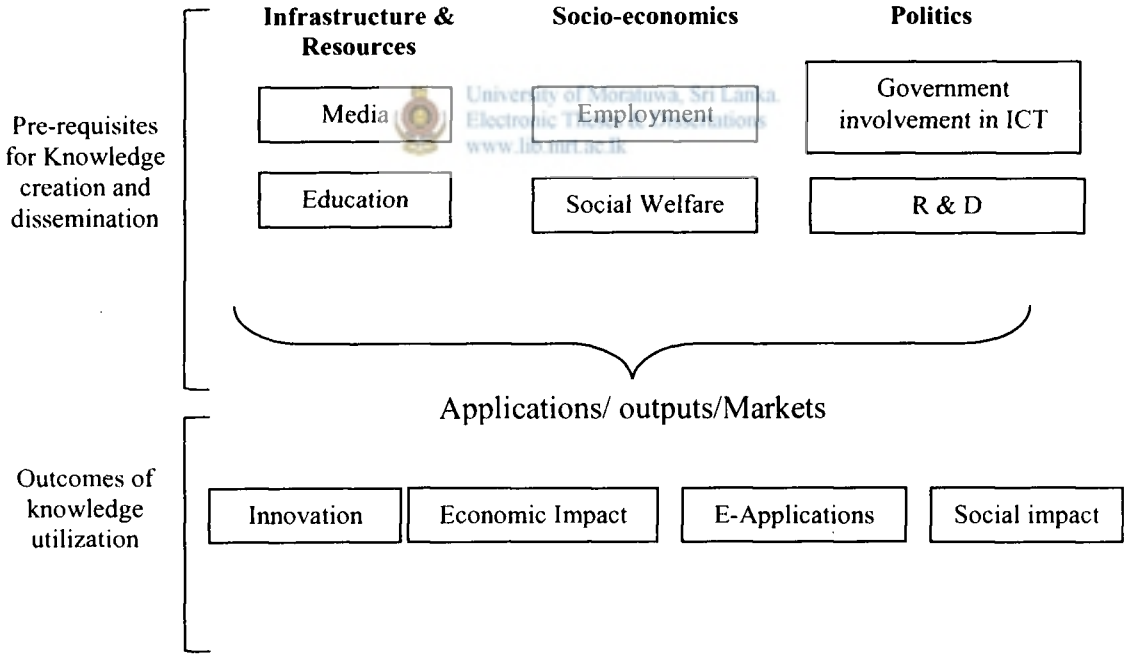


Figure 5: Indicator Framework of the Present study

3.2 Sample Period and Sources of Data

Internet and E-mail have been emerged during the last decade. Statistics of the Internet and E-mail usage in Sri Lanka can be found from 1995 and it was the emerging era of the Knowledge societies in developed countries starting from USA. Therefore the period of 1990 to 2005 is critical transition period of every country in the world. Countries like

South Korea, China and India came out with flying colors as world class economies. Therefore in this research, period from 1990 to 2005 (15 years) is selected as period of evaluation. Due to unavailability of latest statistics, some of the variables were evaluated using less than fifteen year period but still with in the range from 1990 to 2005.

Due to the macro level nature of the research problem this research is mostly based on available secondary data for years from 1990 to 2005 provided by responsible organizations in national as well as international level. Major sources would be World Bank reports, Asian Development Bank Publications, ITU reports, Economist Intelligence Unit Researches, Central bank reports, Sri Lanka census department reports, University Grants Commissions (UGC) publications and other relevant secondary data sources.

3.3 Operationalization

In order to convert the indicator framework of the present study to researchable variables operationalization process was conducted and identified indicator variables are shown in table 6 and these variables are used as benchmark indicators of evaluating knowledge societies

Table 6: Main Indicator variables of the Study

Indicator Name	Description of Analytical Method	Source
Pre-requisites		
Requirements that identified as fundamental necessities of a society that needs to be a Knowledge Society		
Infrastructure and Resources		
Infrastructure and resources that identified as requirements for knowledge dissemination and further knowledge creation		
Media		
Telephone subscribers	**Overall status**- Jipp curve analysis **Trend** – changes over the period	Economic and Social Statistics in Sri Lanka 2004- Central Bank of Sri Lanka
Internet and E-mail Users	**Overall status**- Jipp curve analysis **Trend** – changes over the period	
Television Receivers	**Overall status**- Jipp curve analysis **Trend** – changes over the period	
Radio receivers	**Overall status**- Jipp curve analysis **Trend** – changes over the period	
Daily news paper circulation	**Overall status** - Jipp curve analysis **Trend**- No. of news papers in circulation	
Books & Magazines	**Overall status**- no. books published **Trend** – changes over the period	Statistical Abstracts in Sri Lanka -2004
Education-General		
Human Resources	**Capacity**- Changes of Stu./Tea. Ratio **Quality**- Qualifications of teachers **Distribution**- Provincial distribution	Statistical Abstracts in Sri Lanka -2004

ICT education	**Usage** – No. of computers in schools **Trend-** policy analysis	Ministry of Education
Finance on education	**From GDP-** Cross country comparison **On tertiary educ.** - Expenses on tertiary educ. **Improvement:** Capital expenditure from GDP **Cost** - Per capita cost of education	University Statistics 2002- University Grants Commission
Enrolment ratio	**Primary-** Gross enrolment ratio, cross country **Secondary-** Gross enrolment ratio, cross country **Tertiary-** Gross enrolment ratio, cross country	
Literacy rate	**Adult-** Adult literacy rate, cross country com. **Youth-** Youth literacy rate, cross country com.	Statistical Abstracts in Sri Lanka -2004
Education – Tertiary		
Institutional development- Universities	**Physical** – No. of departments **Human Resources-** No. of employees, teachers **Enrolment-** No. of students, new admissions	University Statistics 2002- University Grants Commission
Technical colleges	**Physical** – No. of technical colleges **Human Resources-** No. of employees, teachers **Enrolment-** No. of students, new admissions	
Socio Economics *Social and Economical requirements identified as indicators of opportunities for utilization of knowledge assets of a country*		
Employment		
By occupation	**Status -** % employments **Trend-** Changes over the period	Economic and Social Statistics in Sri Lanka 2004- Central Bank of Sri Lanka
By economic activities	**Status-** % from labor force **Trend-** Changes over the period	
By age group	**Status-** % from labor force **Trend-** unemployment rate	
By ownership	**Status-** % employment in each sector **Trend-** Trend line analysis	
By education	**Primary-** % of employed **Secondly-** % of employed **Tertiary -** % of employed	
Foreign employment	**Importance-** changes over period **Nature of work-** % by manpower level	Statistical Hand Book on Migration 2003- SLBFE

	Exploitation - % vacancies and departures	
Social welfare		
Human development Index	**Status**- Cross country comparison **Relationship**- correlation between indexes	Economic and Social Statistics in Sri Lanka 2004- Central Bank of Sri Lanka
Digital divide with in the country	**Status:** Radio and television usage by province Telephone and PC usage by province	
Politics		
Government effort to improve ICT & knowledge	Observations	Policy documents
Expenditure on R&D	Observations	Not Available
Outcomes/ Utilization *Indicators that are measured the status of existing utilization of knowledge in Social and economical activities*		
Innovation		
Patent applications	**Trend:** International Applications Local applications **Nature:** Categories of applications **Sources:** sources of applications	WIPO Publications Sri Lanka Intellectual Property office publications WIPO Publications WIPO Publications
E-Applications		
E-Commerce usage	**Trend:** Survey on E-commerce **Status:** Survey on E-Commerce in Sri Lanka **Nature of online business in Sri Lanka:** empirical study on websites	The Economist's survey Web Search Web Search
E-Government	**Status:** Survey on e-government in Sri Lanka **Trend:** ICTA e-strategies	ICEG 2004- Survey results
Economic Impact		
GDP and ICT	**Relationship:** Correlation coefficients **Utilization in Sri Lanka:** nature of the E-Application	Economic and Social Statistics in Sri Lanka 2004- Central Bank of Sri Lanka
GDP and Education	**Relationship:** Correlation coefficients **Utilization in Sri Lanka:** employment by education	
Social Impact		
Correlation between health, infrastructure and education	**Relationship:** Correlation coefficients **Status of Sri Lanka:** Indicator values	Economic and Social Statistics in Sri Lanka 2004- Central Bank of Sri Lanka
Correlation between prisoners and education	**Relationship:** Percentage from education level	

3.4 Definitions of Compound Indicators

In this study media, education and employment are considered as compound indicators because they have significant amount of related factors that can be defined and analyzed from different viewpoints. In order to minimize the possible conceptual conflicts, media, education and employment are defined and analyzed based on following narrations.

3.4.1 Media

According to Professor Clement K. Dzidonu's works on "A Framework for Core Information Society Measurement Indicators", Indicators on the level of deployment and the geographical spread of ICT infrastructure are as follows:

- Telecommunication infrastructure (fixed line, mobile, satellite, national backbone infrastructure); communications and computer networks infrastructure;
- Internet Infrastructure and International and Local Bandwidth,
- Broadcasting infrastructure (radio and TV); [32]

But some authors categorize printed media as a part of ICT infrastructure [3]. To evaluate both forms of indicators suggested by different authors electronic media and conventional print media are going to be analyzed separately (Table 07).

Table 7: Analytical framework of Media Indicators

Concept	Variable	Indicators	Measurement
Media	Electronic media ICT Infrastructure	No. of fixed telephones per 1000	Ratio
		No. of mobile telephones per 1000	Ratio
		No. of computers per 1000 No. of	Ratio
		Televisions per 1000	Ratio
		No. of Radios per 1000	Ratio
		Internet and Email registrations	Ratio
		GDP per Capita Income	US$
	Conventional Media	No. of news papers per 100	Ratio
		No. of books published	Units
		No. of Magazines published	Units

Analysis is going to achieve two objectives stated bellow,

1. To identify the long term trend of ICT infrastructure of Sri Lanka
2. To identify relative status of Sri Lanka's ICT infrastructure by cross-country comparison using Jipp curve analysis.

To achieve first objective percentage growth of ICT infrastructure components (Telephone wired, wireless, cellular, public telephone booths, overall tele-density and Internet and E-mail penetration) will be analyzed for the period of 1990-2003.

To achieve second objective will be achieved by using JIPP curve that shows relationship between tele-density and per capita income. Jipp curve will be plotted by taking tele-density as a dependent variable and the per capita GDP as an independent variable. As far as Tele-density must be positive value, reference curve will be plotted as start from the origin (interception=0). Hence linear regression model would be

$$Y = bX$$

Y is the dependent variable and in this analysis it would be the Tele-density, mobile-density or Internet-density. X is the independent variable and it would be per capita GDP of given country. This regression line will not be the ultimate end result but it would be used as a reference curve to make conclusions on nature of the relationships and relative status of ICT in examining country.

3.4.2 Education

The survey conducted by Eurofound in 2004; Advancement of Knowledge Societies: comparing Europe, the US and Japan indicators of education were Pupil / teacher ratio (preprimary, primary, secondary), Number of teaching hours per year in public institutions (by level of education), Everyday computer availability at home, Everyday computer availability at school, Everyday computer usage at home, Everyday computer usage at school, General computer availability in schools. Eurofound's work covered substantial range of modern education by considering the ICT in schools as key indicators. But to conduct such a comprehensive study in Sri Lanka or South Asia is not going to be easy due to the lack of official national or regional level statistics. But according to Sjoholm's study on Educational Reforms and challenges in Southeast Asia, the state of a country's education can be evaluated from inputs into education such as public expenditures on education and the number of teachers, and from outputs of educational efforts, such as enrolment and literacy rates and by doing this he was able to eliminate the existing statistical barriers. By doing that he ignored the evaluation of modern teaching-leaning process in Southeast Asia. In present study both these suggestions will be used with in the limitations of availability of published statistics. Correlation coefficients, ratios, percentage values, increment values will be used as statistical tools and data will be presented mainly in tabular and graphical forms.

3.4.3 Employment Related factors

Labor has a dual role in the economic process; it is both an input to production and a source of income [33]. There is a close relationship between high levels of unemployment and underemployment, widespread poverty, and unequal distributions of income. But the creation of more employment opportunities should not be regarded as the sole solution to the poverty problem; more far-reaching economic and social measures are an essential ingredient in any development strategy. Data on labor serve as macro economic indicators for monitoring the current performance of the economy and the changes occurring in the

main components of the labor force in relation to other inputs and outputs. Specifically, the current information on labor force are generally used to study the situation and trends in employment, unemployment and underemployment, to quantify the magnitude and distribution of employment opportunities needed at any point of time or over a given period of time, to monitor the performance of employment programs and the economy in general, finally to evaluate the impact of such programs on unemployment and under employment. Hence it is clear that so far Sri Lankan responsible authorities have not identified and analyzed the importance of the knowledge work and its perspective in relation to labor force and employment in Sri Lanka. In this study employment is going to be analyzed from six different perspectives as illustrated by figure 06 to evaluate the importance and the status of labor force and employment by giving special attention on knowledge and knowledge intensive work of the country.

Figure 6: Analysis of Employment in Sri Lanka

To generate conclusions statistical tools like percentage values, percentage increments will be basically used and data will be presented in tabular and graphical forms.

3.4 Definitions of Key Terms

Technical terms that have been used in this study report are defined according to the World Bank's Human Development Report -2004 definitions.

Economically Active Population (EAP)/ Labor Force.

All the persons 10 years and above of either sex, who furnish the supply of labor for the production of economic goods and services during a specified time reference period, normally for one year.

Employed Population

Employed persons are all household members who during the reference period have performed some work for a wage or salary, or profit or family gain, in cash or in kind.

Unemployed Population

Unemployed Persons comprised of all persons 10 years of age and above, who during the specified reference period were,

a. Without work
b. Currently available for work
c. Seeking work
d. Not seeking for work.

Human Development Index (HDI)

A composite index that is measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living.

Gross Domestic Product (GDP)

The sum of value added by all resident producers in the economy plus any product taxes (less subsidies) not included in the valuation of output. It is calculated without making deductions for depreciation of fabricated capital assets or for depletion and degradation of natural resources. Value added is the net output of an industry after adding up all outputs and subtracting intermediate inputs.

Gross National Product (GNP)

The sum of value added by all resident producers in the economy plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad. Value added is the net output of an industry after adding up all outputs and subtracting intermediate inputs. Data are in current US dollars converted using the *World Bank Atlas* method.

Purchasing Power Parity (PPP)

A rate of exchange that accounts for price differences across countries, allowing international comparisons of real output and incomes. At the PPP US$ rate, PPP US$1 has the same purchasing power in the domestic economy as $1 has in the United States.

GDP Index

One of the three indices on which the human development index is built. It is based on GDP per capita (PPP US$) by using based years PPP US$ value.

Adult Literacy Rate
The percentage of people ages 15 and above who can, with understanding, both read and write a short, simple statement related to their everyday life.

Youth Literacy Rate
The percentage of people ages 15–24 who can, with understanding, both read and write a short, simple statement related to their everyday life.

Gross Enrolment Ratio
The number of students enrolled in a level of education, regardless of age, as a percentage of the population of official school age for that level. The gross enrolment ratio can be greater than 100% as a result of grade repetition and entry at ages younger or older than the typical age at that grade level.

Education expenditure
Includes both capital expenditures (spending on construction, renovation, major repairs and purchase of heavy equipment or vehicles) and current expenditures (spending on goods and services that are consumed within the current year and would need to be renewed the following year). It covers such expenditures as staff salaries and benefits, contracted or purchased services, books and teaching materials, welfare services, furniture and equipment, minor repairs, fuel, insurance, rents, telecommunications and travel.

3.5 Method of Analysis

To achieve objectives of the research each concept mentioned in relation to knowledge societies are going to be analyzed based on one or more variables shown by the table 06 and each variable is going to evaluate broadly through one or more indicators as an overall analysis of the study. Hence this study is going to analyze each indicator from relevant variable point of view and based on overall findings related to variables are used to conclude the nature of the particular concept in relation to Sri Lanka.

In order to get the final conclusions and recommendations on Sri Lanka as an emerging knowledge society, conclusions of each indicator will be drawn based on primary evaluation criterion. Then conclusions for pooled variables will be drawn and final conclusion on knowledge society evaluation in Sri Lanka will be drawn based on the conclusions on concepts (Figue 7).

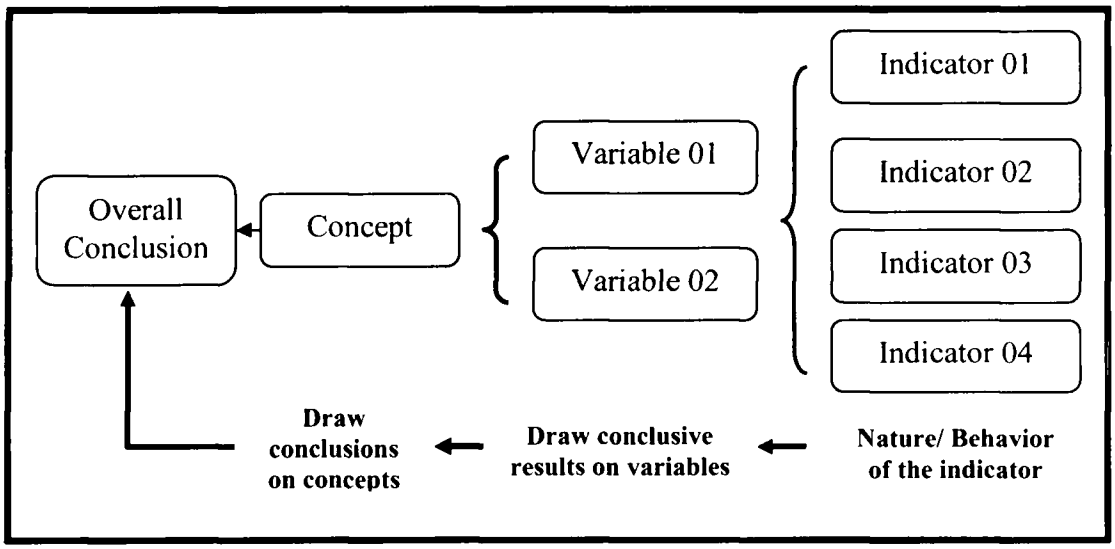


Figure 7: Analytical Sequence of Indicators, Variables and Concepts

To identify the inter-dependency between indicators Pearson's two tailed correlation coefficient will be used. Indicators that do not have realistic correlation will be analyze based on their variations and relative levels. In order to achieve secondary objectives each indicator that was mentioned in table 06 is going to be monitored within the period of 1990 to 2005 (subject to the availability of official statistics) to identify any significant changes in Sri Lankan context as per Asian trend. Then each sub indicator will be pooled in to compound indicator, for an example no. of fixed telephones per 1000, no. of mobile telephones per 1000, no. of computers per 1000, Internet and Email registrations will be pooled as ICT, and television receivers, radio receivers and daily news paper circulation will be pooled as conventional media. They will be evaluated against the South and South-East Asian courtiers' indicator values and indicator behaviors are compared with the regional trend patterns and behaviors.

Chapter 4 -Data Analysis and Findings

Under this section, the calculated indicators as shown in the Table 06 will be analyzed to draw conclusions regarding the level of knowledge society that prevails in Sri Lanka. Firstly study is going to analyze the pre-requisites for creating knowledge society in Sri Lanka and then evaluate the utilization and outcomes of knowledge intensive activities.

4.1 Media Infrastructure and Resources

The first main category of the prerequisites is Infrastructure and Resources. Media and Education indicators will be analyzed as main pre-requisites and then social and political indicators would be observed respectively.

4.1.1 Information and Communication Technology (ICT) Media Indicators

This section evaluates the conventional and modern indicators of the "Media prerequisite" which comes under infrastructure and resources in the Table 06.

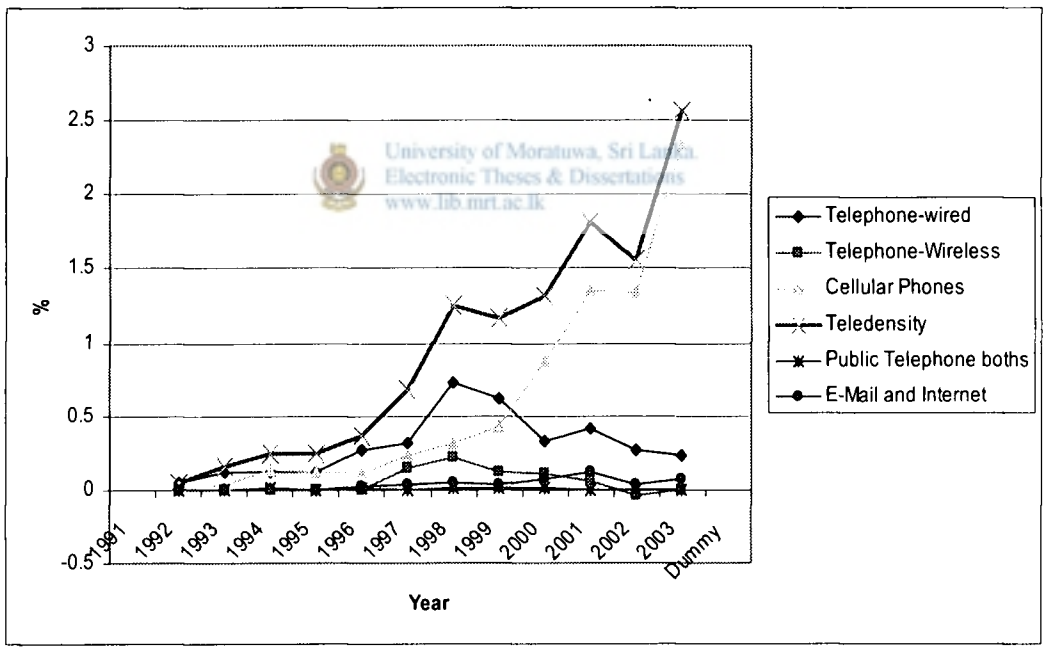


Figure 8: Growth of the ICT infrastructure in Sri Lanka 1991-2003
(Source: Economic and Social Statistics of Sri Lanka 2004)

According to the figure 08, it is clear that overall Tele-density of the country is continuously increased and year 2002-2003 shows steep increase basically due to the mobile phone took off in 2002-2003. As figure depicts demand for fixed line telephones are gradually declining while wireless fixed telephone growth also not very promising. According to figure 09, from total ICT usage (including both telephone and Internet) 57.5% is cellular phone users and it will continually grow due to third generation

technology and Internet accessibility through mobile phones. Wireless fixed line telephones claims only 4.8% and that indicated that wireless technology did not took-off as mobile technology. But after the introduction of CDMA technology in 2005 in there might be a big boost but statistical evidences are yet be found.

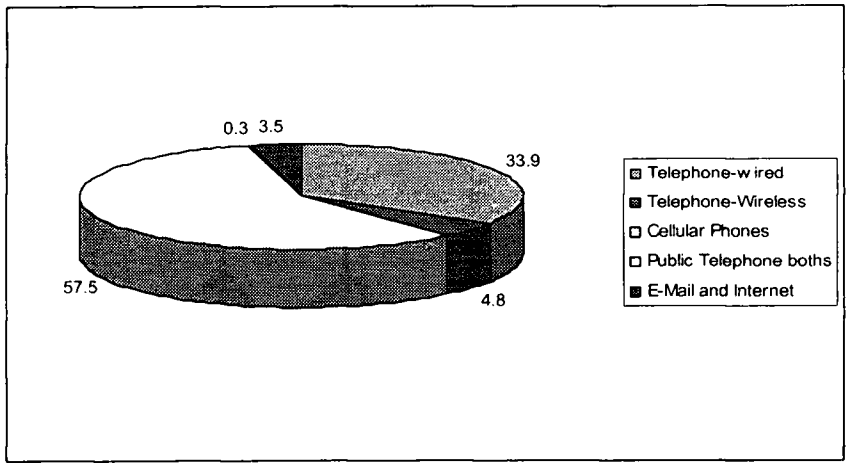


Figure 9: Composition of ICT infrastructure in Sri Lanka 1991-2003 (Source: Economic and Social Statistics of Sri Lanka 2004)

Despite the fact that entire world interested about the Internet and E-mail, the usage of Internet and E-mail in Sri Lanka is not very healthy. Only 3.5% of total ICT usage was contributed by Internet and E-mail users and its growth rate also not very promising like mobile phone boost (Figure 9).

Table 8: Internet Users Growth in Asia 2000-2005		
Country	**2000-2005 Growth Rate**	**% from population**
Bhutan	2900%	1.9%
Pakistan	1020.2%	0.9%
India	684%	3.6%
Indonesia	665%	7%
China	357.8%	7.9%
Philippines	291%	9.3%
Thailand	266.1%	12.8%
Malaysia	171.4%	37.9%
Maldives	150%	5.1%
Bangladesh	143%	0.2%
Sri Lanka	105.8%	1.3%
Singapore	77.9%	60.2%
Rep. of Korea	66%	63.3%
Nepal	60%	0.3%
	Source: www.InternetWorldStats.com	

Table 08 shows the internet penetration rates of Selected Asian economies. These statistics shows very significant issues that needed to be carefully considered. Singapore and Rep. of Korea were identified as two of world best ICT giants but during the period of year 2000-2005 their Internet user growth rate were at lowest growing countries. While Bhutan; one of the fifty poorest economies in the world in year 2004, was shown 2900% user growth rate in Internet user growth. But overall penetration rate shows that both Singapore and Rep. of Korea have more than 60% penetration rate and their acceleration is now slowing down. On the other hand Bhutan, Pakistan and India have very moderate penetration rates hence they can have rapid growth. That indicates, from Internet penetration some Asian countries act as leaders and some act as followers. Leaders are getting more economic benefits while others are yet to exploit them. But that is still not true for Sri Lanka; it has not accelerated as the improvement of penetration rates in Bhutan, Pakistan, Indonesia or India. Therefore the usage of Internet and E-mail in Knowledge dissemination in Sri Lanka is not going to be the most feasible option in near future but facilitating Internet and E-mail access through mobile phones would be a better option to improve Internet penetration by the citizens. Next section of the study will further evaluate the factors that make these differences and analyze the adequacy of ICT in Sri Lanka to be competitive in Knowledge era.

4.1.2 South-East Asia, Sri Lanka and Traditional Jipp Curve Analysis

Seven South Asian countries; Pakistan, India, Maldives, Nepal, Bhutan, Bangladesh and Sri Lanka and six East-Asian countries; Singapore, Rep. of Korea, Malaysia, Indonesia, Philippines and Thailand were used to estimate traditional linear Jipp curve for the region. Larger R values indicate strong relationship between tele-density and GDP per capita income. R^2 is the proportion of variation in the dependent variable explained by the regression model and adjusted R squared attempts to correct R squared to more closely reflect the goodness of fit of the model in the population. Linear regression curve (Figure 10) estimate was shown very high correlation (R=0.925/Ad. R^2 =0.844) between Tele-density and per capita GDP.

As per figure 10, Singapore, Rep. of Korea and even Malaysia were standing far away from the rest of the members due to high per capita income (>9000 US$) but still only Rep. of Korea stand above the reference curve by creating a significant gap between curve and the point indicating satisfactory level of fixed phone lines per 1000 inhabitants. Other countries including Singapore, Malaysia and Indonesia need to accelerate the

improvements in fixed lines telephone usage. Meanwhile Sri Lanka is lying below the curve with rest of the South-Asian countries as a cluster with less than US$ 5000 per capita income.

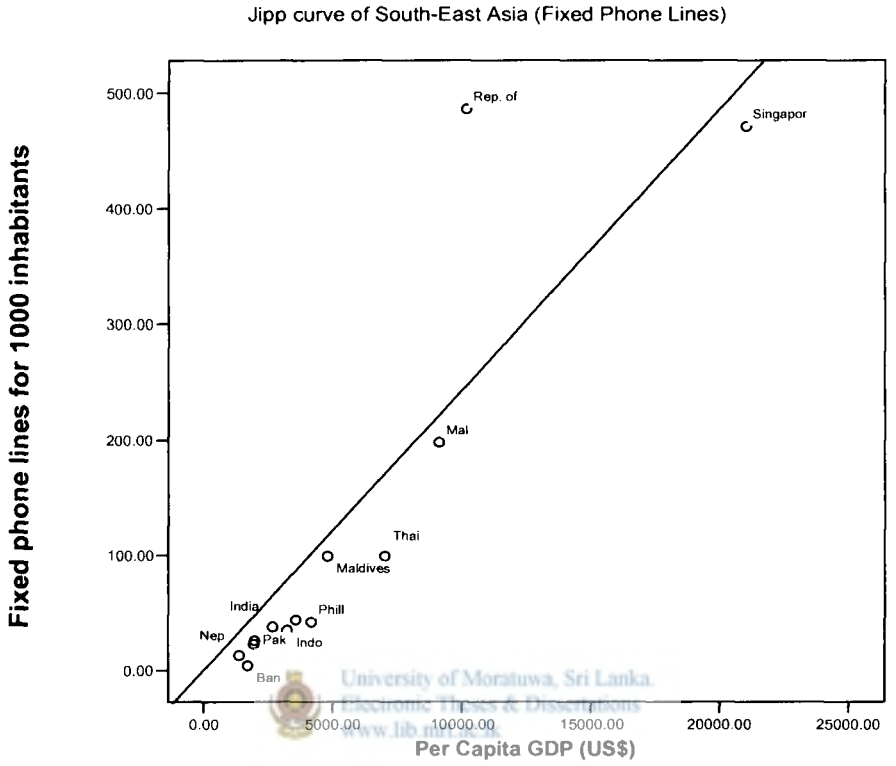


Figure 10: Linear Jipp Curve for South-East Asia for latest available Data (Source: Economic and Social Statistics of Sri Lanka 2004)

As figure depicts, higher per capita income in Singapore and Rep. of Korea heavily influence to the curve estimation. In order to eliminate the anomalies generated by these two countries with high per capita GDP another Jipp curve was graphed using South Asian countries those who share similar per capita range (Figure 11). With in the South Asian region, only Maldives is placed above the curve indicating a satisfactory level in tele-density. While Bangladesh has the highest distance between curve and the point and Sri Lanka shows the second highest distance by standing below the reference curve. That means they need to work hard to improve the tele-density up to their reference level related to per capita income. That does not indicate rest of the countries in the cluster are good with Tele-density but compared to their GDP per capita income dispersion of the rate from reference level is relatively low but still as a region South Asia is not yet achieve the satisfactory tele-density.

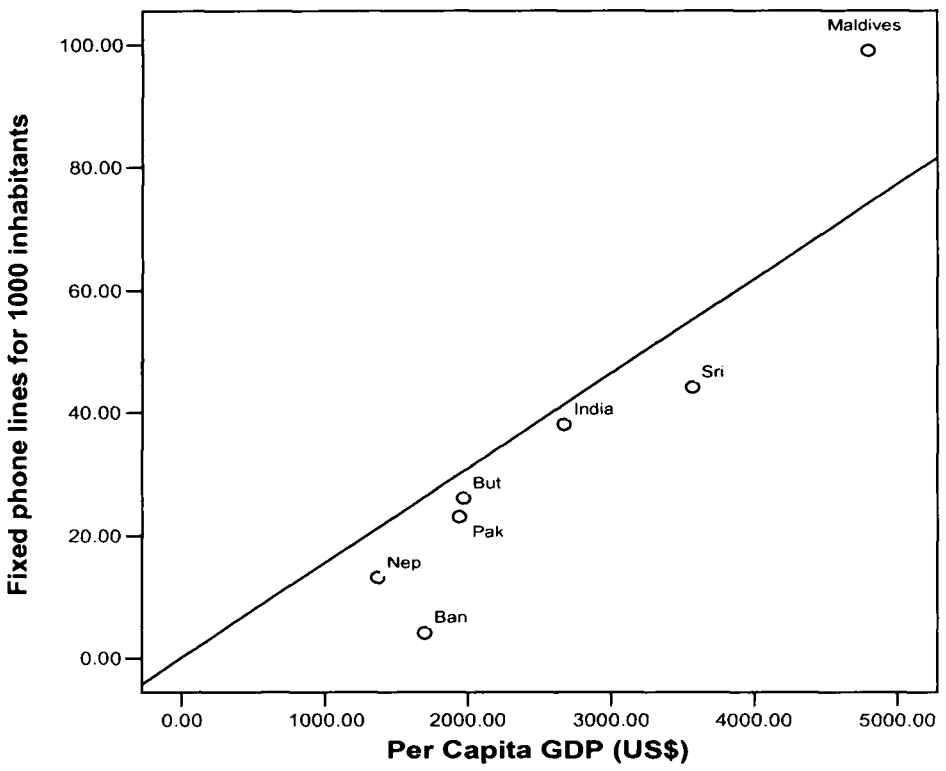


Figure 11 : Linear Jipp Curve for South- Asia for latest available Data (source: Economic and Social Statistics of Sri Lanka 2004)

Jipp curves of figure 10 and 11 give valuable analysis to the policy makers to understand the rationale of investing in ICT infrastructure of the country. In this study Jipp curve is developed as only a primary level tool to identify the nature of the ICT infrastructure of the country. But there is a possibility to develop Jipp curve as a good statistical tool by identifying best type of curve to get the reference. In this study linear regression curves are used by accepting basics of Jeunhomme's model [18]. But present study is not going to use highly statistical tools but only shows the possibilities of using Jipp curve as a policy level tool. For a demonstration based on figure 10 and 11 two linear regression equations can be developed. By doing so, one can compare the adequacy of Tele-density of Sri Lanka when compared to the GDP levels in the South-East-Asian countries and also in South Asian countries separately. This would eliminate the impact of extreme GDP values that prevails in East-Asian region. Linear regression curve for South-East Asia (Figure 10) is $\mathbf{Y_1 = 0.024X_1}$ (Y_1= Fixed phone density in South-East Asia, X_1= per capita GDP in South-East Asia and model ignores the intercept) and for South-Asia linear regression curve (Figure 11) is $\mathbf{Y_2 = 0.015X_2}$ (Y_2= Fixed phone density in South Asia, X_2= per capita GDP in South Asia). According to above equations Sri Lanka (per capita GDP

US$ 3570) should have a minimum of 86 fixed line phones per 1000 inhabitants in comparison to per capita GDP distribution of South-East Asian countries and should have only 54 fixed line phones per 1000 inhabitants when it compared with per capita GDP distribution of South Asian countries. Sri Lanka's current fixed line tele-density is 44 (year 2002). Hence comparison to South-East Asian countries Sri Lanka needs to expand by 95% and in comparison to South-Asian countries need only 22% increase in fixed line phone density.

4.1.3 Mobile Phone Usage and GDP per Capita Income

Figure 12 shows cross-country comparison of the relationship between mobile phone usage and GDP per capita income in South-East Asian countries. Graph indicates high positive correlation (R=0.934) between two variables namely mobile phone density and GDP per capita income and it is a relatively significant correlation than the fixed phone density (R=0.925). Apart from Rep. of Korea none of the countries lie above the reference curve. Singapore and Malaysia are very close to the reference curve while others are relatively far away from expected level.

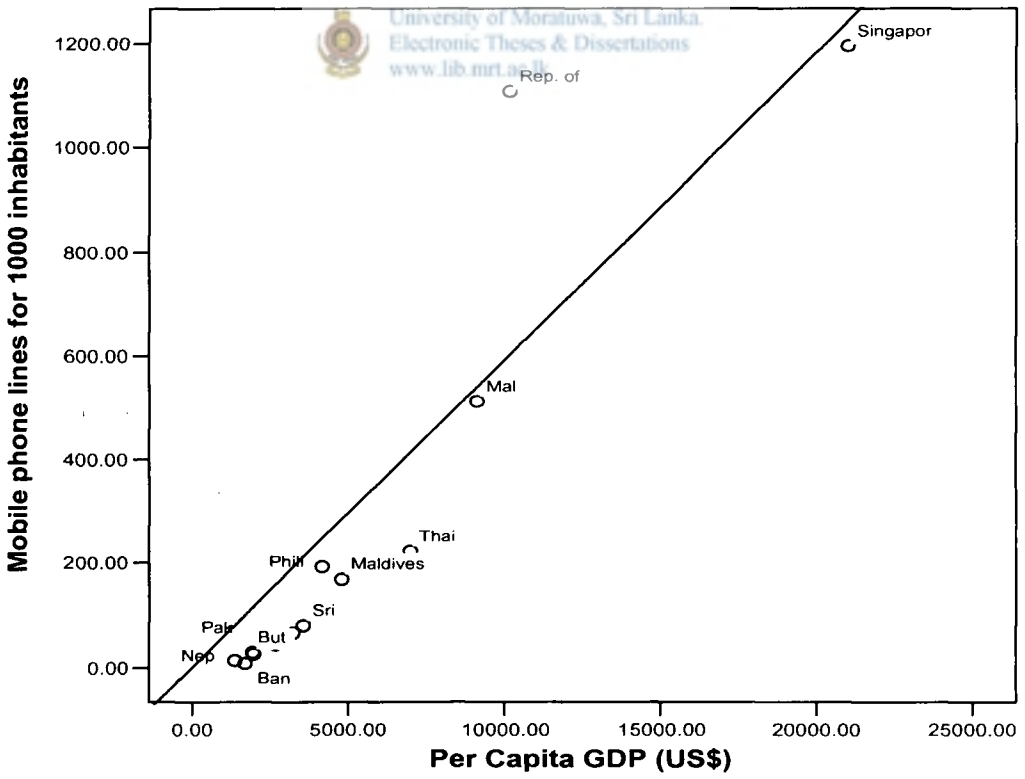


Figure 12 : Linear Jipp Curve for Mobile Phone Usage in South- East Asia (source: Economic and Social Statistics of Sri Lanka 2004)

To get a clear picture of the mobile usage in similar economies, South Asian countries were re-analyzed and the nature of the reference curve is shown in figure 13. Only Maldives is located well above the reference curve others need to progress faster. Sri Lanka is positioning as second best of the region placing itself very close by to the curve. Linear regression equation is $Y_3 = 0.024X_3$ and according to Sri Lanka's per capita income US$ 3570, minimum expected mobile density would be 86 but current rate is 80. Therefore required effort to improve mobile usage is relatively less compared to the fixed line phones.

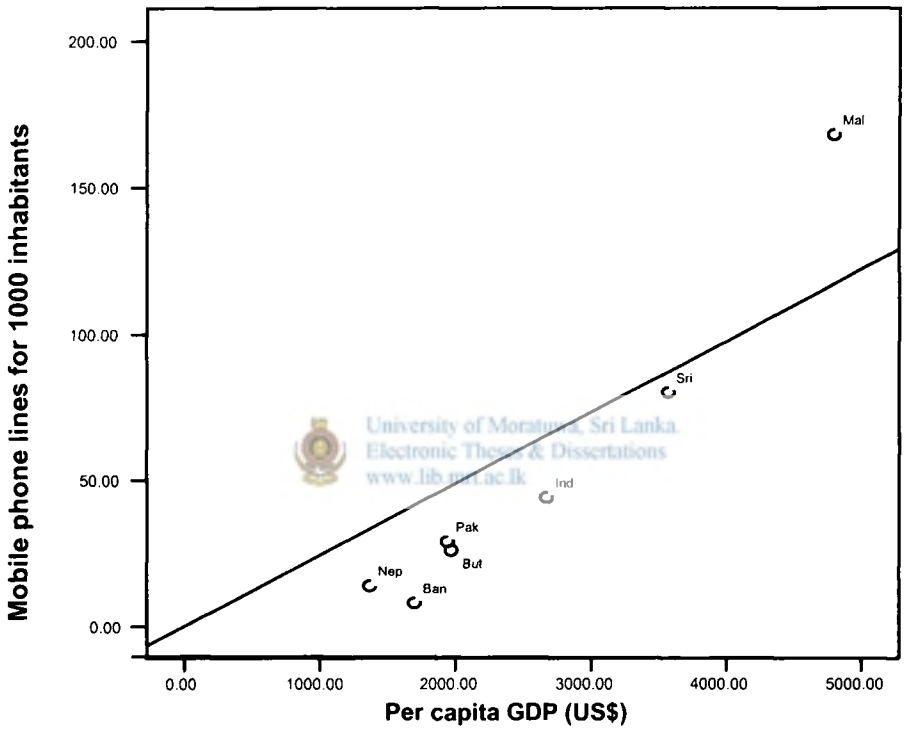


Figure 13 : Linear Jipp Curve for Mobile Phone Usage in South- Asia (source: Economic and Social Statistics of Sri Lanka 2004)

4.1.4Internet and GDP per capita Income

Internet is the widest knowledge source in the world, any one who has the access to Internet can share its resources with others and hence it is considered as the most popular information dissemination medium in the world. Now the Internet is moving from narrow band to broad band and some of the East-Asia countries like Rep. of Korea and Singapore are rated higher in world rankings. According to figure 14, correlation between internet penetration and per capita GDP in South-East Asia is shown high positive relationship (R=0.884) and indicates Sri Lanka is far behind the expected penetration rate in relation to per capita GDP. Most of the ICT rankings such as ITU's Digital Access Index (DAI) , Economist Intelligence Unit's E-readiness rankings ranked Singapore and Rep. of Korea

as countries with high internet access, figure 14 also justifies that by pointing Korea well above the reference curve but not Singapore. According to rankings Sri Lanka was ranked as middle access country. Appendix shows the e-readiness rankings of Asia-Pacific region countries and the basis for rankings.

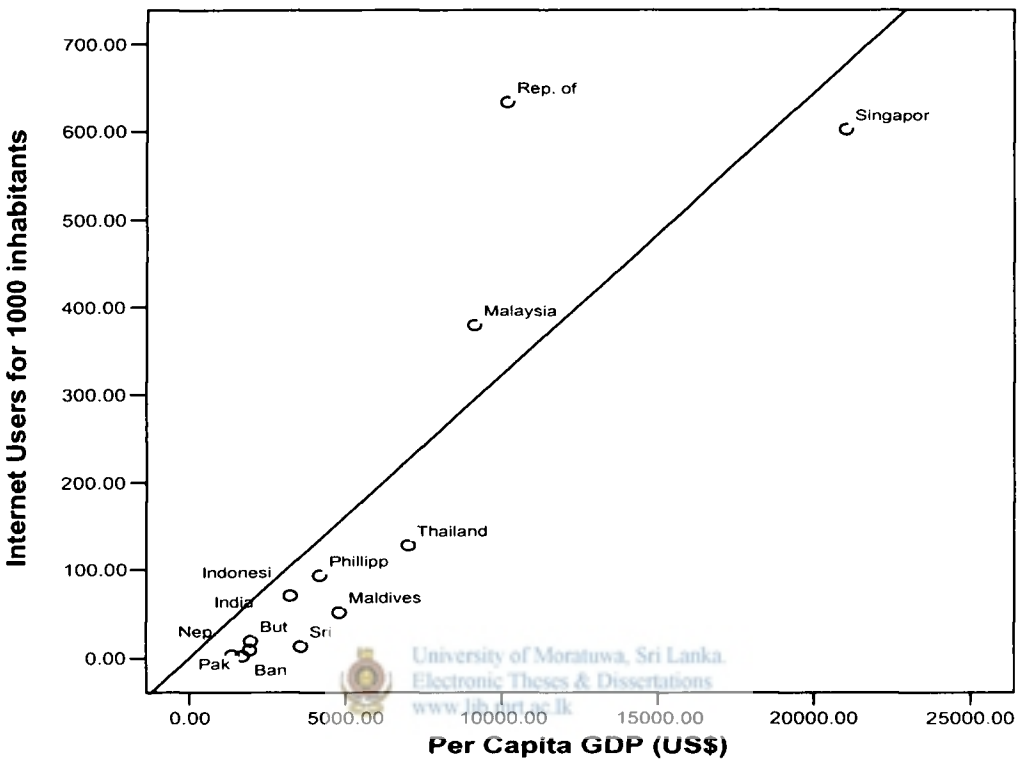


Figure 14: Linear Jipp Curve for Internet Usage in South- East Asia (Source: Economic and Social Statistics of Sri Lanka 2004)

As identified earlier analyses of this chapter, South Asian countries were plotted separately to avoid the impact of higher GDP per capita of the East Asian countries (Figure 15). Result indicated that Sri Lanka as the worst country compared with others, the gap between reference curve and the point is largest of the bunch. But India, Bhutan and Maldives were placed above the curve and possess healthy position compared to GDP per capita. But in terms of fixed line phones and mobile phones usage point of view both India and Bhutan were always positioned below the reference curve. That means those countries are identifying and utilizing Internet as a medium of knowledge dissemination. This would be the reason that makes the economic disparity between India and Sri Lanka in recent years.

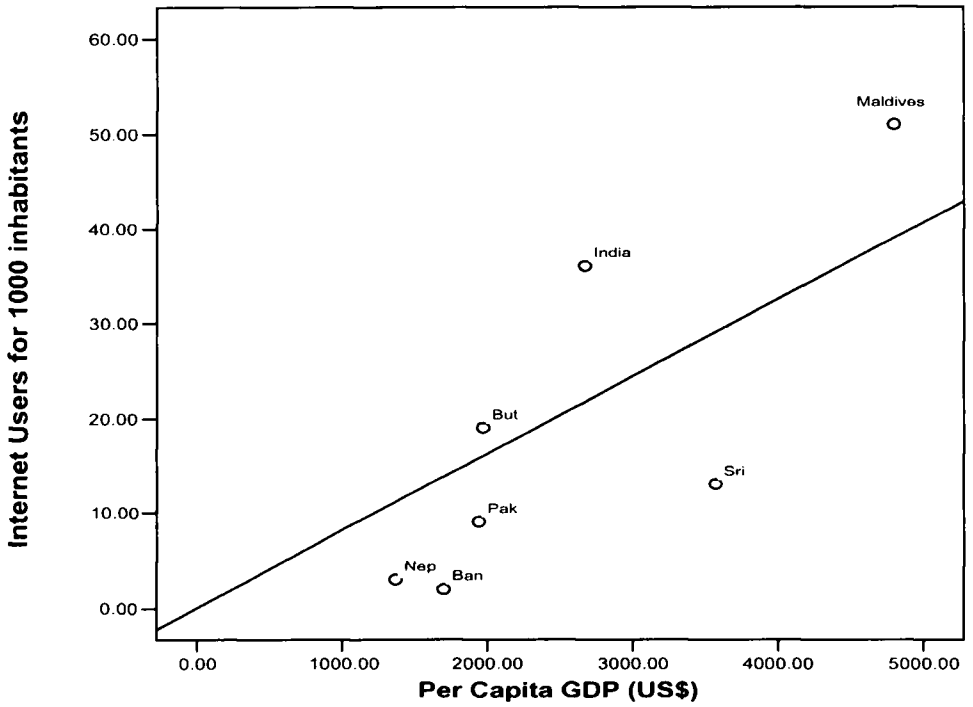


Figure 15 : Linear Jipp Curve for Internet Usage in South- Asia
(Source: Economic and Social Statistics of Sri Lanka 2004)

4.1.5 Broadcasting Infrastructures

In this study broadcasting media is identified as one of the major knowledge dissemination medium in Asian region. As per the analysis of ICT infrastructure, apart from the Rep. of Korea rest of the South-East Asian countries, especially all South Asian countries (except Maldives) do not have sufficient ICT infrastructure backbone to be at high level in knowledge era.

Within the broad category of ICT infrastructure, broadcasting infrastructure is a special segment with a relatively long history. Television and Radio are the most popular electronic communication mediums all around the world. At the blooming stage of the Internet, most of the people thought that it will significantly affect the television and radio usage. But in Sri Lanka from 1995 to 2003 television channels increased from 06 to 08 and radio services increased from 18 to 21 and television sets and radios per 100 households increased from 19.6 in 1986/87 to 69.9 in 2003/2004 and 67.1 in 1986/87 to 78 in 2003/2004 respectively (Economic and Social statistics in Sri Lanka, 2004). Due to this popularity as medium of knowledge dissemination, television and radio still have a major role to play. To overcome the lack of Internet penetration in Sri Lanka, the knowledge that is gained from Internet can be disseminated through these two mass media. Not only because of lack of internet facilities but also because of the low computer literacy and lack of English knowledge keep the most of the rural communities away from

Internet. Especially television and radio spread even in rural areas and it does have many language options, new agricultural, industrial and scientific knowledge can be effectively shared among citizens. Study will analyze both television and radio usage in South East Asia.

4.1.6 Television and per capita income

In here the relationship between per capita income and television usage is going to be analyzed based on the Jipp curve concepts.

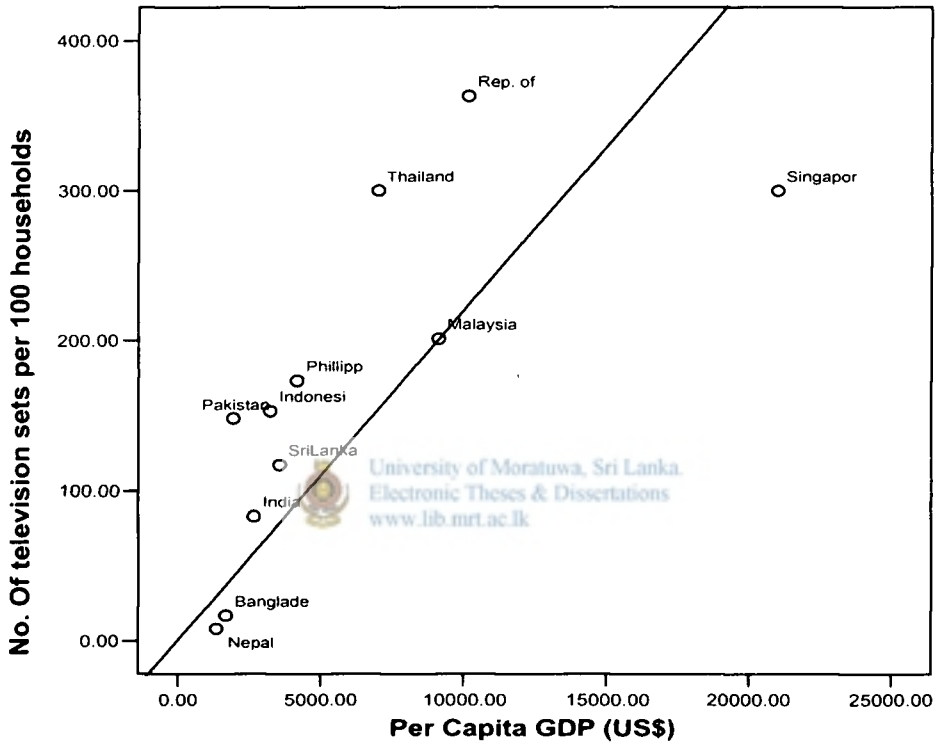


Figure 16 : Television usage and per capita income in South-East Asia (Source: Economic and Social Statistics of Sri Lanka 2004)

Linear regression curve in figure 16 shows the high positive correlation (R=0.737) between per capita GDP and television usage in South East Asia. According to figure 16, only Bangladesh, Nepal and Singapore are shown lower status compared to the reference curve. From those countries, unit vise as far as Singapore is concern it is the second highest (300 T.Vs per 1000 households) in the region but compared to accelerated economic growth that is shown by the higher GDP per capita it was not enough, but for Bangladesh and Nepal this will be a critical factor to become a knowledge society because they do not have any of the ICT infrastructure at satisfactory level. By positioning above reference level, Sri Lanka has shown positive signs not only within the

urban regions of the country but all around the country (Table 09) and this distribution will be discusses further at the social welfare infrastructure section of this chapter.

Table 9 : Television and Radio usage of Sri Lanka by province - 2003		
Province	**Television sets per 100 households**	**Radios per 100 households**
Western	84.8	83.8
Southern	65.8	78.6
North-Central	66.3	75.6
Central	70.0	78.3
Uva	57.3	75.4
Sabaragamuwa	67.2	78.8
North-Western	72.3	78.3
Eastern	45.9	61.4
Northern	43.3	72.5
All country	**69.9**	**78**
Source: Economic and Social Statistics of Sri Lanka -2004, Central Bank of Sri Lanka		

4.1.7 Radio and Per Capita Income

According to the literature review radio media has identified as the most influential media in South Asia region.

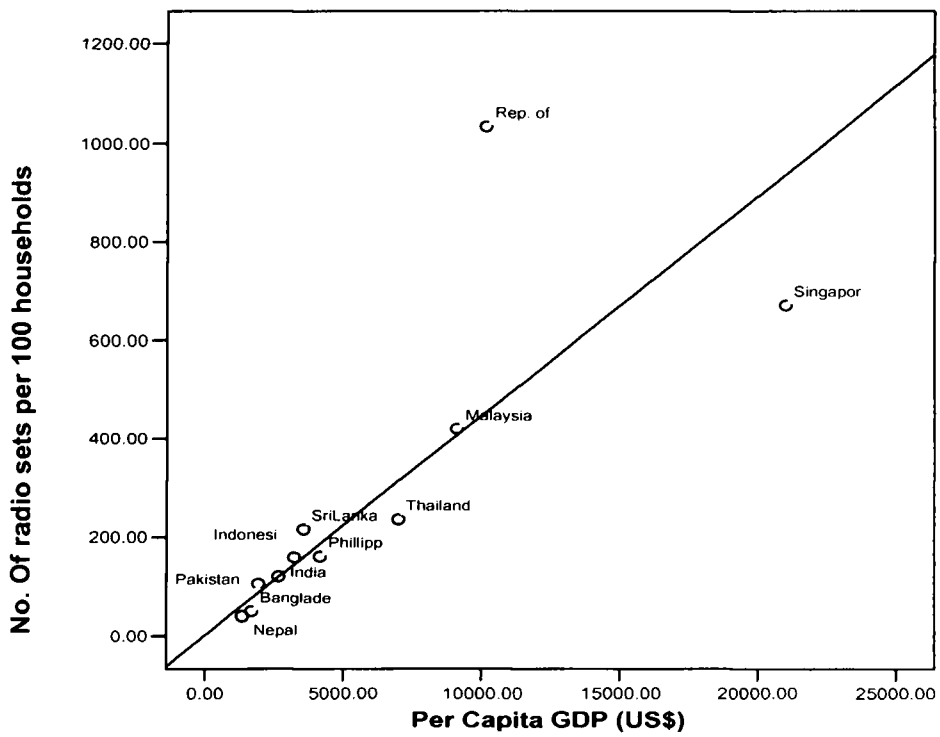


Figure 17 : Radio usage and per capita income in South-East Asia (Source: Economic and Social Statistics of Sri Lanka 2004)

Correlation between radio usage and per capita income is significantly positive (R= 0.755) indicating that countries with high wealth tend to have more radios in households. According to the figure 17 from radio usage point of view Sri Lanka is positioned above the reference curve with Rep. of Korea, Indonesia, India and Pakistan while Nepal and Bangladesh lagging behind as members of South Asia(Figure 17). Study also found high positive correlation between television usage and radio usage with 0.826 R value. That indicates, there are probabilities of having higher radio usage within the countries that have shown higher television usage.

4.1.8 Conventional Communication Media

In early part of the 19th century invention of printing machine was the greatest discovery of man kind. After the invention of that printed medium was the most popular way of disseminating knowledge and in knowledge era still it has a vital role to play. In Japan, daily news paper copies per 1000 inhabitants were 563 in year 2004, in Norway it is 562, USA 194, Singapore 256 and in U.K. 301 [26]. In Japan per head expenditure on books was US$ 158 per year, in Norway it is US$ 117, in US it is US$ 98 and in UK it is US$ 72. These statistics shows the undeniable power of the conventional communication medium as a dominant communication medium in developed Knowledge societies with high economic wealth. Study identified high positive correlation (R=0.793) between number of copies per 1000 inhabitants and per capita GDP in South-East Asia. Daily news paper copies per 1000 inhabitants in Sri Lanka is not at the satisfactory level as Rep. of Korea, Philippines, Bangladesh, Pakistan and Malaysia (Figure 18). Figure 18 also shows that there is a tendency of having more newspaper copies with higher per capita income.

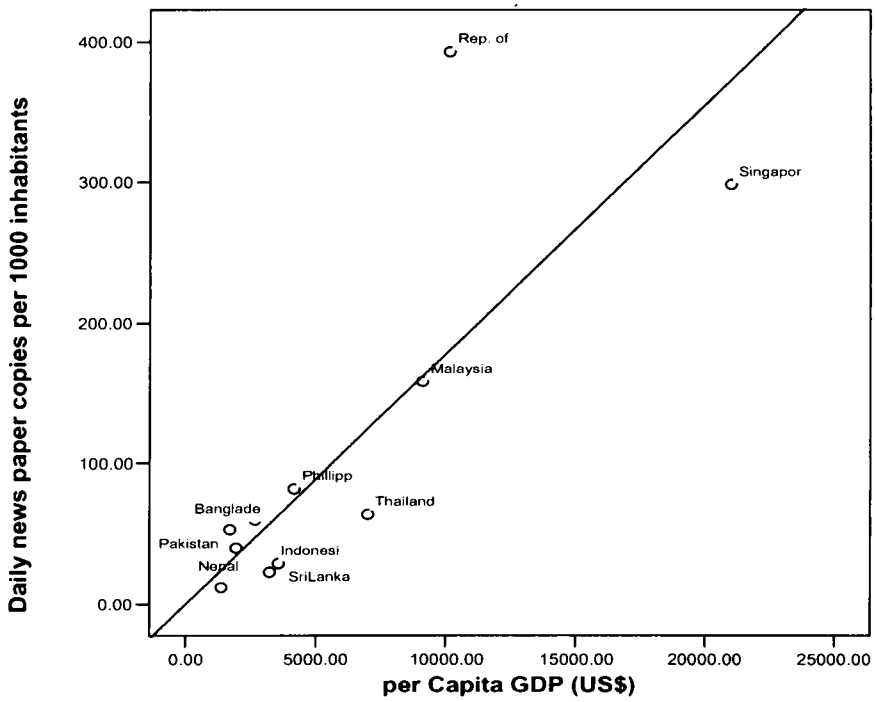


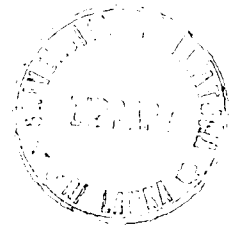
Figure 18 : Daily News Papers and per capita income in South-East Asia

(source: Economic and Social Statistics of Sri Lanka 2004)

As a multi-cultural and multi-lingual country with a low rate of English literacy, Sri Lanka need to use more and more print publications like books, magazines, journals and newspapers to disseminate knowledge to all the citizens without any discrimination.

Table 10 : No. of Books published by Language in Sri Lanka 1998-2002					
Language	**1998**	**1999**	**2000**	**2001**	**2002**
Sinhala	2920	2640	1221	1074	1172
Tamil	428	600	186	428	211
English	942	900	126	503	446
German	0	1	0	0	0
Japanese	1	1	0	0	0
Hindi	0	6	0	0	0
Bilingual	1548	507	285	377	152
Total	**5839**	**4655**	**1818**	**2382**	**1981**
Source: Department of National Archives					

Table 11 : No. of news papers in circulation in Sri Lanka 1998-2002					
Language	**1998**	**1999**	**2000**	**2001**	**2002**
Sinhala	119	115	119	122	110
Tamil	35	35	39	45	46
English	23	24	22	22	33
Bilingual	4	4	0	0	0
Total	181	174	180	189	189
Source: Department of National Archives					



Since the Sinhala language is the most common language in Sri Lanka, printed publications in Sinhala were the highest as expected (Tables 10, 11). While Sinhala news papers reduced by 7.5% from 1998 to 2002, number of Tamil and English news papers were increased by 31% and 43% respectively. While news papers increased by 5 % from 1998 to 2002, published books were diminishing over the period of 1998 to 2002 by 66%; According to table 10, this low level of book publication trend can be identified since year 2000. As per the statistics in table 12, published magazines also show a decline by 70% from 2000 to 2002 and all these figures indicate that usage of conventional printed media is diminishing in Sri Lanka. Increase of printing cost and importation of low cost editions of various books would be the possible reasons for this. Low level of Internet penetration rate, low outgoing Internet traffic and lack of materials authored by Sri Lankan citizens on the Internet, indicate that new knowledge is not published in electronic medium as well.

Table 12 : Magazines published in Sri Lanka 2000-2002

	2000	2001	2002
Children's and Adolescents Magazines	82	46	74
School Magazines	113	8	12
Christian Magazines	122	10	18
Trade Magazines	129	19	31
Total	446	83	135

Source: Department of National Archives

According to the results regarding knowledge dissemination infrastructure level in Sri Lanka, it shows a great potential to be at higher level in ICT with the rapid expansion of the mobile technology, but from Internet and E-mail point of view it has not yet gained the required boost to be aligned with knowledge revolution. Apart from the exceptional cases of Singapore and Maldives, rest of the countries with less than US$ 5000 per capita GDP are running with ICT shortages and countries with greater than US$ 9000 are running with acceptable level of ICT. Maldives is a country with only 0.3 Million population and hence its ICT infrastructure per 1000 inhabitants tends to be large because of the low denominator. On the other hand due to the nature of the economic activities in Singapore, it has gained a remarkable economic growth in 1990-2000. In 1990 and 2000 its GDP growth rate was high at 9% and this boost unexpectedly increased its per capita GDP. This rapid increase in per capita income made them a wealthy nation with a

relatively low ICT infrastructure. Results of the analysis indicate that wealth of the countries in South-East Asia (measured by per capita GDP US$) is the deciding factor of ICT infrastructure. Therefore the argument which was raised, whether the ICT makes the development or development makes the ICT has been to some extent answered. Study identified the high positive correlation that was shown by the traditional Jipp curve analysis is still there and hence concluded that ICT and Economic development are highly linked. In all aspects of ICT infrastructure that have been analyzed by the study, it can be concluded that since Sri Lanka's ICT infrastructure level is not in par with per capita income, the contribution of ICT and conventional media on knowledge dissemination is not very significant hence the impact of this on economic development is questionable.

4.2 Overall Educational Indicators

Educational indicators are going to measure the finance on education, institutional development, enrolment in education, tertiary level education and literacy rate of Sri Lanka in comparison to the South-Asian region when required.

4.2.1 Finance on Education

Finance on education was evaluated from using four different indicators, expenditure on education as a percentage from the GDP, expenditure on education as a percentage of total government expenditure, amount of capital investment and current expenditure on education and per capita cost of education. It is expected to identify any significant trend patterns and correlations of indicators of Sri Lankan education system in comparison with the knowledge society requirements that has taken place in most of the South-East Asian countries.

4.2.2 Expenditure on Education from the GDP and GNP

According to Table 13 most of the East Asian governments spend an average of 3.7 % from GDP and South Asian governments averagely spend 3.45 % of the GDP on education. In both cases there were extreme situations from Malaysia and Maldives spending 7.5% and 8.1% respectively from their GDP. Without considering those two countries East Asia spent an average of 3.02% and 2.52% was spent by the South Asia. It depicts that East Asian governments have relatively high concern of the importance of education. Though the Sri Lankan government expenditure on education is 2.5% of GDP which is equal to the average expenditure from GDP of South Asia, it should be considered as very low rate due to the free education system in Sri Lanka. Because of the free education from primary level to university education this rate is not totally

comparable with Rep. of Korea, Indonesia or even India. In Sri Lanka, apart from 85 secondary level private schools (in year 2003), rest of the 10390 schools, 13 universities and technical colleges were largely financed by government and agencies affiliated to the government. In other countries mentioned above, education is not provided on free of charge, and especially university education is largely owned and financed by private individuals who charge fees from the students. Even though the Sri Lankan University education is given for free, the structure of the total expenditure on education shows a relatively low percentage of GDP. Hence the concern for education as an important government activity is much higher in East Asian countries than in South Asians including Sri Lanka.

Table 13: Government expenditure on education from GDP in South-East Asia -2004			
Malaysia	7.5	India	0.4
Thailand	4.1	Sri Lanka	2.5
Singapore	4.0	Nepal	2.4
Philippines	3.0	Maldives	8.1
Rep. of Korea	2.8	Bangladesh	2.2
Indonesia	1.2	Bhutan	5.1
Asian Development Bank (ADB) - Key Indicators 2004 (www.adb.org/statistics)			

According to literature review the importance of the tertiary level education and especially university education was highlighted. Figure 19 shows the total expenditure on general education and university education as a percentage of GNP in Sri Lanka. It shows that trend pattern for education expenditure from GNP is slightly decreasing from 1990 to 2001 (2001 is the latest available year), but contribution for university education is consistently moving around 0.5% without having any significant increase. This is not in line with the knowledge society requirements as found in the literature review.

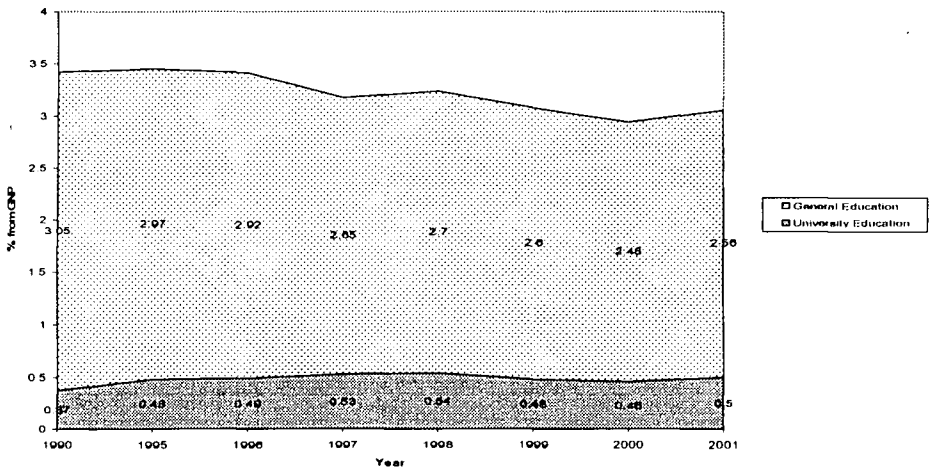


Figure 19: Expenditure on general education and university education as a percentage of GNP 90-01
(Source: Sri Lanka University Statistics 2003)

According to government total recurrent expenses only 15.4% and 9% of capital expenditure were allocated to education in year 2003. Over the period from 1990-2003 there is no significant increase in either recurrent expenses or the capital expenditure on education (Figure 20) but capital spending on transportation, communication, energy and water supply are given higher priority as economic activities (Figure 21).

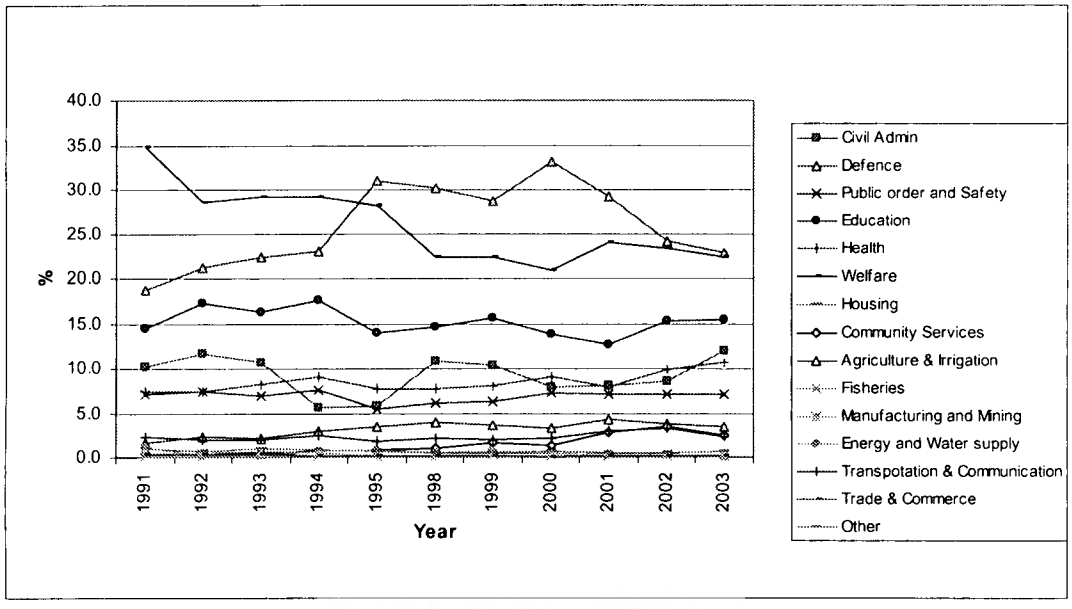


Figure 20: Sri Lankan Government's Recurrent Expenses 1991-2003
(source: Economic and Social Statistics of Sri Lanka 2004)

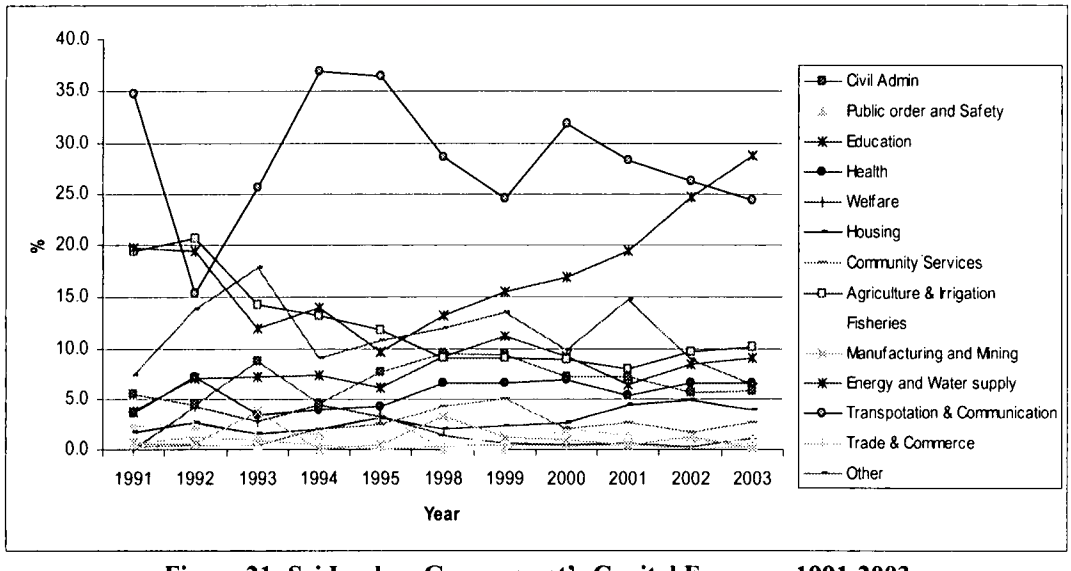


Figure 21: Sri Lankan Government's Capital Expenses 1991-2003
(Source: Economic and Social Statistics of Sri Lanka 2004)

The Central Bank of Sri Lanka still categorizes education as a social service of the government rather than identifying it as an economic activity. Hence the knowledge and innovations is not yet being identified as important as other infrastructure in Sri Lanka

and spending on education is recognized as expenses rather than investment of the government.

4.2.3 Per Capita Cost of Education

Per capita cost is derived by dividing expenditure of respective education category for a year by number of student enrolment in that category. This measures the amount of public economic resources of a country that is devoted for education. As far as Sri Lankan government is offering free education from primary level to university level, per capita cost of one student is going to be a very important financing indicator. It not only indicates how much emphasis a country places on public education, but reflects the public cost of educating students and the relative wealth of the country [34]

When general education per capita cost is compared with the university education per capita cost, it is significantly high (Table 14). In year 2001, the ratio between general education per capita cost and university education per capita cost is 1:17. Economic and social returns on investment of such high per capita cost are also going to be evaluated by Correlation between health, infrastructure and education, Correlation between prisoners and education in the forthcoming section of this study.

Table 14: Per capita cost of education in Sri Lanka 1990-2001

Per Capita Cost (Rs.)	1990	1995	1996	1997	1998	1999	2000	2001
General Education	2023	4285	4824	5062	5834	6056	6436	7453
University Education	37544	90863	102134	114960	126425	107792	111926	128673

Source: Sri Lanka University Statistics- 2002, UGC

Study further identified that while per capita cost of education was increasing, according to the Table 15, participation for education by relevant age group was decreasing over the 1990-2001 (all the required actual statistics after 2001 to the analysis is not yet published)

Table 15: Participation in education by relevant age group 1990-2001

Participation (per 100)	1990	1995	1996	1997	1998	1999	2000	2001
General Education (5-19)	72.2	67.21	67.23	66.29	65.67	64.8	64.6	64.38
University Education (20-24)	1.6	1.7	1.7	1.9	2	2.2	2.3	2.3

Source: Sri Lanka University Statistics- 2002, UGC

General education participation rate shows a very high negative correlation with per capita cost, by having a higher -0.964 R value. University level participation rate and per capita cost also shows -0.699 R value. These high negative R values indicate that per capita cost of education is a significant factor to decide participation in education. Due to free education system in Sri Lanka, university participation is entirely decided by

University Grants Commission's (UGC) decisions on enrolments. Hence 97% of the population in the age group of 20-24 years was not getting the opportunity for higher education in Sri Lankan universities. While in general education still 35% of the population within the age group of 5- 19 years do not participate in education but there is no government limitation or regulation on participation as in the university education. Study further examines the consumer expenditure shares as percentage of their total expenditure and found that there was no significant difference between 1953's education expenses share (2% from total expenditure) and 2003's share (3% from total expenditure). In 1953 Sri Lanka was by and large agrarian society with large families and people involved in agriculture at very young age. Hence the importance of education was negligible. During last decade importance of education was increased with reducing family size and having competition for better education, but consumer expenditure share was stagnated at 2%-3%. That indicated increasing importance of education and increasing per capita cost on education did not cause huge weight on consumers.

With the low government investments in education with restricted private investments in higher education, increasing per capita cost of education with high negative correlation with participation, free university education system with harmful restrictions on participation in university education are not encouraging to a knowledge society.

4.2.4 Enrolment in education

According to the statistics provided when the education level moves from primary to tertiary level, enrolment in relevant age group is becoming significantly lower in both sexes in all the countries that were examined (Table 16). Primary level education in every country other than Bhutan and Pakistan shows remarkable enrolment ratios in both sexes but when it comes to secondary education there were significant variations among enrolment ratios and it is spread between 9%- 91% for females and 11%-91% for males in latest years. Enrolment in tertiary education has made the clear cut difference between East Asia and South Asia. Lowest tertiary level enrolment in East Asia is shown by the Indonesia with 14% and 16% enrolment of females and males respectively, while the highest tertiary level enrolment in South Asia is shown by the India. At the same time in these countries female enrolment in tertiary education is also going hand in hand with male enrolment and female are becoming vital part of the economy. In this knowledge era most of the East Asian countries and India are performing significantly well as emerging

economies and it can be assumed as an outcome of the differences in tertiary education enrolment of majority of the young labor force. This would be statistically analyzed at the economic impact of education section of this study.

Table 16: Enrolment ratios in South-East Asian countries from relevant age groups															
	Gross Primary School Enrollment Ratio (%)					Gross Secondary School Enrollment Ratio (%)					Gross Tertiary Enrollment Ratio (%)				
	1990		Latest Year			1990		Latest Year			1990		Latest Year		
DMC	Female	Male	Female	Male	(Year)	Female	Male	Female	Male	(Year)	Female	Male	Female	Male	(Year)
Rep. of Korea	105	105	102	102	(2001)	88	91	91	91	(2001)	25	51	61	102	(2001)
Indonesia	114	117	110	112	(2001)	40	48	58	58	(2001)	6	13	14	16	(2001)
Malaysia	94	94	95	95	(2001)	58	55	73	66	(2001)	7	8	28	26	(2000)
Philippines	109	113	111	113	(2001)	73	74	86	78	(2001)	33	24	35	27	(2001)
Singapore	102	105	95	96	(2001)	66	70	73	75	(1996)	15	22	40	47	(1997)
Thailand	105	100	96	100	(2001)	30	31	81	85	(2000)	19	17	38	35	(2001)
Bangladesh	66	77	98	97	(2001)	13	25	49	45	(2001)	1	7	4	8	(2001)
Bhutan [c]	15	24	19	23	(1999)	2	7	9	11	(1999)	...	...	...	...	
India	84	110	90	107	(2000)	33	55	40	56	(2000)	4	8	9	13	(2000)
Maldives	132	136	124	125	(2001)	51	49	68	64	(2001)	...	...	...	...	
Nepal	81	132	113	130	(2001)	20	46	37	50	(2001)	2	8	2	8	(2001)
Pakistan	39	82	62	84	(2000)	15	30	19	29	(2000)	2	4	3	4	(1997)
Sri Lanka	105	107	110	111	(2001)	77	71	77	72	(1998)	4	6	4	6	(1997)
Source: Key Indicators 2004 - Asian Development Bank (ADB) (www.adb.org/statistics)															

In order to generate benchmark indicators Rep. of Korea is considered as the benchmark due to the highest enrolment ratios in all three levels and Indian and Sri Lankan enrolment ratios were plotted for males and females. Numbers on the axis are interpreted as follows,

1. Primary level enrolment
2. Secondary level enrolment
3. Tertiary level enrolment

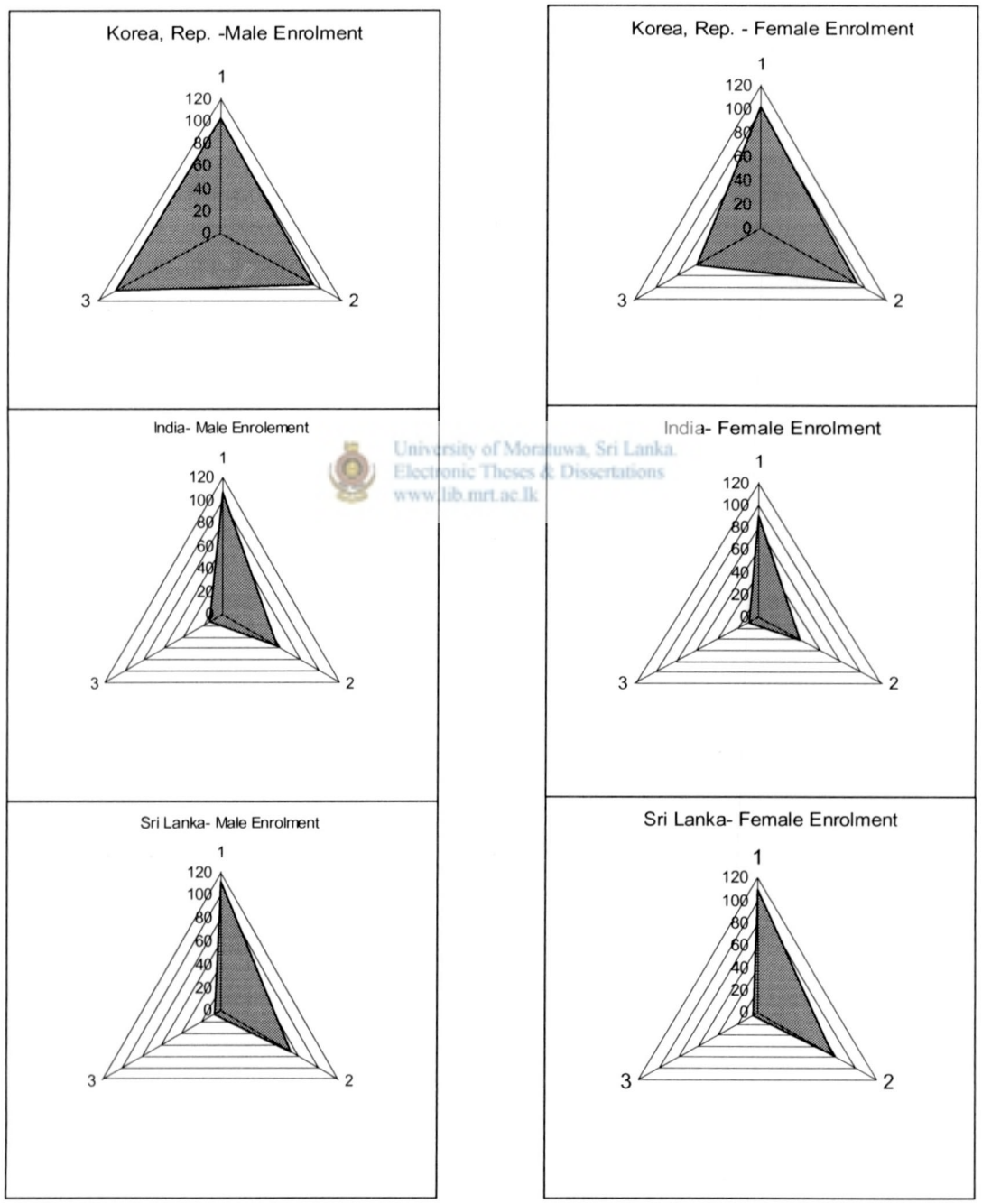


Figure 22: Enrolment rates in all levels of education in Korea, India and Sri Lanka (Key Economic Indicators 2004- Asian Development Bank)

According to the figure 22, it is clear that in both sexes tertiary level enrolment in India and Sri Lanka are much lesser than the Rep. of Korea and also the tertiary level enrolment in India are relatively higher than the Sri Lankan enrolment. Hence the improvements of high level R&D and technological innovations in knowledge era are not going to be easy to Sri Lanka as Rep. of Korea and emerging India.

4.2.5 Student-Teacher Ratio

Student-teacher ratio is the indicator that was used internationally to measure the human resources involved in education and if the student-teacher ratio is getting smaller that means positive sign in education and vise-versa. Most of the student-teacher analysis in knowledge era is done based on the level of education, namely as primary, secondary and tertiary level student-teacher ratios. In Sri Lanka available statistics were not categorized as above mentioned way but categorized as general education student-teacher ratio, that includes both primary and secondary school education and university student-teacher ratio. Also due to the limited scope as a qualitative indicator about the quality of teaching or knowledge dissemination, rather than identifying relative changes in human resources, study does not try to give any conclusion as whether these ratios are satisfactory or not.

Table 17: Student-Teacher ratios in Sri Lanka 1990-2002

	1990	1995	1996	1997	1998	1999	2000	2001	2002
General education	23.1	21.8	22.3	22.9	22.2	22	21.9	21.6	21.5
University Education	13.9	11.1	11.2	12	12.1	13.4	14.1	14.5	14.2

Source: Sri Lanka University Statistics- 2002, UGC

Table 17 shows the student-teacher ratio in Sri Lanka from 1990 to 2002 and it shows a slight decrease in general education's student-teacher ratio and indicates very slight increase in university's student-teacher ratio. That indicates that the human resources of general education are becoming better while university education human resources are stagnating without showing significant variations.

To evaluate the quality of teaching category of appointment of teachers is used by the study and according to category of appointment 64.53% from the total number of teachers was trained and 28.41% were graduate teachers (Table 18). Hence 92% of the general education teaching staff has better qualifications to disseminate knowledge among others. To identify whether the entire country is getting services from qualified teachers has been answered by the study. Apart from Northern, Eastern, North Central and Uva provinces rest of the country is having relatively equal distribution but study is trying to identify justifiable

reasoning for this unequal distribution in some provinces. Correlation coefficient (R) between percentage of students and percentage of teachers shows high positive value of 0.96.

Table 18: Government school teachers by category of appointment 2003

Province	No. of Students (in 000)	% of students	Teachers					% of teachers
			Graduate	Trained	Untrained	Trainee	Total	
Western	952	23.23	13302	22936	780	892	37910	20.31
Central	547	13.34	7067	18279	1075	362	26783	14.35
Southern	536	13.08	8291	17328	609	318	26546	14.22
Northern	269	6.56	3252	5784	285	567	9888	5.30
Eastern	366	8.93	3244	10363	592	478	14677	7.86
North Western	479	11.69	7519	16231	689	161	24600	13.18
North Central	266	6.49	2413	9405	632	111	12561	6.73
Uva	296	7.22	3234	10334	491	554	14613	7.83
Sabaragamuwa	388	9.47	4718	13545	578	276	19117	10.24
Total	**4099**	**100.00**	**53040**	**124205**	**5731**	**3719**	**186695**	**100.00**
%			28.41	66.53	3.07	1.99	100.00	

Source: Economic and Social Statistics of Sri Lanka 2004

Hence the unequal distribution of teachers in North, North Western, North Central, Uva and rest of the provinces is justifiable according to their respective student distribution and study concludes that by and large general education that includes primary, lower secondary and upper secondary do have satisfactory human resources to disseminate required knowledge at respective levels.

4.2.6 Literacy Rate

In Sri Lanka Both adult and youth literacy rates are showing higher values as East Asian countries like Rep.of Korea, Singapore and Philippines (Table 19). Hence the as a basic indicator of the education in the country, both adult and youth literacy rates are at satisfactory level. South Asian countries like Bangladesh, Nepal and Pakistan are showing relatively low literacy rates when it compared to Sri Lanka. In knowledge societies literacy rate is not a significant factor of development. Thus as the findings of literature review improvements of literacy rate has certain positive effects on social and health improvements of a country. Countries who invent more technological, pharmaceutical and intellectual products would be emerge as economically developed countries, therefore the contribution from basic reading and writing skills are not enough and more high level skills should be learned by the people of a country. It can be gained by giving more advanced knowledge to the people through higher education.

Table 19 : Adult and Youth literacy rates in South-East Asia 1009-2004								
	Literacy Rate, 15 Years and Over (%)				Literacy Rate 15-24 Years Old (%)			
	1990		2000-2004		1990		2000-2004	
	Female	Male	Female	Male	Female	Male	Female	Male
Rep. of Korea	93	98	96	99	100	100	100	100
Indonesia	73	87	83	93	93	97	98	99
Malaysia	74	87	83	91	94	95	98	97
Philippines	91	92	95	95	97	97	99	99
Singapore	83	94	88	96	99	99	100	99
Thailand	89	95	94	97	98	99	98	99
Bangladesh	24	44	31	50	33	51	41	58
Bhutan	23	51	34	61	...	...	...	...
India	36	62	45	68	54	73	65	80
Maldives	95	95	97	97	98	98	99	99
Nepal	14	47	26	62	27	67	46	78
Pakistan	20	49	28	57	31	63	42	71
Sri Lanka	85	93	90	95	94	96	97	97
Source: Key Indicators 2004 - Asian Development Bank (ADB) (www.adb.org/statistics)								

4.2.7 Educational Reforms

Currently implemented education reforms in Sri Lanka seem to be headed towards the right direction. Especially secondary education reforms in IT education and student centered learning, primarily for Advanced Level self study projects are showing great potential to improve the next generations innovative and ICT skills, but lack of physical resources and unequal distribution of existing resources making the execution difficult.

According to the information enclosed in literature review ministry of education recognized the importance of improving ICT education in schools as a policy and is trying to introduce IT subjects to school curricula. In align with this currently they introduced basic IT subject for Advanced Level students but without having proper IT facilities in all schools this would be a controversial execution. Available statistics on computer usage in Sri Lankan schools were rare and according to the statistical department of the ministry of education in 2003 there were 8760 and in 2004 there were 11200 computers in all government schools in the country and most of them were belongs to western province. But still they do not have any official published statistics in this regard and neither the ministry of higher education nor the university grants commission calculate the ICT availability of universities in Sri Lanka as well. Hence the study is unable to give sound conclusions on ICT availability of education in Sri Lanka.

4.3 Tertiary Education Indicators

Under this section institutional development of universities, technical colleges and graduate output indicators are going to be measured as a prerequisite for specialized higher knowledge dissemination.

4.3.1 Institutional Development

Due to the free university education in Sri Lanka, institutional development is identified as a key prerequisite to determinate the tertiary education enrolment and extent of the disseminated knowledge. According to **Table 20** from 1990 to 2002 number of universities was increased from 9 to 13 with vast expansion in departments from 229 to 374. According to UGC's categorization these departments are offering six (6) core knowledge areas namely Arts and Law, Management and Commerce, Science, Medicine and Dental, Vet and Agriculture and Engineering and Architecture with their sub categories.

Table 20: Universities' institutional development in Sri Lanka 1990-2002

	1990	1995	1996	1997	1998	1999	2000	2001	2002
No. of Universities	9	9	12	12	12	13	13	13	13
No. of Faculties	32	36	47	48	48	51	55	61	66
No. of Departments	229	275	306	323	323	327	337	370	374
No. of Employees	7687	8541	9052	9253	9733	10379	11486	12112	12634
No. of Teachers	2040	2808	2927	3950	3200	3228	3241	3268	3390
No. of Students	28260	31241	32800	38594	40174	47914	48296	48661	59740
No. of new admissions	8970	8663	9787	10450	10779	11896	11805	11918	12144

Source: Sri Lanka University Statistics- 2002, UGC

The correlation between number of departments and number of employees, teachers, students and new admissions expected to be positive and their respective R values as shown in **Table 21.** These indicators not necessarily show the quality and relevance of the knowledge that these universities disseminate but these R values indicate that the physical expansion of universities requires more and more human resources and it will enable in increasing the enrolment.

Table 21: Correlation between human resources and institutional development

	No. of Departments (R)
No. of Employees	0.93
No. of Teachers	0.77
No. of Students	0.89
No. of new admissions	0.89

Apart from the universities, technical colleges are providing post school vocational training to the school leavers. Their scope is not to provide theoretical knowledge but to give practicing knowledge with experiences. In Sri Lanka there were grade I technical colleges,

grade II technical colleges and affiliated technical units and majority of them are government owned or affiliated to the government. After 1995 all existing grade II technical colleges were promoted as grade I colleges and since 2001 all the affiliated technical units were also promoted as grade I colleges. Table 22 indicates the institutional development of these technical colleges after 1995.

Table 22: Technical Colleges institutional development in Sri Lanka 1990-2002

	1990	1996	1997	1998	1999	2000	2001	2002
Number of;								
No. of Grade I Technical Colleges	13	27	26	27	27	27	36	37
No. of Grade II Technical Colleges	11	0	0	0	0	0	0	0
No. of Affiliated Technical Units	6	7	7	9	9	9	0	0
No. of Teachers	681	754	687	623	606	612	574	558
No. of Employees	612	895	932	939	949	907	1101	1137
Total Enrolment	18572	13444	15425	16326	17321	17345	16263	17850

Source: Statistical Abstract 1996, 2003, Statistics and Census Dept. of Sri Lanka

According to the statistics of the table 22 it can be identified apart from promoting grade II technical colleges and affiliated technical units to grade I status there is no any significant expansion of technical colleges as universities. In 1990 the total enrolment was 18,572 but in 2002 it was 17,850 with 4% decrease in enrolment. Teaching staff also decreased by 18% but non-teaching employees were increased by all most 100%. While 97% of 20-24 age group participants were not getting the opportunity to enter in to the universities, the status of technical colleges is not at the satisfactory level or rather negligible.

4.3.2 Enrollment by Subject Field

Universities are identified as the only institutes that disseminate research skills for the labor force. Hence to improve the R&D of a nation the enrolment in university education is becoming critical. During the literature survey it was identified that mathematics and science education is important in expanding the research and development on technological advancements and innovations in knowledge societies.

Due to the free education at university level in Sri Lanka, an opportunity to enter in to the university in any field is very competitive. Selection is basically done by the G.C.E Advanced Level marks and recently based on statistically calculated Z score of their relevant fields.

Table 23:Student enrollment by subject fields 1994-2002

	1994/1995	1995/1996	1996/1997	1999/2000	2000/2001	2001/2002	% Change
Arts	10313	11861	13432	15383	16173	16567	60.4%
Commerce & Management Studies	5790	7231	8236	10678	11694	10708	84.9%

Law	828	795	731	795	777	961	16.0%
Science	5249	5642	5509	8021	7820	7544	43.7%
Medicine	4987	5270	5265	6012	6056	5546	11.2%
Veterinary science	328	369	304	387	373	376	15.3%
Agriculture	1515	1517	1758	2281	2351	1283	-15.3%
Engineering	4233	5010	4660	4224	4324	4185	-0.01%
Architecture	343	273	266	321	347	419	0.22%
Computer Science & IT	0	0		0	0	47	
Total	**33586**	**37968**	**40161**	**48102**	**49915**	**47636**	**41.8%**

Source: Statistical Abstract 2003, Statistics and Census Dept. of Sri Lanka

According to the evaluation results in table 23 during the period from 1994 to 2002 major expansion in enrollment took place in social science fields and they are neither categorized under science nor in the mathematics areas. Enrollments in agriculture related fields were decreasing and surprisingly during that period engineering student enrolment also showed a minor drop of – 0.01%. Increase of the enrollment in Arts and commerce and management studies were 60.4% and 84.9% respectively and they are not directly involved in technological R&D and hence would not contribute to the required knowledge creation in Sri Lanka that has taken place in Rep. of Korea, Singapore and India. But due to the expanding nature of the commerce and trade services in the country, commerce and management graduates would be able to involve in those affairs but by and large the Arts graduates would become a social problem by having lack of opportunities in knowledge societies.

Table 24: Enrolment rate from eligible students 1995-2003						
Field	**1995**	**1999**	**2000**	**2001**	**2002**	**2003**
Arts	12	10	10	8	8.1	9.4
Commerce	9	15	14	10	9.2	10.3
Science	59	34	37	33	31.5	32.3
Total	**16**	**16**	**16**	**13**	**12.6**	**14.1**

Source: Economic and Social Statistics of Sri Lanka 2004

Statistics in table 24 is adding salt in to the wound. Even the arts and commerce enrolments are much higher than the science, percentage of enrolment from eligible students shows, enrolment from eligible students is very high in science than arts and commerce. It indicates that most of the upper secondary level students prefer arts and commerce subjects than science. Due to this higher demand, number of students enrolled in arts and commerce is increasing while the enrolment rate of eligible students is decreasing. On the other hand comparison between 1995 enrolment rate and 2003 enrolment rate shows remarkable drop especially in science enrolment. Due to this diminishing enrolment ratio more and more people in 20-24 years of age would joined the labor force and other vocational trainings

without having formal university education. Problems arising from this trend would be discussed under the employment section of this study.

4.3.3 Graduate Output

According to Peter Drucker's thoughts in the literature review, labor force participants those who have university education are more valuable in knowledge societies. According to the Table 25, percentage median annual income increments in United States from 1990 to 2001 indicates that highest percentage income increments were received by graduates and specially post graduate qualifiers.

Table 25: Percentage median annual income increments in United States from 1990 to 2001

Education Level	Men % change From 1990 to 2001	Women % change from 1990 to 2001
Less than 9th grade	23%	36%
9th to 12th , no completion	25%	33%
High school completion	30%	38%
Some college, No degree	29%	37%
Associate Degree	26%	29%
Professional's	35%	32%
Bachelor's	42%	46%
Master's	43%	45%
Doctorate	52%	43%

Source: adapted from http://www.infoplease.com

Apart from the slight drop in year 2001, in Sri Lanka first degree graduate output is showing steady increase (Figure 23) with very low conversion rate of first degree to post graduate degree. Consequently the highest level specialized knowledge has become very rare in the country.

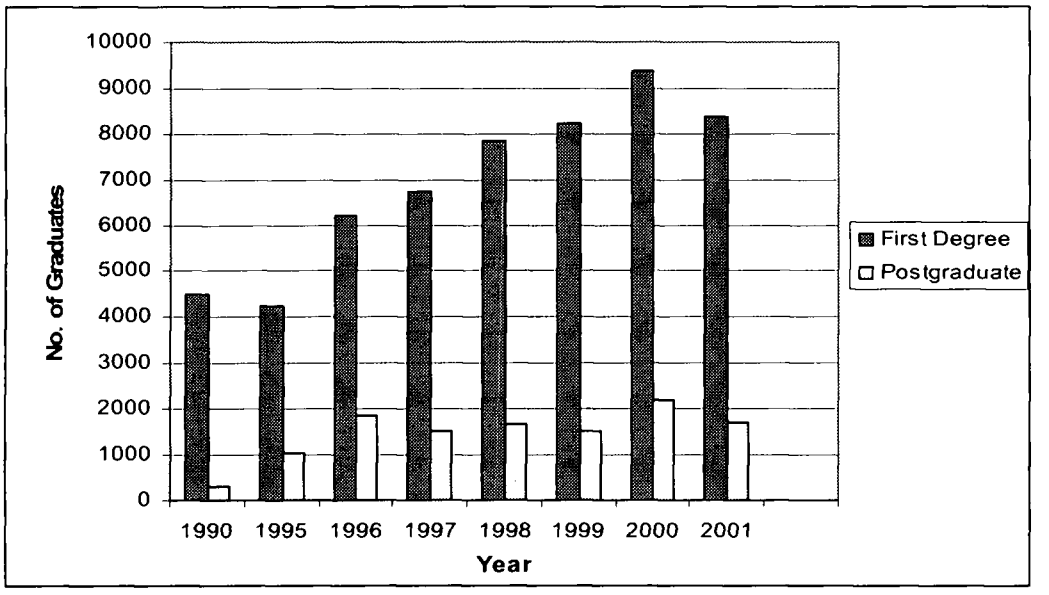


Figure 23: Total graduate output in Sri Lanka 1990-2001 (Sri Lanka University Statistics 2003)

Study further analyzes the graduate output by academic streams and identified phenomenal increase in commerce and management and Arts graduate output. Science and engineering graduate output is shown relatively low increase but still the number of passed out graduates were very low (Table 26).

Table 26: first degree graduate output of Sri Lankan universities by academic streams 1995-2002

	1995	2000	2001	% Change
Commerce & Management Studies	347	2448	2367	582.1%
Arts	1590	3656	3256	104.7%
Veterinary science	37	0	70	89.2%
Medicine	442	904	801	81.2%
Agriculture	226	249	365	61.5%
Engineering	458	548	653	42.6%
Architecture &Quantity Survey	56	55	79	41.1%
Law	140	173	182	30.0%
Science	844	1264	1052	24.6%
Dental Science	66	77	71	7.6%
Computer Science & IT	0	0	0	0.0%

Source: Sri Lanka University Statistics 2002, UGC

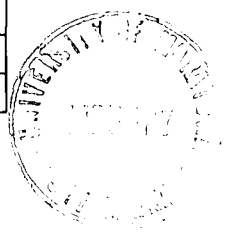
Postgraduate education is the highest level of formal education that is available to gain specialized knowledge in relevant field. According to table 27 Postgraduate outputs in agriculture and education is showing massive increase while other science oriented postgraduate output also showing good progress other than engineering field. Opportunities

and demand for foreign post degree qualification can be a major reason for this but the rarity of statistics on post graduate output from foreign universities, the study is restricted the study to Sri Lankan universities.

Table 27: Post graduate output of Sri Lankan universities by academic streams 1995-2002

	1995	2000	2001	% Change
Arts	782	354	348	-55.5%
Education	64	1582	887	1285.9%
Commerce & Management Studies	17	2	87	411.7%
Law	4	6	7	75.0%
Science	73	129	148	102.7%
Medicine	5	2	23	360%
Dental Science	0	0	0	0.0%
Veterinary science	1	0	2	100.0%
Agriculture	1	1	29	2800.0%
Engineering	72	28	83	15.2%
Architecture &Quantity Survey	29	65	77	165.5%

Source: Sri Lanka University Statistics 2002, UGC



4.4 Employment Indicators

4.4.1 Distribution among occupational Groups

Classification of employed persons by major occupational groups shows that majority of the workers are involved in relatively primary level manual work (Table 28). Skilled agriculture and fisheries, craft related workers, plant and machinery operators and elementary workers are basically working with tangible objects and their daily routines are traditional and very systematic, also the requirements of intellectual abilities are very low relatively to other occupational groups. 70% of the employed labor force involved in these occupations and scrutinized statistics of employment in major economic activities is also shows that majority of workers involve in agriculture and manufacturing sectors rather than service sector or knowledge intensive sectors (Table 28).Only 30% of employees occupied with more knowledge incentive occupations. That clearly depicts the primary nature of economy of Sri Lanka; despite the fact that there is a significant value addition of service or knowledge intensive activities, traditional labor intensive primary level manual agricultural and production activities are still dominate the employment. Advancements of ICT and ICT related automations are still not being fully utilized and that leads the way to remarkable demand for unskilled and elementary level workers. Because of the slowness of the implementation of modern technologies and modern management practices in the country the magnitude of innovations and conceptual skills are not being very impressive. Hence the employment setting at recent past in Sri Lanka is not encouraging the importance of utilizing

the knowledge within the labor force. But the trend analysis shows that there is essential but not yet accelerated change is taking place in employment atmosphere. From period of 1992-2002 improvement of overall knowledge intensive occupational employment increased from 24% to 30.1% with 6.1% increase and on the other hand employment in less knowledge intensive occupations declined from 76% to 69.9%. But this trend has not enough velocity to seize the accelerated economic change that is shown by the table 3 and 4 in chapter 1. Statistics shows the very miniature improvement in employment of professionals, technical workers, clerks and sales related workers, but when the whole world is concerning of the importance of knowledge incentive work, the more knowledge sensitive occupational class in Sri Lanka is decrease from 2.4% to 1.3%. Hence by and large the available job opportunities for highly educated people of the country are not very favorable.

Table 28:Currently Employed Persons by Major Occupational Groups %												
	High ←					Knowledge Involvement			→ Low			
	Senior officials & Managers	Professionals	Technicians & Associate Professionals	Clerks	Sales & Service workers	**Total**	Skilled agri &Fishery workers	Craft & related workers	Plant & machine operators	Elementary occupations	Other	**Total**
1992	2.4	5.1	3.2	3.7	9.6	**24**	29.2	15.2	4.2	23.1	4.3	**76**
1993	1.4	5.9	3.7	4	10.3	**25.3**	30.6	14.4	4.8	21.5	3.3	**74.7**
1994	1.3	5.3	3.3	4.6	12.2	**26.7**	25.2	15.7	4.8	24.1	3.6	**73.3**
1995	1.5	5.5	3.4	4.8	12.3	**27.5**	24.7	15.7	4.3	26.1	1.7	**72.5**
1996	1.3	5.6	3.9	4.7	11.8	**27.3**	23.5	16.2	5.1	25.8	2.1	**72.7**
1997	1.7	5.4	4.2	4.6	11.7	**27.6**	22.7	15.7	6.1	25.6	2.4	**72.4**
1998	1.5	5.4	4.3	4	12	**27.2**	24.9	14.3	5.8	25.3	2.6	**72.8**
1999	1.2	5.5	5	4.2	12.5	**28.4**	22.1	14.8	6	24.7	4	**71.6**
2000	1.2	5.4	4.8	4.1	12.1	**27.6**	25.7	16.1	5.5	23.1	2.1	**72.4**
2001	1.4	5.7	5.5	4.8	12.5	**29.9**	22.8	15.9	6.6	22.8	2	**70.1**
2002	1.3	5.4	4.9	4.4	14.1	**30.1**	24.8	14.4	5.8	24.8	1.1	**69.9.**
Source : Economic and Statistics of Sri Lanka 2004, Central Bank-Sri Lanka												

4.4.2Distribution among economic sectors

Employment by major economic activities also shows continuous decline in agriculture and improvement in service sector employment. This transition is justifiable with the diminishing value addition from agriculture to GDP and the increasing value addition from service sector to GDP (Table 4). But this trend is going to create social problem that Drucker mentioned way back in 1989 in his book "New Realities" [2]. People who were involved in agricultural and related occupations are going to loose the importance of their work that had been there for long period of time in the Sri Lankan history. Most of the people from top policy makers to common people do not have willingness to accept this reality and hence are still trying to improve labor-intensive agriculture as a heart of this economy. But by and large children of uneducated farmers are becoming educated ones and they search for better quality of life that has been experience by intellectual workers those who are involved in knowledge incentive occupations, hence they are tending to employee away from the agriculture. The period of 1990-2001 clearly shows this incoming trend and also indicates the gradual improvements of employment in other economic sectors (Table 29). But as discussed in earlier section most of the job opportunities are not knowledge intensive, in year 2001, 22 % of the total employed workers are elementary workers. It indicates that the improvements in non-agrarian industries are still at the elementary level and they do not consider much about continuous Research and Development (R&D), innovations and novelties.

Table 29 : Employment by Economic Activity as % of Labor Force

Year	Major Industrial Group					
	Agriculture	Manufacturing	Construction	Trade & Hotels	Services	Others
1990	46.8	13.3	3.9	9.6	15.7	10.7
1991	42.5	15	4.7	10.7	14.8	12.3
1992	42.1	13.1	4.8	11.3	16.9	11.8
1993	41.5	13.2	4.4	11.1	17.5	12.3
1994	39.5	14.3	4.1	12.2	18.1	11.8
1995	36.7	14.7	5.3	12.2	17.3	13.8
1996	34.4	14.6	5.4	12	18.2	15.4
1997	36.2	16.4	5.6	12.4	17.3	12.1
1998	40.6	14.3	4.9	11.6	17.2	11.9
1999	36.3	14.8	5.3	12.1	18.4	13.4
2000	36	16.6	5.5	12.7	17.5	11.7
2001	32.6	17	5.2	13	18.5	13.7

Source: Economic and Statistics of Sri Lanka 2004, Central Bank-Sri Lanka

4.4.3 Distribution among age groups

Age group participation in labor force indicates that more than 70% of the labor force are under 40 years old and relatively young (Table 30). But the unemployment rate among labor force under 40 years is significantly high at 94.2% from total unemployment in year 2000 and with in 20-29 years class only, participation rate is 36% from the labor force and the unemployment rate is very high at 62%. These two factors are the evidence for two significant issues in Sri Lankan economy: High young participation of labor force indicates the blooming importance among young people to actively participate in economic activities. But on the other hand this high young traffic generate higher unemployment rate and that means young people of the country are being discarded from the economic activities. Due to the very limited opportunities for higher education in Sri Lanka, most of the young people between age of 20-24 who are completed lower secondary and upper secondary education are comming in to the labor force without having much option to continue with higher education. Not only that, unemployment rate among young participants were highly contributed by the university graduates who completed the higher education as well [33]. Identified reasons for that were; age at which they complete the university education: it should be between years 20 to 24 but due to various reasons academic periods in universities is tend to increase, inadequate knowledge of English language and reluctance of the private sector employers to recruit graduates due to misconception of those graduates are radicals. But these are not justifiable reasons to generalize it as a good continual practice. The changing nature of the world economy is too hasty to continue the economic activities with old horses. Labor force participants of 40 years and above were at least born in year 1965 or earlier and they completed their secondary education with ceiling of 1980s, due to the lack of lifelong learning opportunities in the country most of them were stagnated and were unable to update their knowledge, hence are becoming obsolete in modern economy.

Table 30 : Age Group Participation and Unemployment Rate as % From Labor Force

Year	Age Category									
	15-19		20-29		30-39		40-49		50+	
	Participation	Unemployed	Participation	Unemployed	Participation	Unemployed	Participation	Unemployed	Participation	Unemployed
1992	8.4	19.2	38.3	61.5	25.6	13.4	16.5	4.5	11.2	1.4
1993	8.9	20.4	37	57.4	26.3	15.5	16.7	5	11	1.7
1994	9.0	22.4	37.6	56.8	26.5	15.5	16.9	3.9	10.1	1.4
1995	8.1	21.1	37	58.3	26.2	15.1	17.2	5	11.4	0.5
1996	8.8	24	36.6	57.4	26.2	14.3	16.8	3.6	11.5	0.7
1997	8.2	22.5	36.7	60.5	26.2	12.7	17.3	3.4	11.7	0.9
1998	9.3	21.4	36.1	58.5	25.8	14	17.1	4.8	11.7	1.6
1999	8.6	23.9	36	57.7	26.1	12.5	17.2	3.9	12	2.1
2000	7.7	19.5	36.1	62.8	26.8	11.9	17.2	5.8	12.1	1.1

Source : Extracted from Economic and Statistics of Sri Lanka 2004, Central Bank-Sri Lanka

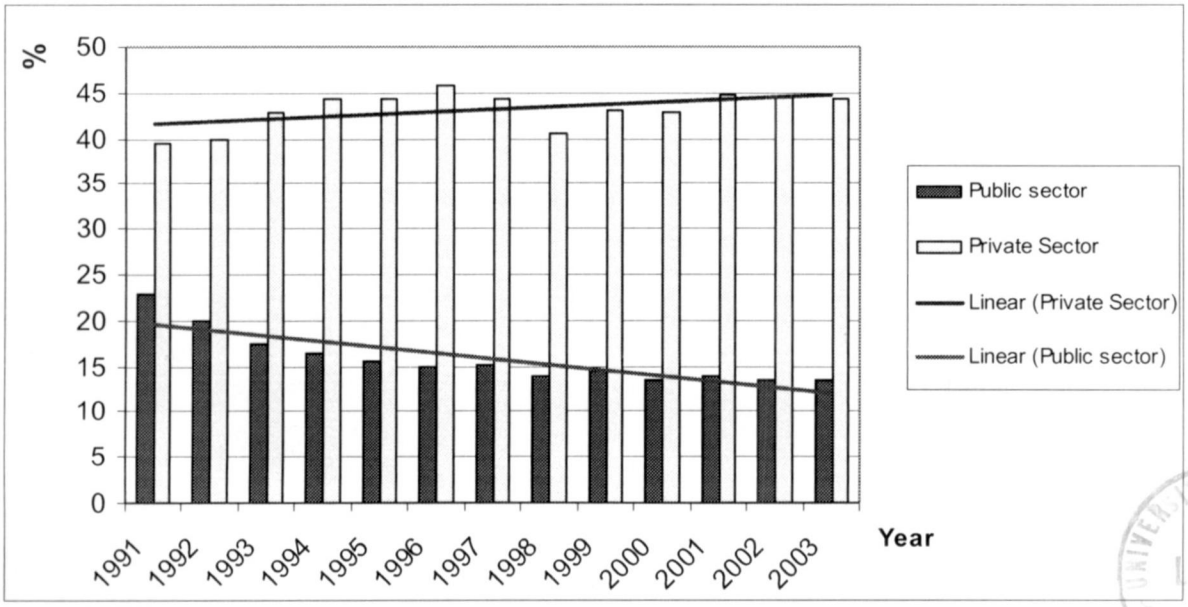


Figure 24: Employment as per ownership structure
(source: Economic and Social Statistics of Sri Lanka 2004)

4.4.4 Distribution among Ownership Structures

Scrutiny of the labor force statistics shows that the both private and public sector are ignored the knowledge as a key factor of productivity in Sri Lanka and that creates the worse economic results throughout the near history. Due to the fact that the government is moving away from the active economic activities more and more job opportunities is generating within the private sector. Figure 24 shows the melting nature of the government employees and the increasing nature of private sector employees in Sri Lanka, but the blooming private sector does not have much faith on university graduates who have more analytical and research skills that are needed to innovate novelties for the nation. This leads the way to the burning social problem of having unmanageable unemployed graduates who are demanding proper job opportunities from the government. This ignorance of graduates will change slightly from year 2005, currently government of Sri Lanka is implementing graduate recruitment program for government institutions. As far as government is moving away from economic activities, effectiveness of such recruitment plan is going to be questioned in the future and it is too early to make predictions on that, but question is can the government continue with such programs in the future by applying serious privatization policy at the same time.

4.4.5 Distribution among Educational Qualifications

The policy of the Government of Sri Lanka is to provide free education from primary stage to the first-degree level of University education. Pre-school education is a matter for the local

government authorities and also the private sector that do not get much attention. Accordingly, the different stages of education can be classified as follows,

Pre-School Education - 3-5 years, provided by the local authorities, religious and voluntary organizations and the private sector.

General Education - The period of General Education is from 5 years to 18 years. It is sub-divided into the following levels:

Primary Education from 5-10 years, covering grades 1 to 5.

Junior Secondary Education from 11-14 years covering grades 6 to 9.

Senior Secondary Education which covers two years leading to the G.C.E. (0/L) examination and followed by two years leading to the G.C.E. (A/L) examination.

Tertiary and University Education - Tertiary level education is provided mainly at the Post Secondary technical and professional institutes and the universities.

Vocational Training - There are also a large number of training institutes run by the Government as well as the private sector for vocational training, catering to the needs of those who leave the school system at different levels.

As per table 31 labor force participants who complete primary education relatively have good chance of being employed, their unemployment rate is only slight less than 5 percent in year 2002. This is a result of having high requirement of elementary level and unskilled workers within the country (Table 28). But participants who comprise the junior secondary education are facing significant level of unemployment problem. 41 % of the participants with such education were unemployed in year 2002. Over the period of 1993 to 2002 the rate is dropdown from 45% to 41% but still very high. Participants those who complete the senior secondary and above education, do not get the chance to effectively contribute to the economy due to lack of employment opportunities. From participants who pass the G.C.E. O/L 29% were unemployed in 1993 and 25% were unemployed in year 2002. Despite the fact the tiny improvement over the last decade, still this rate is very high and participants who have G.C.E. A/L, University education or other tertiary level education are facing unemployment problem that is continually becoming worse; in year 1993 the rate was only 18% and in year 2002 it increased up to 29%.

Analysis of the employment by the occupational groups indicates that the employment opportunities that particularly matched for the graduates and tertiary level educated people are very limited and incompatibility is coming from the under employment of graduates. Less than 10% of total labor force does have the opportunity to perform knowledge incentive occupations and hence higher educated people who go over and above that rate going to be under employed. In 1997, Lord Dearing's National Committee of Inquiry into Higher Education reviewed the role of higher education in Knowledge Society and define the role of higher education as follows: "Inspiring and enabling individuals to develop their capabilities to the highest levels" [35]. In contrast with the focus on the short term employment needs inevitably driving other forms of post-school education, university education focus on the research and teaching in the development and dissemination of knowledge. Lack of demand for educated people to knowledge intensive occupations is the cause for this and therefore from the nature of the local employment point of view Sri Lanka is virtually knowledge-ignored country in competitive knowledge era.

4.4.6 Distribution among Foreign Employment

The international exchange of human resource has emerged as a central issue of many nations today, new labor markets created by globalization are vital important for underdeveloped countries to minimize their unemployment problems. The quantity and occupational structure of the migration is largely determined by the demand for jobs in the labor receiving countries. Migration for employment grew rapidly after the decisions were taken at the Non Aligned Conference in 1976 to grant more job opportunities that are available in Middle East region, to Asian countries which have labor surpluses [36].

According to the Sri Lanka Bureau of Foreign Employment (SLBFE) statistics total foreign employed labor force is 13.2% from the total labor force in year 2003. (Table 32)

Table 31 : Unemployment Rate by Level of Education as a percentage of participation 1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
No Schooling	1.3	1.2	0.8	1.2	0.8	0.5	0.2	0.6	3.6	4.8
Grade 0-4	7	7.4	4.7	6.7	4.9	5.4	3.1	2.6		
Grade 5-9	44.9	44.9	47.1	47.1	44.7	44	42	45.6	40.7	41
G.C.E. O/L	28.7	28.3	29.1	26.1	28.2	27.8	29.2	26	27.3	25.1
G.C.E. A/L and above	18	18.2	18.3	18.9	21.1	22.5	24.6	25.2	28.4	29.2

Source : Economic and Statistics of Sri Lanka 2004, Central Bank-Sri Lanka

Table 32 : Migration for Foreign Employment and Labor force 1992-2003			
Year	**Labor force**	**Foreign Employed**	**% From Labor force**
1992	5808	425	7.3
1993	6032	460	7.6
1994	6079	500	8.2
1995	6106	560	9.2
1996	6241	600	9.6
1997	6266	710	11.3
1998	6633	740	11.2
1999	6666	785	11.8
2000	6827	853	12.5
2001	6773	932.5	13.8
2002	7145	970	13.6
2003	7593	1003.6	13.2
Source : Statistical Hand Book on Migration 2003- SLBFE			

Compared to 7.3% contribution at the year 1992, it shows the remarkable improvement of 81% in year 2003. As per SLBFE statistics most of the employment opportunities were located in Middle-East region and Saudi Arabia is the prominent labor demanding country and demanding for both high skilled and unskilled labors. Departures for foreign employment by manpower levels over the period of 1994-2003 generally shows the improvement of foreign employment for each level (Table 33), but it clearly depicts that majority of employment opportunities were for the unskilled laborers and departures for high skilled knowledge intensive occupations were at very low level.

Table 33 : Departures for Foreign Employment by Manpower Levels 1994-2003							
Year	**Professional**	**Middle Level**	**Clerical & Related**	**Skilled**	**Unskilled**	**Housemaid**	**Total**
1994	0.44	1.38	2.59	20.92	14.67	60.01	100.00
1995	0.51	1.45	2.66	15.75	13.62	66.01	100.00
1996	0.37	1.20	2.07	14.92	13.49	67.96	100.00
1997	0.38	1.09	2.38	16.30	13.68	66.16	100.00
1998	0.43	1.77	3.06	19.87	21.46	53.40	100.00
1999	0.70	1.76	3.46	20.74	24.35	49.00	100.00
2000	0.51	2.08	3.20	20.02	19.63	54.57	100.00
2001	0.66	2.05	3.27	19.98	18.14	55.89	100.00
2002	0.73	2.24	3.55	22.32	17.90	53.26	100.00
2003	0.73	3.58	3.23	22.74	21.16	48.57	100.00
Source : Statistical Hand Book on Migration 2003- SLBFE							

But SLBFE point out that there are reasonable demand for professionals and skilled laborers from Middle East countries and supply of such employees for foreign employments were very low (Table 34).

Table 34 : Vacancies and Departures by Occupational Level 2001-2004

	2001			2002			2003			2004		
	V	D	%	V	D	%	V	D	%	V	D	%
Professional	2634	338	12.83	3174	592	18.65	2604	356	13.67	4551	260	5.71
Middle Level	13753	1834	13.34	9565	2551	26.67	11838	3340	28.21	14307	2703	18.89
Clerical & Related	21361	3038	14.22	14435	3933	27.25	15070	3290	21.83	18053	3102	17.18
Skilled Workers	217949	24836	11.40	100492	32115	31.96	108603	33806	31.13	121252	31457	25.94
Unskilled	58692	21123	35.99	37577	24007	63.89	53329	31206	58.52	51535	28604	55.50
Housemaid	424253	81261	19.15	143530	89392	62.28	156013	82623	52.96	155729	89584	57.53
Total	738642	132430	17.93	308773	152590	49.42	347457	154621	44.50	365427	155710	42.61

Source : Statistical Hand Book on Migration 2003- SLBFE

Table 34 indicates that majority of vacancies are not knowledge intensive and in year 2004 only 10% from total vacancies demanded for professionals, middle level and clerical and related workers who require more formal knowledge through upper secondary or above education. As a country with higher unemployment rate among educated people government and responsible authorities should be able to make use of these opportunities to solve burden of high unemployment of the country. But averagely only 12% (year 2004-5.7%) of these vacancies were filled at the same time 40% of elementary level vacancies were filled by continuing traditional reputation of low cost labor. Accepting the fact that foreign employment sector is the top net foreign income generating sector of the country, relatively to the knowledge intensive workers salaries, elementary level workers are poorly paid [36]. That depicts the ignoring opportunity to export knowledge in large scale and according to governor of the central bank of Pakistan that is the major difference between India and rest of the South Asia.

4.5 Social Welfare Indicators

To analyze the potential impact of social welfare as a prerequisite for knowledge societies both Human Development Index (HDI) and digital divide is going to be used. HDI would give the insight of availability, affordability and quality of education, health and economic wealth and digital divide will give the insight about availability and reach of ICT within Sri Lanka.

4.5.1 Human Development Index (HDI)

Currently HDI is used as the most common indicator to measure the social wellbeing of any country. Due to the limitation of GDP per capita income as a development indicator most of

the studies used HDI as dominant indicator to measure social wellbeing. From the sub indices of HDI, adults' literacy rate, gross enrolment ratio and education index are expected to have direct impact on expectations of knowledge societies as fundamental perquisites to improve knowledge creation and dissemination and by and large life expectancy and GDP indicators are expected to be the outcomes of knowledge utilization. Hence HDI is very essential as an indicator of knowledge society.

As a composite index HDI includes life expectancy at birth, Adult literacy rate, combined primary, secondary and tertiary gross enrolment ratio, GDP per capita income, life expectancy index, education index and GDP index. World Bank categorized countries based on the HDI as high, medium and Low Countries in human development. In year 2003, apart from Nepal and Pakistan, which are categorized as low human developed countries, rest of the South-East Asian countries that has been examined in this study are categorized as high or medium human developed countries (Table 35).

Table 35 : South-East Asia's HDI- 2003	
Singapore	0.884
Korea, Rep. of	0.879
Malaysia	0.790
Thailand	0.768
Philippines	0.751
Maldives	0.751
Sri Lanka	0.730
Indonesia	0.682
India	0.590
Bhutan	0.511
Bangladesh	0.502
Nepal	0.499
Pakistan	0.499
Source: Human Development Report 2003	

In year 2003 Sri Lanka was categorized as a country with medium human development and hence the study restricted its analysis to medium human developed countries. Due to the composite nature of the HDI, identification of correlation between each sub indicator that relates to HDI is critically important to evaluate the relative importance of knowledge factors. As shown in the **table 36** correlation between HDI and all its sub indicators. Medium human developed countries do have high positive correlation coefficients but two economic indicators, namely GDP per capita income and GDP index do have relatively low correlation than other indicators. That would be the reason that some countries like Sri Lanka with low

economic performances are also been scoring high HD scores and some of the Middle East countries ranked as medium HD countries. Especially adult literacy rate, gross enrolment ratio and education index those directly related to the knowledge factors shows high positive correlation with more than 0.6 R value indicating their relative importance in human development of a country.

Table 36 : Correlation between HDI and it's sub indexes of medium HD countries -2003

R	Life expectancy at birth (1)	Adult literacy rate (2)	Combined gross enrolment ratio (3)	GDP per capita (PPP US$) (4)	Life expectancy index (5)	Education index (6)	GDP index (7)
HDI	0.751459	0.713191	0.628681	0.504183	0.75315	0.766255	0.654924

Source: Adopted from Human Development Report 2003

The study assumed that Inter dependency between HDI's sub indicators such as combined gross enrolment ratio and adult literacy would heave some positive relationship between each other. Hence correlation between each indicator was also calculated using medium human developed country data for 2003 and resulted R values were shown in table 37.

Table 37 : Correlation between each sub indicator of HDI in medium developed countries -2003

R	1	2	3	4	5	6	7
1	1.00						
2	0.31	1.00					
3	0.20	0.55	1.00				
4	0.08	0.17	0.29	1.00			
5	1.00	0.31	0.20	0.09	1.00		
6	0.31	0.96	0.75	0.24	0.31	1.00	
7	0.23	0.25	0.44	0.93	0.23	0.34	1.00

Source: adopted from Human Development Report 2003

Table 37 shows that between life expectancy at birth and life expectancy index do have remarkable perfect positive correlation and between adult literacy rate and education index do have 0.96 R value and between GDP per capita income and GDP index do have 0.93 R value indicating very high positive correlations. Relationship between gross enrolment ratio and education index is also high at 0.75 R value (Table). These high positive correlations depicted that by improving one above mentioned indicator that will make significant improvement of another indicator. Correlation coefficient table also shows that there is 0.55 R value between adult literacy rate and gross enrolment ratio and 0.44 R value between gross enrolment ratio and GDP index indicating positive relationships between each

other. That indicates by improving enrolment ratios in education, country not only can improve their adult literacy rate that improve their social welfare but also it would influence to the economic improvement as well. This relationship is critically important for a country that needs to understand the importance of knowledge as a factor of production, by giving more educational enrolment opportunities for the citizens and invest in education not only that, they can improve the basic level literacy rate and life but it would improve human capital of the country to create new knowledge that affects to the long term economic growth and then they can improve their HDI score as a high or medium human developed country.

4.5.2 Digital divide with in the country

During the Media indicator analysis study identified the digital divide in South-East Asia at country level. In this section study is going to evaluate the provincial digital divide of Sri Lanka to identify whether the entire country is receiving equal access to modern and conventional ICT.

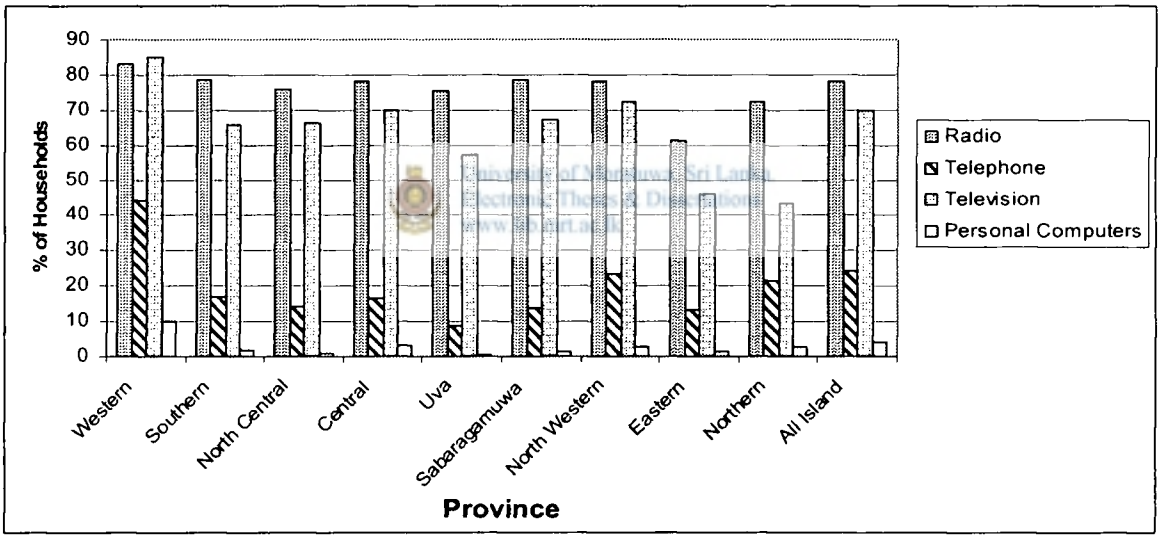


Figure 25 : Availability of ICT, % of households by provinces-2003
(Source: Economic and Social Statistics of Sri Lanka -2003)

According to the figure 25 it can be concluded that western province do have the superior ICT usage than the other provinces in comparison to country's overall rates and still the radio and television are the most popular media equipment in all provinces. Telephone usage is showing significant variations between provinces only western, North Western, North were reached 20% telephone usage rate and next problem is lower usage of computers as household equipment. Apart from western province's 9% rest of the country have not reached even 5%. These two factors make the Sri Lankan citizens always from the modern ICT usage and specially keep them away from using Internet, while 80% citizens of Rep. of Korea receiving broadband facilities to their households. Hence most of the Sri Lankan citizens

were unable to gather up-to-date knowledge from the Internet and were unable take the advantages of emerging e-commerce to make their life much easier. Due to the vastly expanded radio and television media, there is a possibility of disseminating new knowledge that is provided by the internet and e-commerce after redistributing them by adapting to the local context and languages using radio and television. According to the literature review in India, Bangladesh and most of the other South Asian countries including some agrarian regions in Sri Lanka do have community radio stations to distribute knowledge and entertainment. It would create a society with up-to-date knowledge of the world without having any geographical barriers or discriminations.

4.6 Politics

Study suggests that the development of a country vastly depend on the national level political structure of a country. Twenty years before China was a communist country that implemented closed economic policies and after the deregulation of the economy they are achieving huge economic growth. Rep. of Korea and India also restructured their economy by national level policy reforms to get benefits from information and knowledge eras. This section of the chapter is going to observe the national level policy issues that would affect Sri Lanka to be a knowledge society.

4.6.1 Government efforts to improve ICT and Education

Government plays a major role when converting Sri Lanka in to the knowledge society especially in ICT and educational improvements. During the examining fifteen-year period from 1990-2005, Sri Lankan government's ruling party was changed four times and shorter political life cycles are generating resistances to the continual restructuring process. The study is not going to evaluate the efficiencies of government initiatives but to identify the major policy decision that would positively or negatively affects to the creation of knowledge society in Sri Lanka.

After privatization of the Sri Lanka Telecom the ICT industry was opened for private sector ICT providers and reduction of the international call charges that had been considered as too high, made the much smooth expansion of ICT infrastructure and utilization in Sri Lanka.

During last 15 years next major political policy decision was E-Sri Lanka project that had been launched on the 20th November 2002. This project aims to use ICT for foster social integration, peace, growth and poverty reduction. In order to improve ICT at a national level the government body responsible for implementing this development initiative was

established by the Information and Communication Technology Act, No. 27 of 2003. E-Sri Lanka program is designed to implement e-leadership and policy making by using six programme strategies (Figure 26). These strategies have specific objectives that would positively affect to the improvements of knowledge creation, dissemination and utilization of the country. That would expand the infrastructure availability by developing multi-stakeholder partnerships and encouraging private sector to involve in ICT industries. On the other hand these strategies designed to improve the awareness within the civil society about the benefits of ICT and to give foundation of ICT education and improve R&D in the country [37].

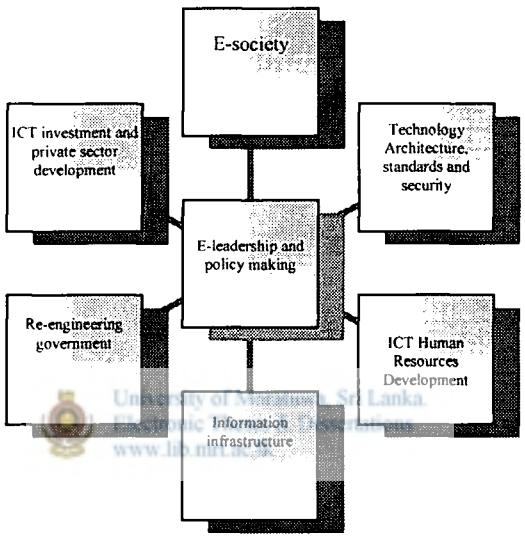


Figure 26: E-Sri Lanka project objectives (Source: ICTA Catalyst 2004)

Importance of teaching ICT and English language are recognized at a policy level and most of the government schools teaching basic IT skills for school children and trying to implement English medium as a learning medium. At university level government is trying to improve the quality and relevance of degree programs by providing funds with the assistance of Asian Development Bank (ADB), World Bank (IRQUE) and other international organizations. That would improve the future human resource capabilities of the country.

Apart from above silver lines ever ending and ever threatening civil war and emerging energy crisis always make resistance to the implementation and expansion of policy to reality.

4.6.2 Expenditure on R&D

Expenditure on R&D from GDP is becoming a key indicator of the nation's knowledge orientation. But most of the developing countries still do not collect statistics on this at national level and unfortunately Sri Lanka is also considered under this category. According

to the observations of the study neither the Central Bank of Sri Lanka nor the department of census and statistics provide comprehensive statistics on R&D expenses in Sri Lanka. Sweden spends highest percentage (3.6) from GDP for R&D. While in South-East Asia Rep. of Korea spend 2.9%, Singapore 2.1% and India 0.8% on R&D and rated among top fifty in the world [26]. Lack of official statistics on R&D in Sri Lanka did not allow the study to make sound conclusion on back ground of R&D in the country but by observing of the co-operate income tax regulations in Sri Lanka depicts that private sector is encouraged to expand their R&D expenses because R&D expenses are considered as allowable expenses within a certain period of time.

4.7 Outcome Indicators

Outcome indicators basically measure the utilization of knowledge that already exists in Sri Lanka, it measures the current status of knowledge activities in the country, and it concentrates on innovations, e-applications, economic impact of knowledge affairs and social impact of knowledge affairs.

4.7.1 Innovations

During the last ten years most of the countries invested huge sum of money on R&D and tended to apply for international patent application. The Patent Cooperation Treaty (PCT) System of the World Intellectual Property Organization (WIPO) is encouraging them by giving the opportunity to fill one international patent application, and to get the protection for an invention in more than 125 countries simultaneously. Figure shows the remarkable increase in international patent application and it depicts the nature of knowledge society we are living that innovate new knowledge continuously.

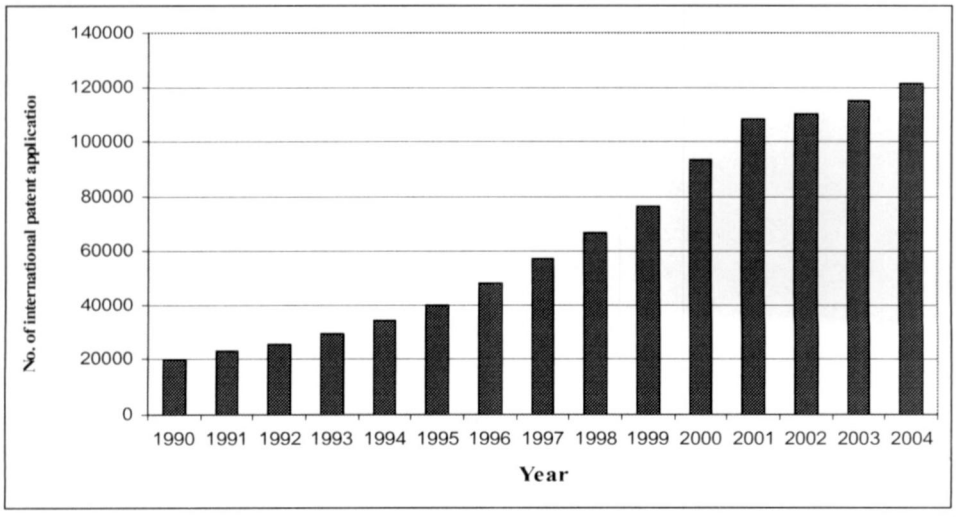


Figure 27: No. of international applications field since 1990
(Source: The International Patent System in 2004 Yearly Review of PCT)

Available statistics also shows that the applications from developing countries for international patent were increasing (figure).

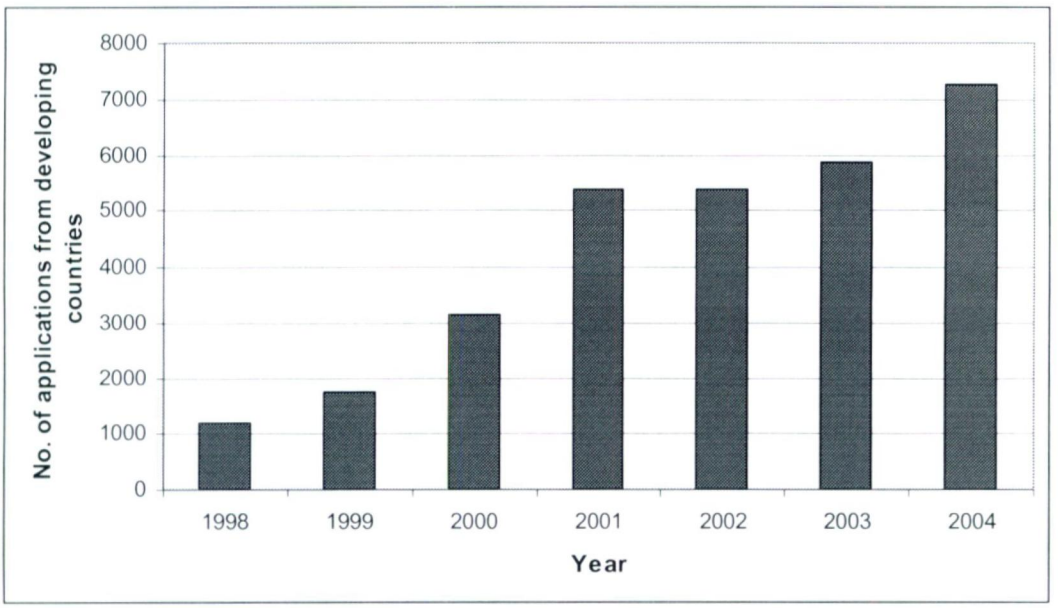


Figure 28: No. of applications from developing countries
(Source: The International Patent System in 2004 Yearly Review of PCT)

From developing countries majority of applications were coming from Asian countries like Rep. of Korea, China, India, Singapore and Malaysia (figure).

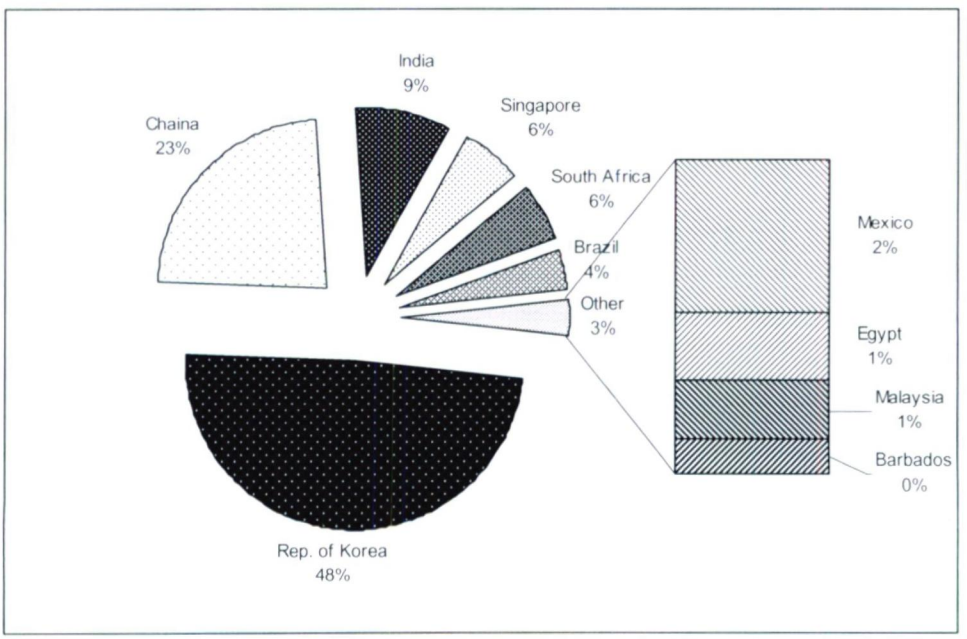


Figure 29: Patent applications from top 10 developing countries in 2004
(Source: The International Patent System in 2004 Yearly Review of PCT)

As discussed in the literature review and pre-requisite analysis in the study, Rep. of Korea, Singapore, India and Malaysia has identified as emerging knowledge societies and this promising innovative capacity shows the clear evidences of utilization of knowledge by using pre-requisites they are having.

Table 38 : Top 15 patent categories in the world in 2004
Pharmaceuticals, Cosmetics and Dental Technologies
Computers, Data Processing
Organic Chemistry - Heterocyclic Compounds
Networking, Telecommunications
Semiconductors Devices
Analysis Materials by Determining their Chemical orb Physical Properties
Diagnosis, Surgery
Micro-Organisms or Enzymes
Pictorial Communication, e.g., Television
Organic Chemistry - Acyclic or Carboxylic Compounds
Information Storage Technologies
Filters Implantable into Blood Vessels; Prostheses; Orthopedic, Nursing or Contraceptive Devices
Telecommunications
Optics
Selecting (switches, relays, selectors; electronic switches)
Others
Source: The International Patent System in 2004 Yearly Review of PCT

Table 38 indicates the top 15 patent categories in the world and almost all the innovations are basically science and technological oriented. It clarifies the reasons behind the emerging importance of specialized science and mathematics knowledge in knowledge societies. These innovations are economically valuable and countries that are continuously innovating on these would gain higher economic development. Majority of innovations are coming from business entities like companies and from individual inventors in top innovative developing countries. According to table 39, Cuba and India do have public R&D innovations over 10% from total and for the rest, academic institution or public R&D institutions do not contribute to the innovations substantially. It indicates the business or economic wealth of innovations and innovations are the primary level income source in knowledge societies.

Table 39: Sources of patent applications by type of applicants									
	Individual Inventors		Academic Institutions		Public R & D Institutions		Companies		Total
	Applications	%	Applications	%	Applications	%	Applications	%	
Rep. of Korea	885	34.7	21	0.8	78	3.1	1568	61.4	2552
China	507	45.1	63	5.6	38	3.4	516	45.9	1124
India	73	15.2	6	1.3	199	41.5	202	42.1	480
South Africa	308	73.7	8	1.9	7	1.7	95	22.7	418
Singapore	84	26.1	57	17.7	30	9.3	151	46.9	322
Brazil	76	37.3	13	6.4	12	5.9	103	50.5	204
Mexico	106	82.8	1	0.8	6	4.7	15	11.7	128
Colombia	28	84.8		0	1	3	4	12.1	33
Philippines	25	96.2		0	1	3.8		0	26
Cuba		0		0	13	100		0	13
Others	27	45.8	4	6.3	8	13.6	20	33.9	59
Developing Countries	2119	39.5	173	3.2	393	7.3	2674	49.9	5359
Source: The International Patent System in 2004 Yearly Review of PCT									

When analyzing of innovation of Sri Lanka in this environmental setting is expected to be at higher side but according to the statistics in year 2004 there were only two (02) international patent applications claimed by Sri Lanka. But according to the local intellectual property office's statistics local applications are better than this (Table 40). From 1995 to 2004 there was 60% increase in patent applications from residents, it was not a real outcome of utilizing knowledge that expected from the knowledge society and There were no statistical evidences to evaluate the nature of the patent granted whether they are scientific or not. On the other hand applications from non-residents were shown a remarkable increase from year 2000 mainly due the emerged knowledge wave that hit the Asian countries during that period of time.

Table 40: Patent applications and grants in Sri Lanka for residents and non-residents 1995-2004						
Year	Applications			Grants		
	Residents	Non-Res.	Total	Residents	Non-Res.	Total
1995	75	114	189	64	95	159
1996	50	114	164	98	107	205
1997	81	193	274	65	96	161
1998	54	158	212	44	97	141
1999	119	248	367	78	101	179
2000	71	250	321	59	169	228
2001	120	236	356	71	104	175
2002	123	202	325	59	54	113
2003	95	189	284	63	52	115
2004	120	195	315	103	85	188
Source: Sri Lanka Intellectual Property office -2004						

According to the above analysis it can be concluded that Sri Lanka is not a nation who use to do scientific economically valuable innovations as a habit like Rep. of Korea, China, Singapore and India used to do.

4.7.2 E-Commerce Applications

"Web site is increasingly becoming the gateway to a company's brand, products and services- even if the firm does not sell online.....if the company don't have a web site they can not survive...." [38].

Along with the development of the internet technology, the website has become the major mode of communication for business organizations in this information era. E-commerce is involved in the fields of retail sales, travel, books, domestic appliances, holidays and even technical products like motor cars [38]. According to the *survey of E commerce* conducted by The Economist magazine in 2004 shows that Three out of four Americans start shopping for new cars online and end buying them from traditional dealers. The difference is that these customers come to the showroom armed with information about the car and the best available deals. This trend is spread through out the world it is no different in Europe, Canada, Italy, Spain.

Why websites matter in the current trend

A website tells the whole story about a company. It incorporates everything and anything that the company offers to customers, potential customers, financial information to investors, potential investors and ethical behavioral information for the society at large. Therefore a company who does not have a website means committing suicide in to day's business world. [38]. A properly designed website will attract and retain customers. Website is the easiest mode to win or loose customers. Whenever the customer feels bored searching one website it is just a matter of a click to move on to a competitor's website. The companies should therefore keep in mind that the website is designed in such a manner that it gives a novel experience of searching and should provide timely response for what the customer wants. According to a research carried out regarding the on-line presence in South African countries it was found that 77% of the firms have never used web sites to do their business [39], hence there is lack of usage of internet in doing business among the developing countries.

Online Business in Sri Lanka

Information and Communication Technology Act No: 27 of 2003, enacted by the Parliament of the Democratic Socialist Republic of Sri Lanka is the ruling and guidance policy in ICT technology related to online business. The Act provides for the following;

1. To provide for the setting up of a national policy on information and communication technology.
2. Preparation of an Action plan for ICT development.
3. Appointment of a task force to improve the ICT standard.
4. Appointment if an ICT agency to implement national policy.
5. To deal with the matters connected to any related issue.

As per the provisions given in the Act, the task force is enabled to perform several functions at the best interest of the development of the ICT in the nation. Further more there is the Information and Communication Technology Agency (ICTA) of Sri Lanka to assist and monitor the Activities of the task force. The Council for Information Technology (CINTEC), which was established under the Science and Technology, Act No: 11 of 1994 have been converted to ICTA from the ICT Act.

In Sri Lanka Small and Medium size Enterprises (SMEs) have taken steps to implement e-commerce to a satisfactory level despite the inhibiting factors such as inadequate finance, access to internet and availability of ISP providers etc. (Survey on e-commerce implementation in the SME sector of Sri Lanka, June 2002) and also survey on e-commerce implementation in the SME sector of Sri Lanka, conducted by the SLBDC for the Asia Foundation has shown that 83% of SMEs use internet for business work, especially the e-mail. 35% have their own websites while 61% used the services of web hosting companies. 3% used freelance designer for the hosting of the site. From usage point of view 97% used the web site to promote the company to potential customers while 3% used it for collecting visitor information for market intelligence. Hence the SME sector in Sri Lanka is emerging in online business.

A sample of 45 companies was derived out of 247 public quoted companies in the Colombo Stock Exchange (CSE). This sample was selected randomly representing 14 sectors among the prevailing 20 sectors (Table 41). This sector wise selection was done in order to keep in line with the Fortune 500 study conducted by Young & Benamati in year 2000 [41].

Table 41: Distribution of the sample of online presence companies among sectors			
Sector	**#**	**Sector**	**#**
Banks, Finance & Insurance	9	Manufacturing	6
Beverage, Food & Tobacco	4	Motors	4
Construction & Engineering	1	Plantation	1
Diversified Holdings	6	Stores & Supplies	1
Footwear & Textiles	1	Trading	3
Hotels & Travels	4	Telecommunication	2
Land & Property	1	Health Care	2

The world recognized search engine, Google was used to find the Uniform Resource Language (URL) of each of the company. The company's full name as per the hand book published by the Colombo Stock Exchange was given as the search hint to the www.google.com the web site of each of the sample company was thoroughly scrutinized to collect the data necessary to fill the questionnaire. The questionnaire which was designed by Young & Benamati to analyze the Fortune 500 companies was used after some modifications. Conclusions were made by quantifying certain aspects of web site hence measuring the effectiveness of each of the website.

Nature of on-line presence

As per the Google search results, 36% of public quoted companies do not have web sites. In contrast only 2% of Fortune 500 does not have web sites. According to this, it can be said that Sri Lankan companies have not identified the importance of web presence. And little effort has been made to this.

A sectoral comparison was then carried out to evaluate the kind of sectors that have paid attention to on-line presence. 100% of the telecommunication companies, 67% of banking finance and insurance companies, 83% of the diversified companies, 67% of manufacturing companies have on-line presence.

Site content classification

As discussed earlier, properly designed web site together with sophisticated content management will bring a business to the forefront of the business world. Customers use companies' websites to look into product information. They log on to internet to find out about the products that provide value for money. Attributed after sales service component attached to the product makes the difference of purchase or not purchase. Then the customer goes to the shop well armed with all the dealers' prices, services etc. this is very popular in

the automobile industry, where the potential customers seek information from the websites and then do the purchase from the outlets.

Young and Benatami have categorized the content of a web site in to four main areas, namely: Informational, Communication, Customer Service and Customer Sales (Transactional).

Findings on site content classification.

Customer sales

Customer sales includes product order facility with or with out the user login. Once the customer visits a web site it provides the option to the viewer to register with web site. Once he is registered, the next time he does not have to go through the procedure from the beginning instead can be logged-in by giving the pass word.

Category	Sri Lankan Companies	Fortune 500
Product/ service order	30%	35%
Customer-Registration/Login	7%	29%

Customer Service

Customer service consists, any aid that facilitates a customer service. The content in this section helps the buyer to search for dealers before the sale is made. Site can provide the calculator function enabling the customer to do their own calculations during the sales. This is important in the case of financial products, for e.g. insurance premiums can be calculated. Customer will be able to get an idea regarding the shipment status after the purchase has been made. Customer service content facilitates the customer before, during and after the sale is made.

Category	Sri Lankan Companies	Fortune 500
Search for dealers	22%	48%
Shipment status	4%	4%
Calculator function	11%	15%

Customer Communication

Classification of communication fulfils the individual customer requirements while the informational content exists in a non-individual manner. The visitor to the web site can e-mail to required personnel to obtain any particular information or the customers can have interactions with the firms via e-mail through this communication component of the site. The

customer has the opportunity to seek for expert service from the company and obtain clarification required. From the company's point of view it enables to build and maintain long term customer relationships by having continuous interactions with the customers.

Category	Sri Lankan Companies	Fortune 500
e-mail to company	92%	92%
Bulletin board	8%	3%
personalisation	4%	6%

Informational content

Informational content consists of the information regarding the product or service description. This includes mainly the features and attributes of the products and services the company offer. Links can be developed under this category of content to connect other divisions of the same firm and some external organizations where the customer might need the services of, such as customs department. The firm can post job opportunities in their web site. It is popular to incorporate key word search with in the site so that the customer has the ability search by the word with out reading the whole site which saves ample amount of time and cost.

Category	Sri Lankan Companies	Fortune 500
News updates	45%	88%
Job opportunities	22%	36%
Financial information	18%	95%
Describe product	89%	97%
Key word search	26%	59%
Internal links	48%	59%
External links	11%	48%
privacy	2%	88%

Based on above analysis, it can be concluded that Sri Lankan public quoted companies do not provide total customer satisfaction through the website. Hence the e-commerce application is not at the satisfactory level in Sri Lanka.

4.7.3 E- Government Applications

E-government is not just a tool to automate old practices of existing government institutions; it is expected to increase the overall productivity of the government services. Due to wider scope of the study, e-government applications in Sri Lanka is not going to empirically

evaluated but going to re- interpret the findings of the study conducted by Punchihewa on *the measurement of e-government readiness in Sri Lanka: survey perspectives* in 2004 with knowledge society perspective [41].

According to the conclusions of that study 77% of government sector institutions are using some form of automation. The data processing, spreadsheets, data bases and presentations related applications were highly utilized by the government institutions.

Out of 572 government sector organizations only 167 have web presence and most of the websites were not updated regularly. Official government web portal of Sri Lankan government http://www.gov.lk has listed 42 ministries but only 14 ministries do have real web presence. Overall, e-government applications in Sri Lanka is still at the initial stage limited to offering web based information, but interactive or transactional is not been witnessed. Hence citizens are not getting benefits from the efficiencies that have been promised by the e- applications.

Due to the lower usage of e-commerce and e-government as a integral part of the economic affairs in Sri Lanka is not very encouraging for the ICT learning of the citizens, and they might feel that ICT as a sophisticated knowledge field rather than day to day necessity knowledge. This would cause so many problems for the establishment of knowledge society in Sri Lanka that requires usage of ICT and knowledge in every aspect of the society.

4.7.4 Economic Impacts

According to the findings of literature review by converting a country to a knowledge society it should be able to gain positive economic results. As discussed so far in the study both ICT and education are the key determinants of the knowledge societies. In order to evaluate the existing impact of ICT and education on economic development in South-East Asia, study conducted a correlation analysis and results are discussed in following sections.

4.7.5 GDP index and ICT

In this analysis study is trying to identify the relationship between ICT usage of a country and its GDP index. Table 42 shows the above mentioned statistics of South-East Asia and their relative correlations.

Table 42: Relationship between GDP index and ICT usage in South-East Asia-2004						
Country	GDP Index	Per 1000 inhabitants				
		Telephone Main Lines	Mobile phones	News papers	Television	Radios
Singapore	0.91	471	1195	298	300	672
Rep. of Korea	0.84	486	1107	393	363	1034
Malaysia	0.75	198	512	158	201	420
Thailand	0.69	99	222	64	300	235
Philippines	0.61	42	192	82	173	161
Indonesia	0.41	35	66	23	153	159
Sri Lanka	0.58	44	80	29	117	215
India	0.56	38	44	60	83	120
Pakistan	0.52	23	29	40	148	105
Bangladesh	0.46	4	8	53	17	49
Nepal	0,49	13	14	12	8	39
Bhutan	0.49	26	26	na	na	na
Maldives	0.66	99	168	na	na	na
Correlation coefficients	1.00	0.904042	0.918657	0.870345	0.823507	0.852863
Source: Economic and Social Statistics of Sri Lanka 2004						

Based on statistics on table 42, correlation coefficient between GDP index and each ICT component are calculated and according to the coefficient values it can be concluded that in South-East Asia region there is a high positive correlation between GDP index and ICT usage. Especially mobile phone usage is highly correlated with GDP index. Hence study concludes that both economic growth and ICT development are going hand in hand as inseparable members in South-East Asia and due the fact that majority of the East Asian countries including India are known as emerging knowledge societies, this relationship is expected to be continue in any knowledge society. Due to the unavailability of GDP index statistics of Sri Lanka from 1990-2005 period study is unable to identify the real correlation of Sri Lankan context. Thus according to the findings of E-application section, study identified that both e-commerce and e-government levels in Sri Lanka are at moderate level. Thus the utilization of ICT in economic activities is not very satisfactory and the real impact of ICT on Sri Lankan economy is not yet reach to its maximum capacity.

4.7.6 GDP index and Education

Economic growth and education analysis is expected to be a return on investment analysis. By expending on education, knowledge societies try to improve the knowledge in application in economic activities. Conventional thinking believes education as a part of social welfare and Sri Lanka also still identified education as the part of social welfare.

During the HDI's sub indicator analysis in table 37 identified that there is a relatively high relationship between combined gross enrolment ratio and GDP index (R=0.44) and it

also shows the positive relationship between education index and GDP index (R=0.34). Despite the fact that the relatively low strength of these relationships in medium human developed countries, advanced knowledge societies is willing to get economic benefits from education rather than thinking education as a part of social welfare.

Table 43: Expenditure on education and GDP index in South-East Asia- 2003

Country	% expenditure on education from GDP	GDP Index
Korea, Rep. of	3.8	0.84
Indonesia	1.4	0.41
Malaysia	6.3	0.75
Philippines	4.2	0.61
Singapore	3.7	0.91
Thailand	5.4	0.69
Bangladesh	2.5	0.46
Bhutan	5.1	0.49
India	4.1	0.56
Maldives	8.1	0.66
Nepal	2.4	0.49
Pakistan	1.8	0.52
Sri Lanka	2.2	0.58
Corrélation coefficient	0.44	

Source: Key indicators 2004-Asian Development Bank, HDR 2003

Table 43 highlights the expenditure on education as a percentage of GDP and GDP index vales of South-East Asia. Correlation coefficient between two variables is positive 0.44 indicates a relatively low relationship. That indicates the percentage value that allocates to the education or financial input for education is not a most significant factor of deciding GDP index or financial return in South-East Asia. But when the correlation analysis is done by using only Rep. of Korea, Singapore, Malaysia, Philippines and Indonesia it shows higher correlation (R= 0.5) and Hence study concludes that by investing more on education in emerging knowledge societies, they can gain higher economic benefits than countries who are not knowledge societies. Sri Lanka has not yet revealed the utilization of formal knowledge of the labor force (majority employed in unskilled and elementary level) as economic factor hence the real outcome of education on economy is yet to be bloomed.

4.7.7 Social Impact

In this section the impact of key knowledge society determinants to social wellbeing is going to be discussed.

Health and Education

During the literature review study identified the relationship between women's primary level education and mortality rates and usage on condoms during unsecured sex relationships in some African countries. Study is going to evaluate the relationship between women's education and mortality rates of South-East Asia.

Table 44: Health, Women's Education and Mortality rate of South –East Asia

Country	Gross Primary enrolment Ratio-Women	Gross Secondary enrolment Ratio-Women	Physicians per 1000,000	Infant mortality Per 1000 live births	Maternal Mortality Per 1000000 live birth
Korea, Rep. of	102	91	173	5	20
Indonesia	110	58	16	33	230
Malaysia	95	73	68	8	41
Philippines	111	86	124	29	200
Singapore	95	73	135	3	30
Thailand	96	81	24	24	44
Bangladesh	98	49	20	51	380
Bhutan	19	9	16	74	420
India	90	40	48	67	540
Maldives	124	68	40	58	110
Nepal	113	37	4	66	740
Pakistan	62	19	68	83	500
Sri Lanka	110	77	41	17	92
Correlation coefficients					
Infant mortality	**-0.439**	-0.870	**-0.569**		
Maternal mortality	**-0.298**	**-0.808**	**-0.501**		

Source: Economic and Social Statistics of Sri Lanka-2004

According to table 44, Sri Lanka is the fourth lowest country in infant mortality and fifth in maternal mortality within the South-East Asia and the best in South Asia. Medical resources point of view there is vast differences between Korea, Singapore, Philippines and Sri Lanka. Correlation between physicians per 1000,000 and mortality rates indicates relatively significant negative relationship. Most significant relationship of the analysis can be identified between gross secondary education enrolment of women and both infant and maternal mortality rates, they show very high negative relationship (R>- 0.8) but the relationship between primary education of women's in South-East Asia is not very significant, still shows the negative relationship. Therefore it can be concluded that there is an impact of education on better health in South-East Asia. As far as Sri Lanka is good with women's education more and more improvements on health can be expected in the future. As

far as there is no huge threat of HIV in Sri Lanka study not going to evaluate the awareness of secured sex practices in Sri Lanka or South-East Asia.

Prisoners and Education

Education not only gives the economically valuable knowledge but also should give the discipline for society. According to the demographic analysis of prisoners in Sri Lanka, study identified that majority of the prisoners (>90%) were not having upper secondary education (Table 45).

Table 45: Percentage of prisoners by level of education in Sri Lanka – 1995-2002

Education Level	1995	1996	1997	1998	1999	2000	2001	2002	Avg.
No schooling	10.4	9.2	7.8	6.0	9.0	9.6	7.6	8.3	**8.5**
Grade 1-5	37.1	45.4	47.0	50.7	49.5	59.3	54.4	56.5	**50.0**
Passed Grade 8	47.3	41.7	39.0	39.8	37.7	18.6	28.0	25.5	**34.7**
Passed GCE O/L	4.4	2.9	5.0	2.6	3.0	11.6	8.3	8.3	**5.8**
Passed GCE A/L	0.7	0.7	1.1	0.8	0.7	0.9	1.7	1.5	**1.0**
Graduates	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	**0.0**
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
Grade 8>	**94.8**	**96.3**	**93.8**	**96.5**	**96.1**	**87.5**	**90.0**	**90.2**	**93.2**
Grade 8<	**5.2**	**3.7**	**6.2**	**3.5**	**3.9**	**12.5**	**10.0**	**9.8**	**6.8**

Source: Economic and Social Statistics of Sri Lanka-2004

Table 45 also shows that prisoner percentage of having G.C.E. A/L and above educational qualifications is only 1% on average. These statistics clearly shows the negative relationship between levels of education and execute crime by the citizens. Higher level education is not only generating specialized knowledge in application but it also generate social wellbeing of the society as well.

Chapter 5 - Conclusions and Recommendations

Each indicator that had been analyzed in chapter 4 was given a detailed conclusive explanation at the end of respective section. This chapter will give the overall conclusions of evaluation of the readiness of Sri Lanka to be a member of global knowledge society by compressing all the detailed discussion that had been done during the data analysis.

5.1 Overall conclusions and Recommendations

Based on comprehensive data analysis done on pre-requisites and outcomes, study draws the conclusive remarks on each Pre-requisite indicator and outcome indicator by giving evaluation of knowledge creation, dissemination and utilization in Sri Lanka. Then concise conclusions are drawn based on the overall picture of the pooled indicators of the indicator framework. Table 46 shows the indicator, primary measurement of the indicator, remarks from different perspectives and finally the concise conclusions on knowledge society pre-requisites and outcomes in Sri Lanka. Based on table 46, study draws following final conclusions on readiness of the Sri Lanka to be a global knowledge society.

In South-East Asian region Rep. of Korea is the best knowledge society while Singapore, Malaysia, and also India are showing great potential to be competitive global knowledge societies. These countries not only focus on ICT but also improving the enrolments in education, especially at tertiary level and R&D. Rather than having emerging enthusiasm on mobile technology and modern CDMA technology, Sri Lanka still does not show any specific urgency, adaptation or greater enthusiasm to be a knowledge society in terms of knowledge creation, dissemination and utilization.

There are high correlations between some pre-requisites such as education and outcomes such as social welfare and health indicators in Sri Lanka. In comparison with the relatively acceptable correlation with economic performances in the South-East Asian region, Sri Lanka has not reached the predicted or anticipated level as a knowledge society in South-East Asia. Major hindrance for this is in Sri Lanka core requirements to be a knowledge society is still not integrated properly. Education has basically improved the social welfare and health of the country but still the ICT, education, social and economical affairs are not interlinked at policy level. Still the ICT utilization in e-commerce and e-government sectors are very moderate and tertiary educated labor force are not being identified as a factor of production. Innovations are not at a satisfactory level especially business organizations are committed to international level R&D and hence the graduates those who are specialized with

research are unable to perform to their fuller capacity. Most of the educated young labor force participants are unemployed mainly due this reason and hence are becoming a social problem that should not be the case in knowledge society. There are some suggested policy reforms that improve IT education in school level and hence the ICT skills of younger generation would be better. If the government can go a step further to identify education as an economic activity rather than a social activity that would give much higher return on investment on education at national level. If the ICTA implements the e-government reforms according to their initial plan and if business community promote online businesses as their normal business operations would make the ICT knowledge as compulsory requirement for citizens. By doing these reforms Sri Lanka can improve economically valuable education, ICT literacy, Internet and E-mail usage and finally it will open the gates for culture that rely on knowledge creation and dissemination. This should not be an isolated effort of government. Education specialists, ICT infrastructure providers, business community and by and large all the citizens must actively participate to the policy decisions and government need to effectively coordinate the entire process because we are far behind the South-East Asian knowledge society schedule.

Table 46: Concluding remarks on Main Indicator variables of the Study

Indicator Name	Conclusions were primarily based on	Remarks on individual indicator	Conclusions
Pre-requisites			
Media			
Telephone subscribers	**Overall status-** Jipp curve analysis **Trend** – changes over the period	Below the expectations Expanding with mobile tech.	Mobile technology is the promising modern ICT media. Internet and e-mail is far away from being popular knowledge dissemination medium
Internet and E-mail Users	**Overall status-** Jipp curve analysis **Trend** – changes over the period	Far below the expectations Relatively low improvement	
Television Receivers	**Overall status-** Jipp curve analysis **Trend** – changes over the period	Satisfactory Improving	Are still the most popular communication mediums in Sri Lanka. Hence have significant role to play in knowledge dissemination
Radio receivers	**Overall status-** Jipp curve analysis **Trend** – changes over the period	Satisfactory Improving	
Daily news paper circulation	**Overall status -** Jipp curve analysis **Trend-** No. of news papers in circulation	Below the expectations Low improvement	Popularity and usage of print media as knowledge disseminating medium is diminishing its importance.
Books & Magazines	**Overall status-** no. books published **Trend** – changes over the period	Far below the expectations Decreasing	
Education- Overall			
Human Resources	**Capacity-** Changes of Stu./Tea. Ratio **Quality-** Qualifications of teachers **Distribution-** Provincial distribution	Slightly improved Satisfactory Satisfactory	General education HR is at satisfactory level.
ICT education	**Usage** – No. of computers in schools **Trend-** policy analysis	Far below the expectation Satisfactory	Not very promising. Lack of ICT facilities and divide between rural and urban schools is not very healthy
Finance on education	**From GDP-** Cross country comparison **On tertiary educ. -** Expenses on tertiary educ.	Relatively satisfactory Not satisfactory	Due to lack of economic wealth expenses is not improving. Per capita cost of general education tends to have negative correlation with the enrolments.

	Improvement: Capital expenditure from GDP	Insignificant	
	Cost - Per capita cost of education	Increasing	
Enrolment ratio	**Primary-** Gross enrolment ratio, cross country	Satisfactory	School education is being good but specialized high level knowledge is lacking. Highly satisfactory to learn basic day to day life activities and health matters
	Secondary- Gross enrolment ratio, cross country	Satisfactory	
	Tertiary- Gross enrolment ratio, cross country	Not satisfactory	
Literacy rate	**Adult-** Adult literacy rate, cross country com.	Satisfactory	
	Youth- Youth literacy rate, cross country com.	Satisfactory	
Education – Tertiary			
Institutional development- Universities	**Physical** – No. of departments	Increasing	Trend is satisfactory with vast array of new knowledge areas and enrolment opportunities. But overall facilities are not satisfactory and technical colleges are not creating enough opportunities
	Human Resources- No. of employees, teachers	Increasing	
	Enrolment- No. of students, new admissions	Increasing	
Technical colleges	**Physical** – No. of technical colleges	Stagnating	
	Human Resources- No. of employees, teachers	Teachers are decreasing	
	Enrolment- No. of students, new admissions	Slightly decreasing	
Graduate output- First Degree	**Graduates-** changes of no. of graduates	Increasing	Science and Mathematics are not much popular but high level business knowledge is readily available. Importance of Post graduate qualifications is improving in science as well
	Academic steam- changes over the period	Non science dominant	
Post graduate	**Graduates-** changes over the period	Increasing	
	Academic stream- changes over the period	Non science dominant with improving science	
Tertiary Education by disciplines	**Enrolment in Science** - changes in enrolment	Below the expectations	Science oriented skills are not generating enough due to lack of demand.
	Enrolment in Arts & Com.- changes in enrolment	Far above the expectations	
	Opportunity in science- enroll/eligible stu.	Relatively high	
	Opportunity in other- enroll/eligible stu.	Relatively low	
Employment			
By occupation	**Status** - % employments	Primary level manual work dominance	Still dominated by primary level work rather

	Trend- Changes over the period	Improving knowledge incentive work	than knowledge work. But it is improving
By economic activities	**Status-** % from labor force **Trend-** Changes over the period	Majority in agriculture Shifting away from agriculture	Employment also moving away from agriculture to services
By age group	**Status-** % from labor force **Trend-** unemployment rate	Relatively young Unemp. is high among young participants	High young labor force participants do not have much opportunities to perform
By ownership	**Status-** % employment in each sector **Trend-** Trend line analysis	Private sector dominating Private sector is continuously expanding	Most of the economic activities are conducted by private sector. Hence the majority is employed in private sector
By education	**Primary-** % of employed **Secondly-** % of employed **Tertiary -** % of employed	High Lower Lowest	Educated people do face difficulties in finding job opportunities due to the elementary nature of the labor market
Foreign employment	**Importance-** changes over period **Nature of work-** % by manpower level **Exploitation -** % vacancies and departures	Increasing Mainly unskilled and housemaids Not satisfactory	Do not attempt to get use the opportunities to exploit the higher skill job opportunities in foreign markets.
	Social welfare		
Human development Index	**Status-** Cross country comparison **Relationship-** correlation between indexes	Satisfactory Highly correlated	Do have healthy human development as a emerging knowledge society
Digital divide with in the country	**Status:** Radio and television usage by province Telephone and PC usage by province	Relatively lower Relatively high	Conventional media are very popular all over the country but modern ICT media are not equally distributed all around the country
	Politics		
Government effort to improve ICT & knowledge	Observations	Encouraging	Government understand the importance of ICT and education in this era but they do not identify the importance of knowledge creation through R&D.
Expenditure on R&D	Observations	Not very encouraging	
	Outcomes		

Innovation			
Patent applications	**Trend:** International Applications Local applications **Nature:** Categories of applications **Sources:** sources of applications	Increasing in the world, developing countries & also in Asia but Sri Lanka very low. .Not encouraging More Science and technological in Southeast Asia, in Sri Lanka unable to find. Mostly commercial companies in Asia & then private inventors.	Innovations are not at satisfactory level according to the regional standard. Companies are not involved in R&D very much. And hence the low demand for graduate cane be some what justified.
E-Applications			
E-Commerce usage	**Trend:** Survey on E-commerce **Status:** Survey on E-Commerce in Sri Lanka **Nature of online business in Sri Lanka:** empirical study on websites	Online business in diminishing in the world Encouraging effort are there with SMEs Mainly informational but not satisfy the customer requirements	Online presence of Sri Lankan public companies is not customer oriented and they do not utilize website to give customer satisfaction. But with SMEs efforts are encouraging with positive future prospects.
E-Government	**Status:** Survey on e-government in Sri Lanka **Trend:** ICTA e-strategies	Not very encouraging Sounds great on the paper	Very elementary level of utilization and planed e-strategy would give positive economic results, if they utilized efficiently.
Economic Impact			
GDP and ICT	**Relationship:** Correlation coefficients **Utilization in Sri Lanka:** nature of the E-Application	High positive relationship is there Not very satisfactory	There is high potential influence from ICT and education to the economic performance of South-East Asia. But in Sri Lanka both are not satisfactorily utilized in economic activities
GDP and Education	**Relationship:** Correlation coefficients **Utilization in Sri Lanka:** employment by education	Positive Underutilized the educated youth	
Social Impact			
Correlation between health, infrastructure and education	**Relationship:** Correlation coefficients **Status of Sri Lanka:** Indicator values	High negative relationship Satisfactory	Education plays a key role of the social wellbeing of South-east Asia and also in Sri Lanka.
Correlation between prisoners and education	**Relationship:** Percentage from education level	Lower with higher educational qualification	

5.2 Specific Issues and strategic recommendations

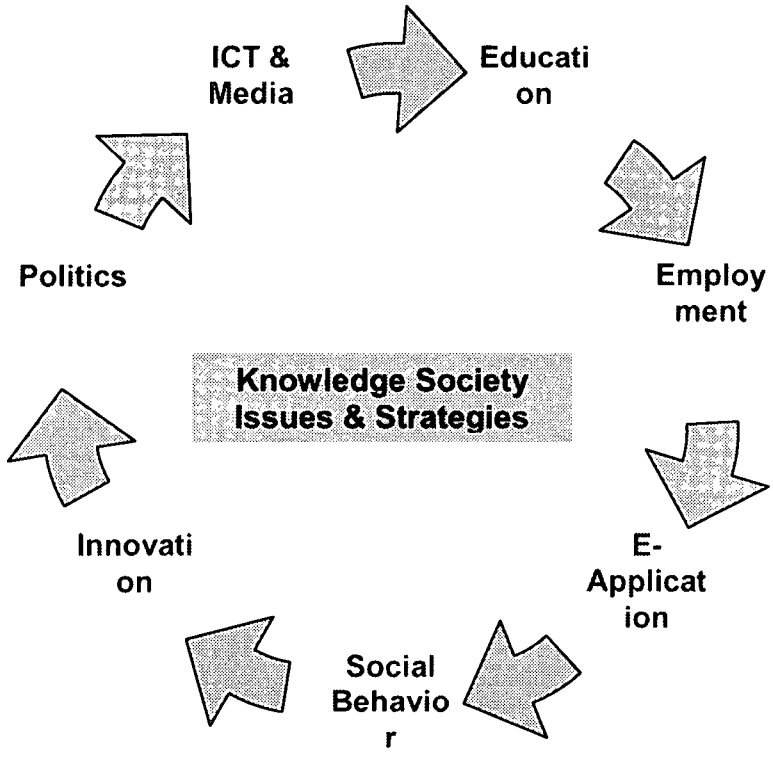


Figure 30: Key Strategic Issues in Sri Lanka to be KS

According to the macro level evaluation of the study, it has identified seven key strategic issues those require long-term strategies to be in competitive in global knowledge society. ICT and Media, Education, Employment, E-Application, Social behavior, Innovations and finally politics are the key factors of determining the readiness of Sri Lanka to be a Knowledge Society in next decade.

Radio and television are still the most popular ways of sharing knowledge and information in Sri Lanka. Due to the low internet users and diminishing interest on printed media, most advanced knowledge and new knowledge that is available on internet and printed media should be re-disseminated through two relatively conventional mass media, television and radio after adapting and translating to common language. Community radio would be the best option. Due to emerging popularity of mobile technology with GPRS and optional Blue-tooth Internet penetration, internet usage over mobile phones can also be improved in near future by reducing cost of mobile Internet penetration as a motivator. In order to utilize high literacy rate of the country to improve availability of information and knowledge among citizens 'printed media' should be encouraged as a formal disseminating

medium. Encouragement should be done not only to improve the readability of the existing knowledge but also to publish newly created knowledge.

General education has been good in Sri Lanka with the free government education and it allows Sri Lanka to fly high in literacy rate and HDI ratings among other members of the South Asia and it has already implemented reforms that would increase the innovative skills and ICT skills of the students in great extent but the tertiary level education is the problem especially due to low enrolment opportunities. Despite the fact that free education system is giving the invaluable benefits for poor people to get the education facilities freely up to university level, but freedom of learning according to their desires is being threatened at the university level education. More than 90% youth are ending their education without having higher education and students who are selected do not get the opportunity to decide their own education stream. Hence calculated risk should be taken by inviting private investors to invest in higher education industry to give "right education to right person to innovate new economically valuable knowledge". Meanwhile technical colleges are not improving enough to absorb the heavy school leaver rate those who do not qualify for the universities and hence should be re-organized to disseminate and create economically valuable knowledge among younger generation of the country.

Sri Lankan university education is still dominated by Arts and commerce study streams and the importance of high level science and mathematics that had been highlighted in knowledge societies during the literature review is not prevailing in Sri Lanka. To utilize the existing high literacy rate to gain improved economic performances scientific findings and enrolment in science and mathematics fields should be encouraged.

Employment point of view most of the jobs available in Sri Lanka are basically primary level unskilled jobs and hence do have high unemployment rate among young and educated people. With the changes that had been taken place in economic activities over the examining period, importance of knowledge intensive jobs were increasing This is a good sign of converting Sri Lanka to a knowledge society but it is still at very elementary level. To learn the best practices and advanced knowledge of developed and economically wealthy countries, government should encourage unemployed educated youth to exploit the readily available opportunities in foreign countries as professional and skill labors as most of the Indians do. It will give the required benefits for the country in the long run; it will basically generate much higher foreign earnings and when Sri Lanka is trying to implement similar

type of technologies and industries the experience of those foreign employed Sri Lankans' will automatically come into play.

Sri Lanka seems to be facing high unemployment rate among educated young labor force participants mainly due to lack of co-ordination between education and human resource planning. Especially the upper secondary and tertiary educational institutes those are offering knowledge to the students are not well known the human resource requirements of the country. This issue clearly highlights the importance of national human resource plan in Sri Lanka for at least five to ten years ahead. Education in both at secondary and tertiary levels should be organized, changed and implemented according to the future human resource requirements of the country, otherwise existing burden of unemployed educated youth would be a never ending hindrance for the country that required short-term remedies for ever.

Social welfare is high in Sri Lanka over the last two decades. Hence the basic health and education are by and large equitably shared and also at least conventional mass media are shared among all the citizens to gain the knowledge outcomes. Digital divide that is being there in ICT, should be bridged by investing and by encouraging private sector to invest on ICT in remote provinces. As far as we are living in a global knowledge society ICT would be a necessary evil in economic affairs. Hence government and business community should be radical and positive towards ICT. Business sector should encourage people to get use to ICT by implementing ICT for their day to day business processes. According to the global trend, customers are preferred gathering specific information rather than online purchasing. Hence high bandwidth, security and legal requirement would not be primary issues that would resist information dissemination using internet based ICT. By making online business and e-government applications as benchmark requirements of business operations ICT can be converted to a day to day necessity that can not be omitted. If so majority of citizens would consider ICT skill as a basic level skill in day today life as ATMs. With in ten years time majority of bank customers are able to use ATM because it became a common feature of banking. But when it comes to e-commerce and e-government still business community and government are very conservative and in an improving ICT environment they do not give real kick to ICT usage to take off as a common language just like in Rep of Korea.

Government of Sri Lanka has identified the importance of ICT, ICT education and modern ways of learning in this era and give financial and policy support to improve ICT and ICT education. Continuous implementation and encouragement for these policies from all the parties who rule the country is a must and should cultivate the attitude of "knowledge society

is driven purely by creation and utilization of economically valuable knowledge, and nothing else". Giving ICT education that is integrated with scientific and mathematical thinking and applications would be a best strategic option to gain future benefits rather than teaching only word processing.

Innovation is the key factor of deciding developed and under developed countries in the future. As far as Sri Lanka is lack with economically valuable knowledge products country will economically stagnated and will be unable to get the economical value of the higher educated youth's maximum contribution. Hence business companies who are able to spend money on R&D at national level should be encouraged and specially individual innovators those who innovate import-substitute product should be encouraged and their innovations should be promoted at national level by using import tariffs to restrict imports, giving individual customers a VAT reduction and giving cooperate customers capital allowances on their cooperate tax. This would save the foreign currency reserve, would utilize specialized knowledge in economic activities, it would generate new job opportunities and there would be opportunities for exporting product to other countries as well.

Finally as far as Sri Lanka encourage private sector to involve in economic affairs, they should be considered as integral members of national policy development. Educational policies, ICT policies, Legal requirements all should be decided in a open forum that every key player in public as well as private sector and also the community members who actively participate. This would help to generate interlink every community in knowledge society that has been not there for yet in Sri Lankan policy development practice.

By applying above mentioned recommended strategies, Sri Lanka can strengthen the pre-requisite backbone and utilization for being a competitive global knowledge society.

5.3Suggestions for future researches

Benchmarked Indicator framework that has been developed by this study can be periodically evaluated to identify whether Sri Lanka is satisfying the criterion in the future. By evaluating each indicator once in two or three years, future researches would be able to identify the strengths, weaknesses, opportunities and threats of Sri Lanka to be at global knowledge society. It would give opportunities for policy makers to develop and re-evaluate timely based development strategies for the country.

By using benchmark indicator model developed in this study is a universally applicable, but this model best suited for developing countries, those are not concentration on

Knowledge society yet. By appling minor modifications according to the availability of statistics, researchers can evaluate any other region's or country's readiness to be a global knowledge society. Modification would be mostly additions of indicators rather than omitting because almost all indicators that have been used in this study are readily available in most countries.

Due to the limitations arise from lack of previous literature support and statistics in this part of the world, there can be other indicators that should be included as benchmarked indicators to get better evaluation of Knowledge Societies. If future researchers can find satisfactory statistics they are free to insert such indicators to the benchmark list. For an example expenditure on R&D from the GDP is important but central bank of Sri Lanka currently does not calculate that ratio and hence not include in the benchmark indicator list. When these statistics are available that ratio can also be included as a benchmark indicator.

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Appendix

The Economist Intelligence Unit has published an annual e-readiness ranking of the world's largest economies since 2000. Currently 65 countries are assessed on their ability to promote and support digital business and information and communications technology (ICT) services. A country's e-readiness is essentially a measure of its e-business environment, a collection of factors that indicate how amenable a market is to Internet-based opportunities. The e-readiness rankings are a weighted collection of nearly 100 quantitative and qualitative criteria, organized into six distinct categories measuring the various components of a country's social, political, economic and of course technological development. The underlying principal behind the rankings is that digital business is at its heart business, and that for digital transactions to be widely adopted and efficient, they have to thrive in a holistically supportive environment. E-readiness is not simply a matter of the number of computer servers, websites and mobile phones in the country (although these naturally form a core component of the rankings), but also such things as its citizens' ability to utilize technology skillfully, the transparency of its business and legal systems, and the extent to which governments encourage the use of digital technologies. Following table shows the E-readiness ranking of Asia-Pacific region in 2005.

Economist Intelligence Unit e-readiness rankings, 2005

Asia-Pacific

2005 rank in region	2004 rank in region	Country	Overall ranking (of 65)	e-readiness score (of 10)
1	2	Hong Kong	6	8.32
2	3	Australia	10	8.22
3	1	Singapore	11	8.18
4	5	New Zealand	16	7.82
5	4	South Korea	18	7.66
6	7	Japan	21	7.42
7	6	Taiwan	22	7.13
8	8	Malaysia	35	5.43
9	9	Thailand	44	4.56
10	10	India	49	4.17
11	11	Philippines	51	4.03
12	12	China	54	3.85
13	12	Sri Lanka	56	3.80
14	14	Indonesia	60	3.07
15	15	Vietnam	61	3.06
16	16	Pakistan	64	2.93

Source: Economist Intelligence Unit, 2005