CHAPTER 4
WTO, GLOBALIZATION, AND RELEVANCE OF ICT SECTORS IN THE KNOWLEDGE ECONOMY

Over the past fifty years, the role of trade in the world economy has increased dramatically. Trade has grown much faster than output and most of countries that have achieved fastest economic growth have done so rapidly by increasing their participation in the world trade. Import substitution policies—widely used in the 1950s, 1960s and 1970s—were much less successful than the export-oriented policies used in East Asia’s high-growth economies. As a result, policy makers in many developing countries started adopting policies for more open trade during the 1980s. By the late 1980s, nearly all centrally planned economies had made reforms in foreign trade and investment for their development programs.

These reforms had led to significant changes in developing countries’ involvement in international trade. Until the mid-1980s, most developing countries relied primarily on commodity exports, which exposed them to high volatility and decline in commodity prices and more dependence on imported manufactures. However, since early 1990s, due to the increasing global integration and multilateral trade negotiations many developing economies increased their manufactured exports. By the late 1990s about 80 per cent of exports from developing countries were manufactured goods. Thus, developing countries are now active in global markets for manufactures and services.

This rapid growth in openness of world economies has been alternately described as globalization/internationalization. While there is no universally agreed definition of globalization, economists typically use the term to refer to international integration in commodity, capital and labor markets. Using integration in these markets as the benchmark, it is clear that globalization is not a new phenomenon. Since the mid-19th century, there have been at least two waves of globalization (WTO, 2008). The first phase began around the mid-19th century and ended with the onset of global depression. The second scenario began in the aftermath of World War II (WWII) and continues until today. In both these episodes of globalization, rapid trade and output growth went together with major shifts in the relative size of the economies involved.
International trade after WWII entered a long period of record expansion with world merchandise exports rising by more than 8 per cent per annum in real terms over the 1950-73 periods. Trade growth slowed thereafter under the impact of two oil price shocks, a burst of inflation caused by monetary expansion and inadequate macroeconomic adjustment policies. In the 1990s, trade expanded again more rapidly, partly driven by innovations in the information technology (IT) sector. Despite the small contraction of trade caused by the dotcom crisis in 2001, the average expansion of world merchandise exports continued to be high.

Thus, globalization refers to doing business abroad and adapting to international business standards to conduct business transactions with others. Globalization is a policy or a system favoring or promoting globalization or the condition of being globalized. The interdependence of countries under globalization helps to promote cross border flow of goods and services, capital and technology. Enterprises with global mindset can divert their energies to the expansion of business opportunities beyond domestic markets; attract new customers; enhance their market share and maximize their profit margins. The economic liberalization of developing countries have complemented the globalization process by generating competition and comparative cost advantages among business firms. In market, companies learn to meet the needs of diversified cultural group, modify business strategies and gain management knowledge (Venkateswarlu, 2004). Globalization has become a reality and countries both developing and developed have no choice but to adjust to that reality.

Globalization or openness of world economies includes reduction in trade barriers, transport costs and communication costs. Related factors include the increasing importance of trade in manufactures and the fragmentation of production process which leads to much more international trade in components and services. Well-designed globalization can promote technology and development. In fact, it is only with a certain degree of openness that one can get to the ideas that are necessary for adoption of technology.

**Globalization and Growth**

Globalization has provided the backdrop for the strong economic growth in recent years. There are three major aspects of globalization, namely international trade, foreign direct investment and labour migration. It has been widely recognized that these three dimensions of globalization
affect, to a greater or lesser extent, the level and distribution of wages.

**International Trade**

At the global level, the trade share of GDP has increased consistently since the 1980s and in recent years, it has exceeded 50 per cent (ILO, 2008-09). At the regional level, the change is most pronounced in East Asia and the Pacific, while a steady upward trend was also observed for sub-Saharan Africa.

The world merchandise exports have escalated to US$ 15717 billion in 2008 as against US$ 1838 billion in 1983. North America exhibited the weakest growth of merchandise trade on both the export and import sides. The share of North America has declined from 16.8 per cent in 1983 to 13.0 per cent in 2008. According to the National Bureau of Economic research, which traditionally is the body that dates recessions in the United States, the US economy has been in recession since December 2007 (WTO, 2008). The Commonwealth of Independence States (CIS) saw robust growth of both exports and imports, resting on the strength of the region’s extractive industries. The share of Europe has declined from 43.5 per cent in 1983 to 47 percent in 2008. On the other hand, the share of developing and emerging economies (Middle East, CIS and Asia) increased from 19 per cent to 38.7 per cent during the same period. This increase reflects the growing openness of developing countries to trade and the competitiveness of their exports in global markets. The openness ratio (the sum of exports and imports as a share of GDP) has increased for most developing regions (World Bank, 2005). As the pace of global integration accelerates, greater openness and the trade reforms will lead to harnessing of new opportunities and risks management practices.

Globalization has affected the prices of internationally traded goods as well. Dollar prices of internationally traded agricultural goods, mining products and manufactures have increased since 1990s and it showed its highest growth by 10.5 per cent in 2003. The price of fuels has increased by 16 per cent due to temporary supply shortage. Several demand side factors also contributed to strengthening of energy prices, like China’s demand for oil increased by 11.0 per cent in 2003. In the United States, the combination of increased demand and falling domestic output resulted in a 7.5 per cent increase in crude oil imports. On average, prices of non-fuel commodities rose on spot markets by 7 per cent. This included an increase in metal prices by 12 per cent in 2003.
Prices of manufactured goods evolved quite differently, by region, due to exchange rate developments (WTO, 2004)

**Foreign Direct Investment**

Global integration in product, capital and labor markets has resulted in a more efficient allocation of economic resources over time. The outcome of integration is greater levels of current output and prospects of higher future output. Consumers have a wider choice of products and services at lower prices. Capital can flow to countries that need it the most for economic growth and development. To the extent that technology is embodied in capital goods or is closely linked to FDI flows, openness further improves the growth prospects of developing countries.

Foreign direct investment (FDI) has increased considerably between 1980 and 2006, but with significant fluctuations. The global average share of FDI in GDP was barely 1 per cent in the 1980s and reached its peak of about 4.9 per cent in the year 2000. Thereafter it declined with the downturn of the early 2000s, from US$ 1401.47 billion in 2000 to US$ 985.79 billion in 2005 but it strongly rebounded before the current global financial and economic crisis and in 2009 it stood at US$ 1114.19 billion. In developed economies it has increased from US$ 172.07 billion to US$ 565.89 billion during the same period whereas in developing countries in escalated to US$ 478.35 billion in 2009 as against US$ 35.74 billion in 1990 (UNCTAD, 2010).

Like international trade, variations in FDI inflows have also increased over the years between developed and developing economies. This suggests that despite a general trend towards more open policies in the areas of trade and foreign investment, the actual success of countries to integrate into the world economy is increasingly diverse. Industrial countries had received most of FDI flows until early 1990s but developing countries have now received more FDI and account for 27 per cent of global stock of FDI (UNCTAD, 2010). In spite of this substantial increase in capital flows, the expected benefits have not materialized for many countries. During the surge in foreign capital flows since the mid-1990s, actual investment into new infrastructure and productive capacity stagnated. This can, in part, be attributed to the fact that much of FDI was spent on mergers and acquisitions (M&As) rather than on investment into new factories or equipment that would have added productive capacity. UNCTAD data show that mergers and acquisitions in part drove the FDI boom. In 2007, the value of worldwide mergers and acquisitions was US$
1,637 billion and it was 21 per cent higher than during its previous peak in 2000 (UNCTAD, 2008).

**Migration of Labor**

The flow of people across regions was a major feature of the globalization process. In 1960, the stock of total migrants in the world population was 2.7 per cent, and in 2005 this percentage had not changed. This has led some commentators to argue that globalization is characterized by increased capital flows and increased flows in trade and services, but not by increased labour flows. However, this characterization is misleading. In Europe, the stock of migrants as part of the population increased from 3.0 per cent in 1960 to 8.8 percent in 2005. The same ratio increased from 6.7 to 13.6 per cent in Northern America, from 13.5 to 16.4 percent in Oceania, and from 4.9 to 37.1 per cent in the Gulf States. By contrast, the ratio of the stock of migrants to the local population declined in Africa, Asia and Latin America as a whole (Hoeven, 2010).

The increase in migration flows has a number of positive impacts in economic terms but can also be a source of difficulties if integration into the host community proves challenging. One of the most visible impacts of the increase in migration flows is the rise in worker remittances. These have been estimated to be in the order of US$400 billion in 2006, exceeding by far the official development assistance of OECD countries to developing countries (WTO, 2008).

**Wage Share and Wage Inequality**

Another development is the declining share of wages in GDP and the growing wage inequality seen in several regions around the world. The wage share declined over the period 1995-2007 in two thirds of the developing countries. The only exception was the Latin American region, where some countries witnessed an increasing wage share.

In addition to it, the distribution of wage among wage earners has worsened. The average wage of the top 10 per cent of wage earners (in relation to the bottom 10 per cent) is found to have increased in 70 per cent of the countries (Hoeven, 2010). The underlying reasons for the increasing wage inequality vary across countries. Wage inequality is growing due to deterioration in the lowest wages and faster increase in top wage earnings than in other wage groups. The wage share has declined faster in countries with a higher openness to international trade. The wage gap
between women and men is also still high and is closing very slowly. This is disappointing in the light of women’s recent educational achievements and the progressive closing of the gender gap in work experience (ILO, 2008-09).

Multinational Corporations and Growth in Trade

Another noticeable trend over the last two decades has been the internationalization of the production process. Today, there are some 82,000 multinational corporations (MNCs) with 810,000 affiliates in the world (Hoeven, 2010). These companies play a major role in the world economy. For instance, exports from foreign affiliates of MNCs are estimated to have grown from about one quarter of total world exports of goods and services in 1982. These MNCs are dominated by a smaller number of large firms. The largest 100 MNCs account for 11 per cent of total employment by MNCs and for about 4 per cent of world GDP. Over the last 15 years, the largest MNCs have undergone a rapid process of internationalization. There has also been an increase in the proportion of companies operating in the service sector and of firms based in developing countries.

Growth of Trade in Commercial Services

Technological innovation has been one of the main forces driving global integration. Massive investments in road infrastructure and revolution in information and communication technology have allowed large growth of trade in manufacturing and commercial services since 1980. New products such as the microprocessor, the personal computer, the cellular phone, internet and World Wide Web have contributed to profound socio-political and economic transformation.

World exports of commercial services rose at an annual average rate of 11 per cent during 2000-06 from a lower annual rate of 5 per cent during the second half of the 1990s. The fastest growths of the major services categories include transport followed by travel (10 per cent) and other commercial services (10 per cent). The share of other commercial services in the total value of exports was 51 per cent, while travel and transport each represented 25 per cent and 23 per cent respectively in 2008 (World Bank, 2008).

World Trade Organization: An Engine of Globalization

The General Agreement on Tariffs and Trade (GATT) was established in 1948 in Geneva to
pursue the objective of free trade in order to encourage growth and development of all member countries. The principal purpose of GATT was to ensure competition in commodity trade through the removal or reduction of trade barriers. The first seven rounds of negotiations conducted under GATT were aimed at stimulating international trade through reduction in tariff barriers and by reduction in non-tariff restrictions on imports imposed by member countries. The 8th round of Multilateral Trade Negotiations, popularly known as Uruguay Round was started in September, 1986 at a special session of GATT Contracting Parties held at Ministerial level.

World trade had undergone a structural change during the five decades since the establishment of GATT in 1948. In the case of trade, liberalization was pursued multilaterally through successive GATT negotiations. Increasingly, bilateral and regional trade agreements became an important aspect of (preferential) trade liberalization as well. World Bank and the GATT played an important role in the process of globalization. They have provided cohesion and greater coherence to international economic policymaking.

The share of agriculture in world merchandise trade, which was 46 per cent in 1950, had declined to 13 per cent in 1987. Simultaneously, the structure of employment and contribution of various sectors to GDP of developed countries had undergone a qualitative change. The share of services in GDP of developed countries was rapidly increasing. For instance, in USA, services represented two third of GDP and employed over 70 per cent of workforce. In 1980, US exports of services amounted to US$ 35 billion. In the commodity sector, the comparative cost advantages had moved in favour of Japan and several other newly industrialized nations. These factors compelled developed countries, under the leadership of USA to take the initiatives of bringing services into trade negotiations.

Thus, Uruguay Round (UR) contained the mandate to have negotiations in 15 areas. In Part I, negotiations on Trade in Goods were to be conducted in 14 areas and in part II negotiations on Trade in services were to be carried out.

Part I (Trade in goods) declaration in UR contained the following: 1) Tariff, 2) Non-tariff, 3) Tropical products, 4) Natural resources based products, 5) Textile and clothing, 6) Agriculture, 7) GATT articles, 8) Safeguards, 9) MTN (Multinational Trade Negotiations), 10) Subsidies and countervailing measures, 11) Dispute settlement, 12) Trade related aspects of Intellectual Property
Rights (TRIPS), 13) Trade Related Investment Measures (TRIM’s) and 14) Functioning of GATT system (FOGS). Thus, besides the traditional GATT subjects, certain new areas, Trade Related aspects of Intellectual Property Rights, Trade Related Investment Measures, and Trade in Services were included for the first time for the negotiations.

The process of liberalization culminated into WTO, which incorporated broader parameters of policy and envisaged a liberalization rule-based trade regime. The establishment of World Trade Organization (WTO) in 1995 as a watchdog on Trade marked an important turning point and the beginning of the new era in the world economic management. At present, 151, countries are members of WTO and about 40 more countries are in line for becoming the members. WTO contains various trade procedures acceptable to both developed and developing countries. It is based on the principles of non-discrimination and provides predictable basis of trade. In the globalized context, WTO also takes note of matters incidental and ancillary to trade and investment such as, employment standards, reduction of tariff rates, investment protection, trade and environment, and trade and employment.

**WTO: Issues of Prime Significance Giving Impetus to Trade, Capital and Factor Flows**

**Removal of Quantitative Restrictions**

Quantitative restrictions or QRs are specific limits imposed by countries on the quantity or value of goods that can be imported or exported. QRs can be in the form of a quota, a monopoly or any other quantitative means. In other words, QRs refer to non-tariff measures, which are taken to regulate or prohibit international trade. The process of removal of QRs was already on its way as a part of economic reform process in India since July 1991.

India has made significant efforts at removing non-tariff barriers to trade since July 1991. India has been maintaining QRs on imports during the last several decades under Article XVIII: B of GATT. India had notified 2714 tariff lines in May 1997 to the WTO on which quantitative restrictions were being maintained under Article XVIII: B of the GATT. However, there was complete elimination of QRs in 2001.

**Commitment to Reduction of Tariff Barriers to Trade**

India has iterated and reiterated her commitment to reduction of tariff barriers. India’s potential
competitiveness in world export markets was primarily in the simpler manufactured consumer goods, but due to reluctance of the Government of India to expose this sector to competition there was a corresponding delay in its restructuring to gain competitiveness. It was only in the year 2001, fully 10 years after the reforms began that licensing control on the import of consumer goods was removed. The process of tariff reduction was also gradual. We began with an average tariff level of 128 per cent in 1991. This was brought down to 34.4 per cent by 1997, but this was followed by a slight reversal after a change of government at that time and average tariff levels increased to 40.2 per cent by 1998. Thereafter, the trend of reducing tariffs was resumed; reaching 10 per cent in 2006-07 and it is proposed to reach at 5 per cent by the end of the Eleventh Plan. The slow pace of trade reforms meant that domestic industry was slow to restructure and this was all the more so because there was no predetermined schedule for the pace of opening up. The broad direction of change was clearly stated but no precise time schedule was announced. Instead, the approach was opportunistic — changes were made, generally in the right direction according to the perception of political feasibility.

Non-Tariff Barriers Strategy for Protection to the Domestic Economy

In order to avail the benefits of raising barriers to trade, Non-tariff barriers (NTB’s) can be used by WTO members. There are many types of NTB’s (other than Quantitative Restrictions). As a tariff increase is not permissible, India has been using NTB’s permissible under the WTO framework to protect the domestic producers.

Trade measures that cause increase in prices, prohibit the entry of some products, or increase custom procedures for imports and exports, are legal, if they are applied to address issues such as material damage to domestic industry, human and animal health, environmental protection, and national security. Though there are rules and guidelines that govern the conditions under which the trade restriction may be applied, they often provide legal space/loop holes for trade restrictions having protectionist intention.

Trade Related Aspects of Intellectual Property Rights (TRIPS)

The agreement on TRIPS establishes minimum standards of protection for a wide variety of intellectual property. Intellectual property rights can be defined as the rights given to people over the creation of their minds. In the post-GATT era, intellectual property rights (IPRs) are being
considered as tools to create wealth through knowledge. The only mean to safeguard the technology is by IPR instruments. It gives justification for patents, as it gives its investor the incentives for further research and attracts more personnel into the field of sciences, technology and other R&D activities.

In the wake of the Trade Related Intellectual Property Rights (TRIPs) agreement of 1994, there has been renewed interest on various economic phenomena, technology transfer being one of them. The transfer of technology is a rather complex phenomena and occurs in several different ways—some indirect, such as international trade, foreign direct investment and the movement of personnel, and some direct, such as overseas research and development via affiliates, and licensing.

Technology transfer today is not quite the same phenomenon that it used to be in earlier centuries. With the passage of time, the predominant proportion of technology has come to be concentrated in the hands of multinational corporations, rather than individuals and the licensing of technology has become an important vehicle of technology transfer between nations. According to World Bank data, the royalty and license fee payments by developing countries totaled almost US$ 27 billion in 2007 (World Bank 2009). Table 4.1 shows that developed countries account for a large share in world export of royalties and license fee than developing countries but it is growing at a faster rate in the latter than in the former. The receipt of royalty and license fee has grown at an average rate of 11 per cent for the period 2000-09 whereas in CIS and Asia, it is growing at a rate of 21 per cent per annum and 10 per cent per annum respectively. The payment of royalty and license fee in India has escalated from US$ 7.24 million in 1990 to US$ 186.02 million by the end of 2008-09 whereas the receipts have grown at a lesser rate due to lesser research and development in the country.

With the enactment of Third Indian Patent (Amendment) Act in March 2005, now the country has fulfilled its commitment to TRIPs agreement. Recent amendments to the Indian Patent Act have also boosted confidence among international players. This has resulted in clustering of R&D centers in new cities such as Hyderabad, Lucknow, and Pune. The royalty and license fee receipts have jumped four folds to US$ 19.2 million in 2008-09 from US$ 5.23 million in 2004. An increasing trend is also discernible in the number of patents granted to companies by the Indian Patent Office. Among Indian patents, the drugs and electronics industry has shown a sharp
TABLE 4.1

WORLD RECEIPT OF ROYALTIES AND LICENSE FEE BY REGION (2000-09)

<table>
<thead>
<tr>
<th>Region</th>
<th>Share (%)</th>
<th>Annual Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>North America</td>
<td>55.4</td>
<td>42.4</td>
</tr>
<tr>
<td>South and Central America</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>Europe</td>
<td>26.9</td>
<td>40.8</td>
</tr>
<tr>
<td>European Union (25)</td>
<td>-</td>
<td>35.1</td>
</tr>
<tr>
<td>Commonwealth of Independent States (CIS)</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>Asia</td>
<td>15.0</td>
<td>13.8</td>
</tr>
</tbody>
</table>

Source: http://www.wto.org/english/res_e/statis_e/its2010_e/its10_trade_category_e.htm

increase in recent years. The number of patents granted to residents and non-residents in India has also been increasing over the years, although the patents granted to non-residents have been about three to four times greater than those granted to Indians.

**General Agreement on Trade in Services**

The general agreement on trade in Services, commonly referred to as GATS provides an internationally accepted legal framework for promotion of liberalization of trade in services. The term ‘services’ encompasses a broad range of industries that provide the basic economic infrastructure (communication, transport, distribution, energy-related services, construction, water supply, sanitation and sewerage services, waste collection, and disposal), financial infrastructure (banking, insurance, financial markets), support to business (advertising, marketing, computer services, professional services), or needed social infrastructural (education, health and social services). In the process of economic development, the high growth of services sector is phenomenal in recent decades rather than simultaneous growth of primary and secondary sectors. This is directly due to the development of the information technology. It benefits consumers by offering
them a broader range of choice and lower prices and creates market access opportunities for domestic firms and helps in transfer of technology.

The development of services is now regarded as one of the pre-conditions of economic growth, and not as one of its consequences. Table 4.2 shows the growth of commercial services exports in the different regions of the world by category. Export earnings of commercial services have grown more than twice since 1995 from an annual average rate of 5 per cent during the period 1995-00 to 11 per cent per annum during the period 2000-06 worldwide. In North America the export earnings has marginally declined during the same period whereas in Asia the commercial service export earnings has grown three fold from an average rate of 4 per cent per annum to 12 per cent per annum during the same period. Commonwealth of Independent States (CIS) and Middle East have also shown robust growth in export earnings of commercial services. It shows that the traditional role of developing countries is changing from mere recipients to employment providers of long-distance services. An important aspect of the “service revolution” is that geography and levels of industrialization are no longer the primary determinants of the location of facilities for production of services.

**TABLE 4.2**

**GROWTH OF COMMERCIAL SERVICE EXPORTS BY REGION 1996-06**

(ANNUAL % CHANGE)

<table>
<thead>
<tr>
<th>Years</th>
<th>World</th>
<th>North America</th>
<th>South and Central America</th>
<th>CIS</th>
<th>Africa</th>
<th>Middle East</th>
<th>Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-95</td>
<td>9</td>
<td>8</td>
<td>9</td>
<td>-</td>
<td>7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1995-00</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>-</td>
<td>4</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>2000-06</td>
<td>11</td>
<td>6</td>
<td>8</td>
<td>19</td>
<td>13</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>2004</td>
<td>20</td>
<td>13</td>
<td>15</td>
<td>28</td>
<td>21</td>
<td>16</td>
<td>27</td>
</tr>
<tr>
<td>2005</td>
<td>11</td>
<td>10</td>
<td>18</td>
<td>20</td>
<td>12</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>2006</td>
<td>12</td>
<td>9</td>
<td>13</td>
<td>23</td>
<td>11</td>
<td>14</td>
<td>17</td>
</tr>
</tbody>
</table>

Globalization/Global Integration of Economies and the Role of ICT

In the global economy of 21st century, a country’s development-policy challenges require it to use knowledge more effectively to raise the productivity of agriculture, industry and services and reduce poverty. Knowledge is more important today than ever, as the twin forces of globalization and technological advances are spurring an ongoing knowledge revolution.

This dynamic process is creating constant restructuring at the global, country, sector, and firm levels. It has risen tremendous possibilities for enhancing growth and competitiveness, but it also carry the risk that countries or firms and organization will fall behind if they cannot keep up with the pace of rapid change. Consequently, countries’ competitiveness depends more than ever on their ability to access, adapt, utilize, and create knowledge (Dahlman and Utz, 2005).

The term “knowledge economy” reflect this increased importance of knowledge for economic development. Use of knowledge has been always a critical ingredient of economic success; however, its importance has increased in recent times to the point that knowledge has become the key driver of economic competitiveness and success. Improved knowledge has led to increased productivity and the creation and application of new technologies has increased the range of products and services. It has brought revolutionary change to virtually all markets and sectors.

Emerging Knowledge Economy of India

The knowledge economy is often taken to mean only high-technology industries or ICTs, but the more important question is how economies are using appropriate knowledge to improve productivity and increase welfare. Creation of new knowledge and use of existing knowledge can be relevant in a variety of circumstances, manifesting not just as leading-edge scientific discoveries, but, more generally, on how to do things better. For example, application of new techniques to subsistence farming can significantly increase yields, and use of information and logistical services can allow traditional craft sector to serve much wider markets than before.

In short, a knowledge economy is one that creates, disseminates, and uses knowledge to enhance its growth and competitiveness. Successful transition to a knowledge economy is founded on four essential pillars (Box 4.1). Making effective use of knowledge in any country requires developing appropriate policies, institutions, and investment and coordination across these four
pillars, because of the strong interdependence that exist among them. The economic and institutional regime is in a sense the most critical pillar of the knowledge economy, because it provides the context for the effectiveness of the other three functionally focused pillars (education, innovation, and ICTs).

**BOX 4.1**

**FOUR PILLARS OF KNOWLEDGE ECONOMY**

1. An economic and institutional regime that provides incentives for the efficient creation, dissemination and use of existing knowledge
2. An educated and skilled population that can create and use knowledge
3. An efficient innovation system of firms, research centers, universities, consultants, and other organization that can tap into the growing stock of global knowledge and adapt it to local needs
4. Dynamic information infrastructure that can facilitate the effective communication and processing of information


**Economic and Institutional Regime**

The economic and institutional regime allows organizations, people and institutions to adjust to changing opportunities and demands in flexible and innovative way. An effective economic and institutional regime includes a competitive environment that stimulates improved economic performance, a financial system that mobilizes and allocates capital to more productive uses, flexible labor markets. Compared with the rest of the world, India has improved its relative position on this pillar. India leads the South Asia and Africa regions, as well china, on its economic and institutional regime since 1995 (Dahlman and Utz, 2005). Several strengths of India’s economic and institutional regime compared with China are democracy; entrepreneurship; stronger infrastructure; supporting private enterprise; efficient capital markets; more advanced legal system and an independent judiciary.

The 1990s have seen progressive integration of Indian economy into global economy. In
the early 1990s, liberalization of investment and foreign exchange regime stimulated industrial and service growth. The real depreciation of rupee after the 1990-91 crisis promoted exports, and reduction of import barriers allowed more foreign goods into the country. With greater import liberalization and tariff exemptions, Indian firms have gained access to imports at world prices, which has helped to encourage exports.

**Education and Human Resources**

Education is the fundamental enabler of knowledge economy. Well-educated and skilled people are the key to creating, sharing, disseminating, and using knowledge effectively. The knowledge economy of twenty-first century demands ICT competencies in addition to ‘hard’ skills such as literacy. It includes a new set of skills that include ‘soft’ skills such as communication skills problem solving skills, creativity and teamwork. These are increasingly important for all workers in the knowledge economy. The development of knowledge economy requires a flexible education system. It begins with basic education that provides for foundation of learning; continues with secondary and tertiary education that develops core skills; encourages creative and critical thinking that is the key to problem solving and innovation; and extends into a system of lifelong learning. A large pool of highly educated and vocationally qualified people in India is making their mark at home and abroad in science, engineering, IT, and R&D. However, they make up only a small fraction of India’s population. To become a knowledge economy India needs to keep developing its human capital base creating knowledge workers to contribute to its growth, development and competitiveness in the global economy.

Rates of literacy among the population have risen considerably in India in the past ten years. The 2001 census recorded literacy rates of 65.4 percent, up from 52.2 percent in 1991. The male literacy rate is 75.9 percent (up from 56 percent in 1991), compared with 54.2 percent for women. The gap between male and female rate has narrowed from 28.8 percent in 1991 to 21.7 percent in 2001. However, considerable regional variations exist. Kerala has a literacy rate of 91 percent, whereas Bihar has only 48 percent.

Since independence, India’s economic development has hinged on the strategy to achieve economic and technical self-reliance. It was evidently visualized that self-reliance would be unattainable unless based on domestically groomed work force and skill. A strong emphasis was
laid on an accelerated rate of human capital formation by perceptibly investing in education, health and research and training. In its size and diversity, India has the third largest higher education system in the world, next only to China and the United States. Before Independence, access to higher education was very limited and elitist, with enrolment of less than a million students in 500 colleges and 20 universities. Since independence, the growth has been very impressive; the number of universities (as on 31st March, 2006) has increased by 18-times, the number of colleges by 35 times and enrolment more than 10 times (Government of India, 2006-07). The system is now more mass based and democratized with one third to 40 per cent of enrolments coming from lower socio-economic strata, and women comprising of some 35 per cent of the total enrolments. Education in India has received enormous financial support from both the Central and the State Governments. In 1962, the total public expenditure on education was only 1.52 per cent of GDP and in 2009 it has grown to 3.78 per cent of GDP as shown in Table 4.3. An analysis of total

<table>
<thead>
<tr>
<th>Years</th>
<th>Share of Public Expenditure on Education in GDP</th>
<th>Share of Total Expenditure on Health in GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962</td>
<td>1.52</td>
<td>-</td>
</tr>
<tr>
<td>1981</td>
<td>2.98</td>
<td>-</td>
</tr>
<tr>
<td>1998</td>
<td>3.49</td>
<td>5.10</td>
</tr>
<tr>
<td>2000</td>
<td>4.19</td>
<td>5.00</td>
</tr>
<tr>
<td>2001</td>
<td>4.28</td>
<td>4.90</td>
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<tr>
<td>2002</td>
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<td>4.80</td>
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<tr>
<td>2003</td>
<td>3.78</td>
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</tr>
<tr>
<td>2004</td>
<td>3.51</td>
<td>4.10</td>
</tr>
<tr>
<td>2005</td>
<td>3.36</td>
<td>4.20</td>
</tr>
<tr>
<td>2006</td>
<td>3.46</td>
<td>4.10</td>
</tr>
<tr>
<td>2007</td>
<td>3.64</td>
<td>4.10</td>
</tr>
<tr>
<td>2009</td>
<td>3.78</td>
<td>6.10</td>
</tr>
</tbody>
</table>

Source: http://www.who.int/whr/2006/annex/06_annex2_en.pdf
http://education.nic.in/planbudget/GDP51-09.pdf
expenditure on health shows that the share of total expenditure on health in GDP has increased to 6.10 per cent in 2009 as compared to 5.10 per cent in 1998.

Recent developments have shown that India has become a major international center for the recruitment of high-quality IT staff. Many IT workers leave, but many return, and both flows generally lead directly and indirectly to significant knowledge transfers and linkages across businesses entities that benefit Indian society as well as individuals. Young IT professionals as well as medical professionals want to go abroad mainly to gain professional experience, which they think will be highly valuable in India when they come back. In addition, they are encouraged by higher earnings, perks, and high quality of life in the host country. Bangalore is becoming a ‘corridor’ for migration (outward and inward) of Indian human resources in sciences and technology. IT professional in Bangalore believe they have growing opportunities for career growth in India in general and Bangalore in particular. India must keep on building a cadre of technicians, professionals, and knowledge workers who will be the backbone of the knowledge-based economy.

**Innovation System**

The third pillar of the knowledge economy is the existence of an efficient innovation system. The innovation system plays an important role in acquiring, creating, adapting and disseminating knowledge. The innovation system in any country consists of network of institution, rules and procedures that affect creation and dissemination of the knowledge. For a developing country like India, tapping and effective use of existing global knowledge will have a greater economic impact.

India generally has great strengths in R&D, scientists and engineers, and technical publications, but she is weak on turning its research into profitable applications. In terms of inputs into the innovation system, India spends only a small fraction of its GNP on R&D: 0.86 per cent of GDP in 2001. One year after independence, India spent only a meager Rs. 11 million on R & D activity in the Central Government sector. Four decades later, the figure grew to more than Rs. 30,000 million. In the year 1991-92, Rs. 48306.40 million were spent on R&D, of which Rs. 38272.30 million were spent by the Central Government and the approximate corresponding figures for the states sector and the private sector are Rs. 3719.40 million and Rs. 6314.70 million respectively. It further escalated to Rs. 216395.80 million in 2004-05. R&D spending as percentage of GDP
in India is only 0.8 per cent as compared to China’s 1.23 per cent. Developed countries have 
R&D expenditure of up to 3 per cent of GDP (Sibal, 2008). Of the 0.8 per cent expenditure in 
India, 80 per cent is by public sector while the private sector share is only 20 per cent.

India lags behind China in spending on research and development work as well as number 
of scientific researchers. Number of persons doing research and development in Scandinavian countries 
was 7,000 per million of population and 4,700 per million of population in the US while in India, 
there were 156 researchers per million of population in 2008. India is placed within the lower end 
of dynamic technology adopters. It is because of huge variations in technological achievements 
among Indian states. Other reasons also exist. Even though the country has one of the world’s 
largest pools of scientists and engineers, its average years of schooling were just more than five 
years and the adult literacy rate was about 65 per cent. These indicators matter, because they 
affect the ability of a country to harness technology and innovations for its developments. To its 
credit, India has been making notable progress in terms of strengthening R&D infrastructure, 
developing technological innovations and alerting the mindset of its people towards better technology 
absorption.

Despite the challenges, the overall Indian innovation system presents some remarkable 
features. India has a dynamic hub of innovation: Bangalore, with its 1.50 lakh strong army of 
software engineers has developed a strong innovation “cluster” in IT, characterized by corporate 
offices, venture capitalists, and business start-ups, and university and research labs. India also 
has vast and diversified publically funded R&D institutions such as Indian Space Research 
Organization, CSIR, Indian Council of Medical Research, Indian Council of Medical Research, 
and World Class higher education Institutions (IITs and RECs). These institutions provide critical 
human capital needed for the innovation.

India has recently been very successful in attracting R&D investments. About 100 MNCs 
have set up R&D centers in India, for example, GE, McDonald’s, General Motors, Delphi, Eli 
Lilly, Hewlett-Packard etc. Large companies are coming to India to take not only the advantage 
of India’s human resource, but also to reap cost advantages. Not all MNCs in India, however, 
work at cutting edge of technology. Most of them do developmental research, which develops or 
improves existing products. Some have expressed concern that the trend to MNC R&D investment 
in India is exploiting not only its most valuable human resource but it has important benefits for
Indian industry. Linkages in R&D between local universities, research institutes, and firms on the one hand, and the R&D network of multinationals on the other will help to integrate India further into global technology development activities.

The new trend of outsourcing of high-end R&D to India is evident from the large number of established R&D outsourcing centers in India, from IT and telecom to automotive and pharmaceutical sectors. The R&D outsourcing markets for IT industry in India is expected to grow from US$ 1.30 billion in 2003 to more than US$ 8 billion by 2010. Outsourcing in new areas by companies from developed countries is gradually leading to the development of many critical skills and technologies needed in the country. It will help to raise India’s technological capability with relatively modest investments.

**Information Infrastructure**

Fourth pillar of knowledge economy is a dynamic information infrastructure that can facilitate effective communication, dissemination and processing of information. Rapid advances in ICTs are dramatically affecting the acquisition, creation, dissemination and use of knowledge. It affects economic and social activities including how manufacturers, service providers and government are organized and how they perform these functions. Applications of ICTs are improving the efficiency of existing services and creating new opportunities in trade, governance, education, business activity, health-care delivery and environmental and natural resource development. The use of ICT is reducing transaction cost, time and space barriers. It allows the mass production of customized goods and services and it has become a backbone of the knowledge economy. This means that countries need to harness to full potential of ICTs for all sectors of economy: for education, innovation, learning, public and private sector management.

The information infrastructure in a country consists of telecommunication networks, information systems, policy framework and skilled human resource. The government of India created favorable conditions to increase ICT penetration in the country. India’s telecoms sector has registered rapid growth in recent years due to reforms and introduction of greater competitions in the sector. The number of fixed lines and cellular subscribers in India has increased perceptibly, especially in the post-reform period. Today, the Indian telecom network with over 621 million connections (as on March 2010) is the third largest in the world. The sector is growing at a speed of 45 per cent.
during the recent years (Government of India, 2010). The rapid strides in the telecom sector have been facilitated by liberal policies of the Government that provides easy market access for telecom equipment and a fair regulatory framework for offering telecom services to the Indian consumers at affordable prices.

Today the wireless subscribers are not only more than wire line subscribers in the country, but also increasing at a much faster pace as shown in figure 4.1. The share of wireless phones in the total subscribers has increased from 2.28 per cent in 1996-97 to 94.05 per cent in 2009-10. This growth has resulted in increase in teledensity in India from 0.68 per 100 people in 1991-92 to 52.74 per people 100 in 2009-10.

Videsh Sanchar Nigam Limited (VSNL) launched internet services in India in 1995. By the end of March 1998, the number of subscribers barely reached 0.14 million. In November 1998, the Government recognized the need for encouraging the spread of internet in the country and opened the sector for private operators. In 2004, the Indian government announced its Broadband and Internet Policy that gave impetus to broadband and internet penetration in the country. As a result, the number of internet subscribers shot up from 0.09 million in 1996-97 to 12.3 million in 2008-09 as shown in Figure 4.2 above. Broadband subscribers have continued to grow since the beginning of 2003. Total number of broadband subscribers in the country has reached 5.65 million as against 0.04 million in 2003-04 and it is expected to reach 20 million by 2010. Broadband has ushered in new set of services including online games, entertainment, education and other interactive public utility services. Internet communication in India is developing rapidly and public sector providers (BSNL/MTNL) dominate the market. Their dominance in fixed landline services put them in an advantageous position to offer combo plans (where user of voice service can avail internet service also).

Despite these achievements, when viewed in a global perspective, the rates of teledensity and ICT penetration for India remain rather low as depicted in Table 4.4. The global benchmarking shows that even though India does better than South Asia and Africa Regions in terms of Information infrastructure indicators, the country has slightly worsened its performance between 1995 and 2005, whereas China has moved far ahead. This is because, despite the several-fold increase in number of fixed line telephones, computers and internet users in absolute terms; the country has maintained its position in telephones, computers but fallen behind in internet users in
FIGURE 4.1
GROWTH OF TELECOM SUBSCRIBERS IN INDIA (%) 


FIGURE 4.2
GROWTH OF INTERNET AND BROADBAND SUBSCRIBERS IN INDIA (%) 

relative terms. China has made a remarkable progress in improving its overall infrastructure. To take an example of just one indicator; total ICT expenditure as percentage of GDP in India was 2.78 per cent in 2002, compared with more than double at 5.81 in China and 8.3 per cent in Brazil. The low level of spending in India has been due to a high level of regulation, lack of local applications, and high tariff on hardware, among others. More investment is required so that India can make strides in strengthening its infrastructure.

<table>
<thead>
<tr>
<th>Variable</th>
<th>India</th>
<th>China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone subscribers per 100 inhabitants, 2007</td>
<td>23.36</td>
<td>68.71</td>
</tr>
<tr>
<td>Mobile subscribers per 100 inhabitants, 2007</td>
<td>19.98</td>
<td>41.19</td>
</tr>
<tr>
<td>Internet users per 100 inhabitants, 2007</td>
<td>6.93</td>
<td>16.10</td>
</tr>
<tr>
<td>Computers per 1000 people, 2002</td>
<td>7.20</td>
<td>27.60</td>
</tr>
<tr>
<td>T.V. sets per 1000 people, 2002</td>
<td>83.00</td>
<td>350.00</td>
</tr>
<tr>
<td>Radios per 1000 people, 2001</td>
<td>120.00</td>
<td>339.00</td>
</tr>
<tr>
<td>Daily newspapers per 1000 people, 2000</td>
<td>60.00</td>
<td>42.00</td>
</tr>
<tr>
<td>Internet host per 1000 people, 2003</td>
<td>0.82</td>
<td>1.28</td>
</tr>
<tr>
<td>Internet users per 1000 people, 2003</td>
<td>174.86</td>
<td>632.48</td>
</tr>
<tr>
<td>International telecommunication, cost of call to the US 2002 (US$ per 3 minutes),</td>
<td>3.20</td>
<td>6.70</td>
</tr>
<tr>
<td>ICT expenditure as percent of GDP, 2002</td>
<td>2.78</td>
<td>5.81</td>
</tr>
</tbody>
</table>

(ii) International Telecommunication Union (2009), Basic Indicators, accessed on 26th April 2009, available athttp://www.itu.int/ITUD/icteye/Indicators/Indicators.aspx#

India’s Global Standing in Information Communication Technology

A number of indexes have been developed to rank countries’ performance on ICTs. The indexes provide a variety of ranking on where India stands in a global perspective and differ with regard to their context and specific informational functions. One possible explanation for
the differences in India’s ranking is the way the different indexes are calculated; all of them use
different methodology and differ in scope in terms of the number of countries and indicators
covered.

*Networked Readiness Index*

its Networked Readiness Index (NRI) of 104 countries. The NRI measures the degree of
preparation a nation or community has to participate in and benefit from ICT developments. The
NRI is composed of three components:

- Environment for ICT offered by a given country or community.
- Readiness of the community’s key stakeholders.
- Usage of ICT among these stakeholders.

The NRI for 2004-05 places Singapore as the best performer worldwide. Singapore is
followed by Iceland, Finland, and Denmark, and the United States occupies the fifth place. In
terms of India and its comparators, Korea tops the list and holds 24th place, but India is next on
the list at 39th, surpassing China at 41st, Brazil at 46th, and Russia at 62nd.

*E-readiness Rankings*

It provides another interesting benchmark for countries in comparing and accessing their
ICT related environment. E-readiness takes into account factors like quality of IT infrastructure,
government initiatives and the degree to which internet is creating real commercial efficiencies.
The ranking covers world’s largest 64 economies. In the 2004 ranking, several countries have
improved their scores. Four tires of E-readiness have emerged in 2004 ranking:

- Denmark holds the top spot, and Korea is ranked 14th. Korea is the densest broadband
  market in the world.
- Second tire includes countries like Brazil (35th) and Poland (36th) that do not have dense
  communication internet infrastructure.
- Third tire includes large ‘e-ready’ economic powerhouses: India (46th), China (57th), Russia
  (55th).
- In the fourth tire is a cluster of markets in which internet services are struggling.
Information Society Index

The Information Society index (ISI) in 2004 measured the abilities of 53 nations to participate in information revolution. The ISI combines 15 variables in four infrastructure pillars. The four pillars are:

- Computers—This pillar look at basic building blocks of information society by measuring the PC households, IT spending as percentage of GDP, software spending as percentage of total IT spending and IT services spending.
- Internet—The internet is the key factor in development of advanced information society. It takes into account number of internet users, percentage of internet users at home, number of mobile internet users at home and e-commerce spending at home.
- Telecoms—This pillars measures broadband adoption, wireless services and mobile handset shipments.
- Social—This pillar evaluates a society’s ability to utilize information technology by measuring education, civil liberties and government corruption.

In 2004 ranking, Denmark was in first place, followed by Sweden, Korea (8th). Brazil took 38th place, Russia 41st, China 44th and India 51st.

E-readiness Assessment of Indian States

According to this report India differs from others by looking at the level of e-readiness of various Indian states. The report classifies Indian states into the following categories:

- Leaders—Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra and Chandigarh
- Aspiring leaders—Kerala, Gujrat, Delhi, Punjab and Haryana
- Expectants—West Bengal, Pondicherry and Madhya Pradesh
- Average achievers—Uttar Pradesh, Chattisgarh, Orrisa, Sikkim, Himachal Pradesh and Rajasthan
- Below average achievers—Mizoram, Jammu and Kashmir, Assam, Meghalya, Uttranchal and Jharkhand
- Least achiever—Lakshadweep, Manipur, Tripura, Arunachal Pradesh, Andaman Nicobar Islands, Bihar, Daman and Diu and Nagaland
ICT infrastructure and the ability to use it are clearly dispersed across Indian states. Some states in India, such as Tamil Nadu have improved by involving private sectors in development of ICT infrastructure and introducing ICTs in State-level policies. Kerala has used the high proportion of literacy and awareness of citizens for the development of ICTs. Madhya Pradesh has developed largely due to private sector involvement in developmental activities. In all cases, these Indian states have made progress due to leadership, connectivity, availability of skilled workers, increased private sector development and creation of institutional mechanism.

It is clear that developing countries must invest in building their information infrastructure; this includes not only telecommunication services, but also ensuring that these services are provided at the lowest cost. They should promote the ICTs to facilitate improvement in economic and social activities. Furthermore, as the applications of the ICTs becomes more important for economic growth and social welfare, special attention must be paid to new investment in improving the skills and competencies of workforce to use ICTs.