CHAPTER 5

VARIOUS ATTEMPTS

Measurement and quantification has been part of development, ICT and information society studies for the last several decades. Numerous efforts (listed in Annexure E), both at the institutional level and at the individual level have been carried out. This chapter seeks to outline various narrative reports and indexes used at different levels in order to understand the overall development scenario and approaches towards measuring either one or more concepts. An attempt is also made to briefly introduce the indicators used and indexes developed at the global, national and state levels.

Section 1 Measuring Development

One of the early efforts in the direction of establishing indicators of socio-economic development was undertaken by The World Bank. Although it measured development, this approach failed to provide a comprehensive and correct reflection of well-being. Hence a parallel effort by UNDP to develop a human development index began in 1990.

5.1 World Development Report (WDR)

The World Bank, since 1978-79 annually publishes World Development Reports and the World Development Indicators (WDI). These reports are World Bank attempts to provide policy and decision makers with comprehensive information related with development priorities, in order to contribute to better planning and hastening the achievement of the common global development goals. The WDI try to capture the most important issues facing the world in general and the developing countries in particular. The indicators are not used to create a composite index to measure socio-economic development, but are presented under various sections; analysis and guidelines based on them are given in each section. These indicators are organized in six sections 1 The world view, 2 People, 3 environment, 4 economy 5 State and Markets 6 the Global Links. The aim is to make statistical data lively and comprehensive and to paint a picture of the world and its people through it. The WDR is the state-of –the-art report based on the indicators.

Each year the Report focuses on a specific theme. The thematic analysis uses the rich database of World Development Indicators with an eye on international development goals. Selected indicators are utilized as the base indicators to support the chosen theme of each year and are presented as comparative socio-economic data for more than 210 economies. For example “Entering the 21st Century” was the theme of WDR 1999-2000. As the development landscape transformed in the last fifty years, presenting policy makers with new challenges at global and local levels, this report charted the way forward by analyzing the contours of the new landscape and distilling lessons from the past. (World Bank, 2000)
World Development Report 1998-99, twenty first in the annual series of WDR, focused on the theme “Knowledge for Development”. This report is of particular interest to the present study hence it is taken as an example to understand the structure of the WDRs. It examined the role of knowledge in advancing economic and social well being. Its objective was to emphasize that economies are built not merely through the accumulation of physical capital and human skill, but on a foundation of information, learning, and adaptation. It intended to explain how people and societies acquire and use knowledge, and why they sometimes fail to do so, since this understanding is essential to improve people’s lives, especially the lives of the poorest. It looked at the problems of development in a new way - from the perspective of knowledge, and focused on two sorts of knowledge: knowledge about technology and knowledge about attributes. The relationship between knowledge gaps and information problems, their impact on development, and the ways that international institutions and governments of developing countries could better address them were the central themes of this report. (World Bank, 1999)

The WDR 98-99 was presented with an overview of the theme, followed by three analytical sections. Section One entitled Narrowing Knowledge Gaps emphasized the power and reach of knowledge, and acquiring, absorbing and communicating knowledge. Section Two, Addressing Information Problems, had chapters on information, institutions, and incentives, processing the economy’s financial information, knowledge of the environment, and addressing the information problems that hurt the poor. Section Three was on Policy Priorities, suggesting what the international institutions and the governments should do. (World Bank, 1999)

The World Bank also produces the Knowledge Index (KI) and Knowledge Economy Index (KEI) since 1995. These are discussed in a later section. (World Bank, 2008a)

5.2 Human Development Reports (HDR)

Quantification of development has been a serious concern since long. GNP and Per Capita GNP were used to measure development for many years, but as the understanding of “development” as a concept widened, it was felt that these indicators could not capture various important facets of development. It was realized that development is something more than mere production of commodities and services. A team of economists at UNDP evolved the concept of the Human Development Index in 1990, and since then UNDP annually brings out its HDRs which provide deeper insight into measurement of development.

The first report, brought out in 1990 emphasised that “people” should be the central focus of every kind of development efforts in all nations. (UNDP, 1990) Creation of an enabling environment for people to live longer, healthy, and creative lives should be the prime objective of development. This new way of looking at development was quite appealing but the major challenge then was to figure out how to quantify well-being of people, and which parameters were needed to be included in such a
measurement. It was also important to define human development so that it could be measured. (UNDP, 1990)

The first HDR defined human development as the process of increasing people’s choices. These choices included the desire to live long, to acquire knowledge, to have a comfortable standard of living, to be gainfully employed, to breathe clean air, to be free to live in a community. Obviously not all these choices could be quantified or measured. The basic idea was to measure at least a few additional choices besides income and to reflect them in a methodologically sound composite index. Hence, to keep it simple, only a few variables were included initially; they were life expectancy for longevity, adult literacy for knowledge and GNP per capita adjusted for purchasing power parity as an indicator of access to a multiplicity of economic choices. Data for these variables were compiled for individual countries in every annual report. (UNDP, 1990)

With its HDR 2009, the UNDP has completed twenty years of bringing out its HDR annually. In the successive years each HDR came out with refinement of both, the concept and the measurement of human development. Each Human Development Report has focused on one important subject. Of these the HDR 2001 which was the 12th report from the UNDP focusing on ‘Making New Technologies Work For Human Development’ (UNDP, 2001) is of particular interest to the present work, as it emphasises the role of information and knowledge in the process of human development. HDR 2001 is taken as a base to gain an insight into the indicators and outcomes of human development reports.

5.2.1 Human Development Report (HDR) 2001

HDR 2001 looked at how people could create and use technology to improve their lives. The intention was to forge new public policies to lead the revolutions in Information and Communication Technologies (ICT) and Biotechnology (BT) in the direction of human development. It focused on the opportunities and challenges of technological transformations from the point of view of developing countries and tried to link technology and human development. A Technology Achievement Index directly related to the strategic priorities of all countries was introduced. The report argued that technology was a tool, not just a reward, for development and that technological change could advance human development by improving human health, nutrition and knowledge and by enabling communication, participation and economic growth. It firmly emphasised that the most notable form of development, which empowered people in the 21st century, was the acquisition of knowledge and the creation of technological capacity. (UNDP, 2001)

The outcomes of HDR 2001 became useful tools for policy related decisions. A core set of five human development indexes were evolved in the Report - namely The Human Development Index (HDI), The Human Poverty Index (HPI-1 and HPI-2), The Gender-related Development Index (GDI), The Gender Empowerment Measure (GEM) and the Technology Achievement Index (TAI). (UNDP, 2001)
HDR 2001 presented estimates of the HDI for 162 countries, as well as trends in the HDI for 97 countries having data for 1975-99. The results showed a substantial shift of the world’s people from low to medium levels of human development and from medium to high levels. As a summary measure of human development the HDI highlighted the success of some countries and the slower progress of others. For example, Venezuela started with a higher HDI than Brazil in 1975, but Brazil made much faster progress. The Republic of Korea and Jamaica had similar HDI ranking in 1975, but in 2001 Korea was on 27th rank and Jamaica on 78th.

Ranking by HDI and by GDP per capita can be quite different, showing that countries do not have to wait for economic prosperity to make progress in human development. Costa Rica and Korea both made impressive human development gains, i.e. HDIs of more than 0.800, but Costa Rica had achieved this human outcome with only half the income of Korea. So, with the right policies, countries can advance faster in human development than in economic growth. And if they ensure that growth favours the poor; they can do much more with that growth to promote human development.

The indicators included in computation of the Technology Achievement Index were based on four dimensions, the creation of technology (indicators used were patents granted per capita, royalties and license fees received per capita), diffusion of recent innovations (marked by number of Internet hosts, high and medium technology exports as a share of total exports), diffusion of old innovations (marked by number of mainlines and cellular telephones, electricity consumption per capita), and human skills (indicators included mean years of schooling and gross tertiary science enrolment ratio). It captured how well a country created and defused technology and built the human skill base which reflected capacity to participate in the technological innovation of the network age. (UNDP, 2001)

5.3 National Human Development Report (NHDR) 2001

In India too the appreciation of the need to anchor public policies and programmes in a social context grew. For any approach or development framework to be meaningful and effective it should reflect the values and development priorities of the society where it is applied. India, too, needed to develop a contextually relevant approach to human development, identify and devise appropriate indicators to help formulate and monitor public policy which should be tied with India’s stage of development as well as her social and economic diversity. Various attempts have been made at the national as well as state level in India to measure the human development.

The Planning Commission took a lead in addressing these issues and formed the project NHDR team which prepared the NHD report for the nation in 2001. The Report attempted to map the state of human development in India. The quality of life and the level of human well being in terms of change in a range of indicators had been tracked across states at different points of time over the last two decades. Since it was observed that in India there is a considerable difference in the level of attainments of people depending on their place of residence, whether it is in rural or urban areas, and on the sex of the person,
the report highlighted this inequality by estimating the Gender Gap and the Rural Urban Gap in all indicators where data was available.

The report identified contextually relevant indicators that reflected the prevailing social values and common development priorities of the states. In all 70 indicators were selected under various major sections such as Economic attainments and well-being, Education attainments, Health attainments and Demography, Other aspects viz. elderly, children, disabilities, law and order, crime and violence against women, physical environment and some indicators on Governance for human development.

A core set of composite indexes was evolved in the Report. The Human Development Index and The Human Poverty Index and were used to estimate human development and poverty in the country, state-wise and at urban and rural levels. Further, for the first time a Gender Equality Index was also constructed. The indexes together presented a quantitative estimate of attainment of the society as a whole, the extent of deprivation and the relative attainment of women as against men.

In addition to these indexes, the data for eight selected indicators were presented through Development Radars which gave a snapshot view of the structure, the growth and the gaps vis-à-vis desired normative levels, in respect of attainments in education, health, economic well being and access to amenities. These Development Radars were a diagrammatic representation of human progress of States separately for rural and urban areas on the selected eight social indicators for two points of time namely early 1980s and 1990s.

The HDI had been estimated for all the States/Union Territories, separately for rural and urban areas, for the early eighties, using data covering the period 1981 to 1983; for the early nineties, covering the period 1991 to 1993-94; and in case of selected major States for the year 2001, using data for the period 1999-2001. At the national level, HDI, which takes a value between 0 and 1, had improved from 0.302 in 1981 to 0.381 in 1991. The improvement for rural areas was from 0.263 to 0.340 and in case of urban areas, from 0.442 to 0.511. Though the rural-urban gap continued to be significant, it had declined. The ratio of urban to rural HDI declined from around 1.7 in the early eighties to 1.5 in the early nineties. At the State level, Chandigarh, Delhi, Kerala, Punjab and Himachal Pradesh were among the States with better HDI at both points of time. States like Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan and Orissa were at the other end. In fact, in the early eighties, these States had HDI close to half that of Kerala. In general, HDI was better for smaller States and Union Territories. The rural-urban gap in the HDI was the least in case of Kerala and the highest for Madhya Pradesh in the early nineties.

Based on the latest available data the HDI had been estimated for 2001 for selected major States only. At the national level it had increased to 0.470. The HDI varied between 0.638 in case of Kerala and 0.365 in case of Bihar. Among the better-off States, Punjab, Tamil Nadu and Maharashtra had a HDI value of above 0.52. At the other end, States like Uttar Pradesh, Assam and Madhya Pradesh had values less than 0.400. The gap between Kerala and next best State, i.e. Punjab, remained quite
significant, though it had declined. By and large the States maintained their relative position between 1981 and 2001. (India, 2001, p.25)

On the whole, while Tamil Nadu, Rajasthan, Madhya Pradesh, West Bengal and Bihar improved their HDI significantly in the eighties, in the nineties, the momentum was maintained only in case of Rajasthan, Madhya Pradesh and Uttar Pradesh. Tamil Nadu improved its ranking by 4 positions from 7 to 3, and Rajasthan from 12 to 9. On the other hand the position of Assam dropped from 10 to 14. Secondly, it turns out that for the economically better off states, as well as for the poor states, attainments on HDI and income levels showed a direct correspondence.

In other words, the poor states were also the states with relatively poor performance on HDI. Similarly, the economically better-off states were also the ones with relatively better performance on the HDI. However, the relation between the HDI and the level of development did not show any correspondence among the middle-income states in the country. In this category of states, some states like Kerala had high attainments on HDI, at the same time, there were states like Andhra Pradesh or even West Bengal where HDI values were not as high.

Thirdly, though at the national level, the economic growth in the nineties was nearly one percentage point higher than in the earlier decade, it had, perhaps, resulted in less human development in the nineties. This was primarily on account of performance of the outlier states and slower improvement in human development indicators for states already with higher HDI values. Finally, it turned out that inequality across States on the HDIs was less than the income inequality as captured in the per capita State Domestic Product. (India, 2001, p.26)

5.4 Gujarat Human Development Report (GHDR) 2004

In India, due to the social and economic diversity amongst states, and as mandated by the Indian Constitution, the responsibility for implementing social sector programmes rests primarily with the State Governments. India has the distinction of having the first sub-national State Human Development Report (SHDR) for the State of Madhya Pradesh in 1995. Since then, the state has published its SHDRs thrice - in 1998, 2002 and 2007. Nineteen other States namely Assam, Arunachal Pradesh, Delhi, Tamil Nadu, Himachal Pradesh, Karnataka, Sikkim, Maharashtra, Rajasthan, West Bengal, Punjab, Nagaland, Orissa, Gujarat, Chhattisgarh, Kerala, Tripura, Uttar Pradesh and Andhra Pradesh have launched their SHDRs. (UNDP, 2009) These reports, owned by the government and prepared by independent experts, serve as platforms for public accountability and action. The SHDRs focus on issues related to Poverty, Livelihoods, Health and Education as well as State specific development issues.

The SHDRs:

- Provide a sound analysis and a clear understanding of the complex and very often intertwined factors encompassing human development at the state and district level;
- Identify constraints being faced in achieving human development attainments and provide policy recommendations;
- Create awareness among policy makers and civil society about human development issues in the state;
- Facilitate learning and exchange of ideas by strengthening local networks and capacity building;
- Help the Government, NGOs and donor agencies streamline their development priorities in order to be more effective.

While some states had initiated construction of their state level HDR even before the national HDR, others followed the Planning Commission 2001 effort. A state level HDR for Gujarat was prepared as a project report in 1999 by two independent academicians, Indira Hirway and Darshini Mahadevia. However this was not published. In the year 2004 the Government of Gujarat, with full support of government officials, as well as a few reputed NGOs and academicians, assigned the work of constructing another human development report to the same team of experts. (Hirway and Mahadevia, 1999)

Gujarat Human Development Report 2004 is the first official Human Development Report of Gujarat. (Hirway and Mahadevia, 2004) It looked at human development as the goal as well as the development paradigm that was conducive to the promotion of development. The Report showed that the status of human development in Gujarat was determined by the macro development path, the efforts made in sectors like literacy and education, health and nutrition etc., and by the micro level preparedness and empowerment of communities. The State experienced a deceleration in the achievements of human development in the 1990s, in spite of a high rate of economic growth. The Report therefore recommended a strategy that strengthens the linkage between economic growth and human development. It also identified critical areas for interventions at different levels and in diverse sectors for promoting human development in the State.

After a thoughtful discussion of the strengths and weaknesses of the UNDP indexes in general and in the context of India in particular, the new human development indexes, named Human Development Measures (HDM) were proposed by the team. Four such measures for India were presented and used in the GHDR. These are as follows.
1. Human Development Measure-1 (HDM-1) that measured opportunities/capabilities of individuals.
2. Human Development Measure-2 (HDM-2) that measured macro level capabilities and opportunities available to both men and women and included macro capabilities relating to macro processes and structures.
3. Gender Development Measure-1 (GDM-1) that measured the level of capabilities/ opportunities available to women in relation to men. GDM-1 was HDM-1 adjusted for gender inequality.
4. Gender Equity Index (GEI) that measured gender inequality per se, independent of level of development.
In the ‘command over resources’ group three different indicators of income and poverty were used for HDM-1/GDM-1 at state level and district level

(i) **HDM-1/GDM-1 at state level**: Per capita income.

(ii) **HDM-1 at district level**: Since district incomes are not available, the indicator used was per capita bank deposits.

(iii) **GDM-1 at district level**: Agricultural wages

Other indicators used were adult literacy rate, percentage attending school (using the net enrollment rate as well as retention rate), infant mortality rate, total fertility rate, percentage of households with all the three basic facilities of potable drinking water, sanitation and electricity, work participation rate, number of main workers, percentage voting in the previous state assembly + parliamentary elections, and population per lakh voters contesting in the previous state assembly + parliamentary elections.

Indicators used for HDM-2 at the districts level were percentage of area under wastelands, percentage of villages connected with pucca roads, percentage of villages with a high school, percentage of village sub-centres having buildings, Inter-district variations in relative index of development, Juvenile sex ratio, and percentage of women ever married in the age group 10-14.

Construction of different human development indexes helped to understand where Gujarat stood at the all-India level and assessed the relative position of different districts with respect to different aspects of human development. The report also discussed lessons to be learnt for the future. These lessons were related to (i) macro policies and sectoral development policies; (ii) policies pertaining to major components of human capabilities such as education, health and so on; (iii) policies with regard to government spending; and (iv) interventions needed at disaggregated level for specific regions and for specific socio-economic groups.

It was observed that in spite of the increase in the rate of economic growth in the state during the 1990s, Gujarat’s position in human development indexes among major states in India had gone down in the 1990s. Though the value of HDI increased from 0.462 in 1991 to 0.565 in 2001, and HDM-1 from 0.426 to 0.479 during this same period, Gujarat’s rank among major states had declined from 5th in 1991 to 6th in 2001. The sectoral components of the indexes also showed a deceleration; the rank of the state in the education index going down from 5th in 1991 to 6th in 2001, in the health index going down from 7th in 1991 to 9th in 2001, and in the income index going down from 4th in 1991 to 6th in 2001. In the case of GDI and GDM-1 also, the state moved down from 4th (0.258 GDI and 0.240 GDM-1) among major states in 1991 to 6th (0.325 GDI and 0.272 GDM-1) in 2001. (GHDR, 2004, p.228)

Another important observation had been made with respect to regional disparities in human development. The tribal districts of Dangs, Dahod, Panchmahals, Narmada, and others were all at the
bottom with respect to the HDI and the HDM-1, as well as with respect to economic growth including agricultural growth, income poverty and human poverty. These districts need the urgent attention of policy makers. The other region that demanded urgent attention was the northern dry region, consisting of Banaskantha, Patan, Western Mehsana (Sami and Harij taluks), Surendranagar and Kachchh. This arid region also was very badly environmentally depleted which resulted in poor growth and poor human development. In addition to these regions, the other regions of concern, with respect to human development, were the small and medium urban centres which had a relatively higher incidence of income poverty as well as poor quality of life mainly because of their poor economic base, poor infrastructure and the weak finances of the urban bodies.

It was noted that different districts did not enjoy similar ranks with respect to different components, which implied that they needed specific attention in different spheres of human development. The disaggregated view could thus guide the formulation of human development interventions in specific sectors and specific regions. As far as gender equality was concerned, tribal districts like Dangs, Narmada, Bharuch, Valsad, and Navsari were in a better position than the rest. This indicated that tribals, in spite of their constraints and problems, enjoy far more gender equality than others.

Encouraged by the Gujarat Government, several districts also tried to develop their own human development reports. Work has been initiated in the districts of Jamnagar, Surendranagar, Banaskantha, Dangs, Surat, Panchmahal, and Narmada. (Marvania, 2010)

**Section 2 Measuring Technology**

No economy in today’s world can afford to ignore the technological revolution. The nature of relationships between countries, and states, takes on a completely different dimension in an increasingly networked world. Apart from the usual rankings of countries, and states in terms of GDP and other socio economic and development indicators, it is now common to rank them according to some technological indicator. This could be technological achievement, digital opportunity, e-Governance, e-Readiness, or other similar terms.

As the world entered the twenty-first century various organizations involved themselves in assessing technological status reached by different countries. Technological achievements of a nation are larger and more complex than what any index can capture. It is not possible to reflect the full range of technologies, from agriculture to medicine to manufacturing. Many aspects of technology creation, diffusion and human skills are hard to quantify. And even if they could be quantified, a lack of reliable data makes it impossible to fully reflect them. For example, important technological innovations occur in the informal sector and in indigenous knowledge systems. But these are not recorded and cannot be quantified, instead indirect indicators need to be used.
Between 2001 and 2003 three global reports were published. Technology Achievement Index of UNDP was published as a part of HDR 2001. This was soon followed by the Global Information Technology Report (GITR) 2001-2002 and the Digital Opportunity Index 2003. An Indian effort on assessing e-Readiness started about the same time. An e-readiness assessment report was published annually, the fourth and latest was for the year 2006. This section summarizes these reports.

5.5 Technology Achievement Index (TAI) 2001

As stated in the earlier section HDR-2001 introduced the Technology Achievement Index (TAI) which aimed to capture how well a country created and diffused technology and was building a human skill base which reflected its capacity to participate in the technological innovations of the network age. This composite index measured achievements, not potential, effort or inputs. It did not attempt to measure which country was leading in global technology development, but focused on how well the country as a whole participated in creating and using technology. For instance the US, a global technology powerhouse, has far more inventions and Internet hosts than Finland but it did not rank as highly in the index because in Finland the Internet is more widely diffused and more is being done to develop a technological skill base throughout the population. (UNDP, 2001)

Thus the TAI was constructed using indicators, not direct measures, of a country’s achievements in four dimensions. It provided a rough summary—not a comprehensive measure—of a society’s technological achievements. The objective of the TAI was to help policy-makers define technology strategies. Many elements make up a country’s technological achievement, but an overall assessment is more easily made based on a single composite measure than on dozens of different measures. Like other composite indexes the TAI was intended to be used as a starting point to make an overall assessment, to be followed by examining different indicators in greater detail. The design of the index reflected two particular concerns. First, a focus on indicators that reflect policy concerns for all countries, regardless of the level of technological development; and the second was to be useful for developing countries.

The TAI focused on four dimensions of technological capacity important for reaping the benefits of the network age. The indicators selected related to important technology policy objectives for all countries, regardless of their level of development:

- **Creation of technology.** Not all countries need to be at the leading edge of global technological development, but the capacity to innovate is relevant for all countries and constitutes the highest level of technological capacity. All countries need to have capacity to innovate because the ability to innovate in the use of technology cannot be fully developed without the capacity to create—especially to adapt products and processes to local conditions. Innovation occurs throughout society, in formal and informal settings, though the current trend is towards increasing commercialization and formalization of the process of innovation. In the absence of perfect indicators and data series, the TAI used two indicators to capture the level of innovation in a society. The first was the number of patents...
granted per capita, to reflect the level of invention activities. The second was receipts of royalty and license fees from abroad per capita, to reflect the stock of successful innovations of the past that were still useful and had market value.

• **Diffusion of recent innovations.** All countries must adopt innovations to benefit from the opportunities of the network age. This was measured by diffusion of the Internet—indispensable for participation—marked by the number of Internet hosts and by exports of high- and medium-technology products as a share of all exports.

• **Diffusion of old innovations.** Participation in the network age requires diffusion of many old innovations. Although leapfrogging is sometimes possible, technological advance is a cumulative process, and widespread diffusion of older innovations is necessary for adoption of later innovations. Two indicators used here—telephones and electricity—marked by number of mainlines and cellular telephones, and electricity consumption per capita, are especially important because they are needed to use newer technologies and are also pervasive inputs to a multitude of human activities. Both indicators were expressed as logarithms and capped at the average OECD level; since they are important at the earlier stages of technological advance but not at the most advanced stages. Thus while it was important for India to focus on diffusing electricity and telephones so that all its people can participate in the technological revolution, Japan and Sweden had passed that stage. Expressing the measure in logarithms ensured that as the level increased, it contributed less to the index.

• **Human skills.** A critical mass of skills is indispensable to technological dynamism. Both creators and users of new technology need skills. Technology requires adaptability—skills to master the constant flow of new innovations. The foundations of such ability are basic education to develop cognitive skills and skills in science and mathematics. Two indicators were used to reflect the human skills needed to create and absorb innovations: mean years of schooling and gross enrolment ratio of tertiary level students enrolled in science, mathematics and engineering. It was felt that though it would have been desirable to include indicators of vocational training, these data were not available.

TAI estimates were prepared for 72 countries for which data were available and were of acceptable quality. The results showed three trends: a map of great disparities among countries, diversity and dynamism in technological progress among developing countries and a map of technology hubs superimposed on countries at different levels of development. The map of great disparities showed four groups of countries, with TAI values ranging from 0.744 for Finland to 0.066 for Mozambique. These countries were considered as leaders, potential leaders, and dynamic adopters or marginalized:

• Leaders (TAI above 0.5)—topped by Finland, the United States, Sweden and Japan—were at the cutting edge of technological innovation. These countries had high achievements in technology creation, diffusion and skills. Coming fifth was the Republic of Korea, and tenth was Singapore—two
countries that advanced rapidly in technology in the last decades. This group was set apart from the rest by its higher invention index, with a marked gap between Israel in this group and Spain in the next.

• Potential leaders (0.35–0.49)—most of these countries had invested in high levels of human skills and diffused old technologies widely but innovated little. Each of these countries ranked low in one or two dimensions, such as diffusion of recent innovations or of old inventions. Most countries had skill levels comparable to those in the top group.

• Dynamic adopters (0.20–0.34)—these countries were dynamic in the use of new technology. Most were developing countries with significantly higher human skills than the fourth group. Those included were Brazil, China, India, Indonesia, South Africa and Tunisia, among others. Many of these countries had important high-technology industries and technology hubs, but the diffusion of old inventions was slow and incomplete.

• Marginalized (below 0.20)—technology diffusion and skill building needed a long way to go in these countries. Large parts of the population were not benefited from the diffusion of old technology. These rankings did not shadow income rankings and showed considerable dynamism in several countries with rising technological achievement— for example, Korea ranked above the United Kingdom, Canada and other established industrial economies. Ireland ranked above Austria and France. Large developing countries—Brazil, China, India—did less well than one might have expected because this was not a ranking of “technological might” of a country.

The technology hubs had a limited effect on the index because of disparities within countries. If the TAI were estimated only for the hubs, such countries would have undoubtedly ranked as leaders or potential leaders. (UNDP, 2001)

5.6 Global Information Technology Report (GITR) 2007-08

The Global Information Technology Report 2002-2003: Readiness for the Networked World (GITR) was published by the World Economic Forum, (2003) where it was a special project within the framework of the Global Competitiveness Program. The GITR resulted due to the collaboration between the World Economic Forum and the Center for International Development (CID) at Harvard University. As a result of the dynamic evolution of ICTs and the increasing importance of their diffusion in the process of economic growth, a need was felt for a broad and systematic comparison of the ICT development of the countries around the globe.

As Policy makers and business leaders increasingly recognize the need to create an enabling environment to support the development and adoption of technologies across all sectors, the importance of Networked Readiness at the regional and national levels had gained prominence on the public policy agenda. Network Readiness was previously defined as “The degree to which a community is prepared to participate in the Networked world”, but in GITR, this definition was expanded to include a community’s potential to participate in the Networked World in future. It transformed the complex dynamics of
Networked Readiness into more easily understood shorthand like the Human Development Index (HDI) and Global Competitiveness Index (GCI)

The objective of the report was to conduct a major international assessment of the capacity of different countries to exploit the opportunities offered by ICTs and to devise a global framework to map out factors that contribute to this capacity. It also attempted to highlight the prospects for growth in countries that have proven themselves ready to take up new technologies and also reveal the obstacles to Networked Readiness. The Report was based on three basic elements to create a coherent message. First was a vision to inspire and challenge to think about technology, development, and their relationship, in new ways. Second was a better understanding about how people and organizations translate vision into action on the ground. Third, which was at the heart of GITR, was to challenge conventional wisdom and standard operating procedures and find better ways to analyze, understand, and measure the results of action in order to establish benchmarks and decision-making capability for future success.

In order to construct the Networked Readiness Index, two sub indexes were created and used viz Enabling Factors Index and Network Use Index, differentiating indicators that enable use (Enabling Factors) and specific indicators of actual use (Network Use)

The Enabling Factors were divided in four sub components i.e. Network Access, Network Policy, Networked Society, and Networked Economy. Network Access considered indicators based on the extent and quality of the network infrastructure and the existence of the equipment, programs, and support services that allow ICTs to be used. Network Policy was made of indicators of information and communications policy environment as well as the business and economic climate. The Networked Society assessed quality of learning using information and communication technologies, the extent of their opportunities in the ICT industry and societal and demographic factors. The Networked Economy considered indicators based on the extent to which the public and the private sectors participated in the Networked World and the quality and availability of complementary non ICT infrastructure. A total of 65 indicators were selected and grouped into 11 separate micro indexes. While 10 micro indexes were used to create the four above mentioned sub indexes of the enabling factors component sub index, the eleventh micro index comprised the network use component index.

Two centerpieces, the Networked Readiness Index and the Country Profiles were the major outcomes of the GTIR. The Index provided a summary measure that ranked 75 countries on their relative ability to leverage their ICT networks. The country profiles explored sub national ICT trends and ways in which ICTs contributed to national social and economic development goals in the context of the framework of the NRI. The perspective of GITR on Network Readiness suggested that the top ranked country was the one with the most highly developed ICT networks and the greatest potential to exploit those networks’ capacity. (WEF, 2003)

5.7 Digital Opportunity Index (DOI) 2007
The first phase of the World Summit on the Information Society (WSIS), held in Geneva, Switzerland, 10-12 December 2003, identified the need for international evaluation and benchmarking through comparable statistical indicators in order to follow up the implementation of the objectives, goals and targets of its Plan of Action. To carry out this, WSIS called for:

- Creation of a composite Digital Opportunity Index (DOI);
- Provision of statistical information on the Information Society from all countries; and
- The establishment of internationally comparable indicator systems.

A novel approach was used to map the core set of indicators for DOI. Most ICT indexes (e-indexes) are based on a set of indicators identified by the index creator while the DOI was created from a set of internationally-agreed indicators. The DOI initially used a subset of the core infrastructure, household and individual access indicators, which were the most widely available among countries. This kept the research manageable and enabled the inclusion of a diverse set of countries since the other core indicator sets generally had more limited country coverage. (ITU/UNCTAD, 2007)

It was decided to compare the set of indicators used by popular e-indexes such as the IDC Information Society Index (ISI), the World Economic Forum Networked Readiness Index (NRI), the Orbicom Monitoring the Digital Divide, and the ITU Digital Access Index (DAI). Although none of the indicators appeared exactly in the same way in all of the indexes, some such as mobile cellular subscribers per 100 inhabitants or proportion of individuals that used the Internet appeared in four of the indexes. Other core indicators such as mobile population coverage or mobile tariffs did not appear in any of the other indexes. It was felt that as only some of the core infrastructure indicators appeared in other e-indexes, the DOI should produce unique results. (ITU & Orbicom, 2005)

For the methodology of DOI a few indexes were compared and it was observed that the methodology of ITU’s Digital Access Index (DAI) and HDI were more useful. The DAI grouped 8 indicators into five categories (Infrastructure, Affordability, Knowledge, Quality and Usage). The indicators were normalized relative to desirable values or goalposts. For example, a goalpost of 100 was established for mobile cellular subscribers per 100 inhabitants. Assuming a country had 60 mobile cellular subscribers per 100 inhabitants, then the index value would be 0.6 (60/100). Indicators were weighted within their groups and then the groups were averaged to arrive at the DAI value. This was the same methodology used by the United Nations Development Program’s Human Development Index (HDI), which is arguably the benchmark for composite indexes, as it is one of the longest-standing and most referenced of all. The DAI covered 178 countries. The DOI followed the same methodology as of the DAI and HDI.

From the set of the indicators identified as the core infrastructure, access and use of ICTs by households and individuals indicators, all were not utilized for the DOI. Either they were not suitable for the proposed framework or sufficient data did not exist. The remaining indicators were logically grouped in three major sets.
1. Opportunity: this covered accessibility and affordability to ICT service. The percentage of the population covered by mobile cellular telephony represented coverage (basic accessibility) while the two tariff indicators, Internet access tariffs (as a percentage of per capita income) and Mobile cellular tariffs (as a percentage of per capita income) reflected affordability.

2. Infrastructure included network indicators such as the proportion of households with a fixed line telephone, mobile cellular subscribers per 100 inhabitants, proportion of households with Internet access at home and mobile Internet subscribers per 100 inhabitants. It also included the devices that provide the interface between the user and the network; represented by proportion of households with a computer.

3. Utilisation showed the extent of ICT usage and included proportion of individuals that used the Internet. Quality a sub set of Utilisation reflected a level of access that enabled higher degrees of functionality. This provided support for services such as video streaming that could enhance desirable information society applications such as telemedicine, e-government and e-learning. The indicator selected for this category was the ratio of broadband subscribers among Internet subscribers (separated by both fixed and mobile).

Thus the Digital Opportunity Index (DOI) was the first e-index based on internationally agreed ICT indicators. This made it a valuable tool for benchmarking those indicators considered to be the most important for measuring the information society. Because the indicators used for the DOI have been endorsed by the international community, they will increasingly be collected over time by countries, adding to the coverage of the index enhancing its inclusiveness.

5.8 INDIA: e-Readiness Assessment Report: For States/Union Territories 2006

India in the last 20 years has been one of the fastest growing economies in the world. Its growth has been unique as compared to other less developed countries of today; it has been able to leverage to its advantage in the services sector to achieve this growth. The role of technology has been crucial in its transformation into an upcoming knowledge economy.

The Government of India supported this transformation by introducing various initiatives in the field of e-Governance. Indian states are very diverse and many of them can be treated as separate countries in terms of area and population. It is, therefore, very important to study them separately to get an idea of their e-rankings. The Department of Information Technology and the National Council of Applied Economic Research (NCAER) have collaborated in producing the India e-Readiness reports since 2003.
in an attempt to evaluate the e-Readiness of State Governments. The first three reports served to establish the concept of e-Readiness and determine the components of this composite indicator. They have constructed an objective ranking method using factor analytic tools. The framework of analysis for evaluating and ranking the e-Readiness of states has remained the same through the series enabling the policy makers and researchers to conduct an inter-temporal comparison of the relative positions of States. (India, DIT, 2006)

The e-Readiness report of 2006, fourth in the series, presented the evolution in the ranking of States according to their Government’s e-Readiness. The e-Readiness is a multidimensional concept. It measures the state’s ability to participate in an increasingly networked world. It can be viewed as the ability to pursue value creation opportunities facilitated by ICT. Therefore, it is not simply a matter of the number of computers, internet connections, telephones and mobiles, etc., in the state but also the ability or readiness to use technology skillfully at the level of the individual, business and the Government. Given the multi-dimensional nature of what had to be measured, the Report employed the use of composite indicators.

To measure e-Readiness, three main sub-indexes were used:

- the environment that promotes the spread and usage of ICT;
  
  This component included market, political & regulatory, and infrastructure environments.

- the readiness of different stake holders of the economy (the government - both the initiatives of the central government and the response of the state governments, businesses and the individual) to use ICT;
  
  The Readiness component included Individual, Business and Government readiness.

- the degree of usage of ICT by the three stakeholders
  
  The component of Usage consisted use by Individual, Business and Government.

The results of the report differentiated states between different levels: such as 1.Leaders: Chandigarh, Delhi, Haryana, Karnataka, Punjab, Andhra Pradesh, Kerala, and Tamil Nadu.
3. Expectants: Rajasthan, West Bengal, Himachal Pradesh, Chattisgarh and Jharkhand.
4. Average Achievers: Mizoram, Orissa, Pondicherry, Madhya Pradesh, Sikkim, Meghalaya, and Uttarakhand.

The report contributed to the public discourse about the value of e-Readiness vis a vis poverty alleviation measures. Using the Social Accounting Matrix (SAM) the report analysed the impact of the increase in expenditure on the IT industry on desegregated rural and urban household expenditure classes. For instance, it showed that the increase in expenditure on IT has led to overall increases in
income, even in the lowest rural household expenditure category, that of abject poverty. Another interesting addition to the report was a qualitative analysis of the e-Readiness of certain select central government ministries. Those ministries that interact most with the public were chosen so as to study how greater e-Readiness helps them achieve their objectives.

**Section 3 Measuring Information & Information Society**

In the context of information, statistical reports of UNESCO have long provided comparative data for different countries, the World Information Report (1997-98) and the World Communication Report were the first attempts to report the state-of-developments in these fields. These descriptive reports have now been replaced by indicators of the Information Society. Early attempts in Japan and USA sought to measure ‘informationalized society’. A trend to measure information society is particularly noticeable in Europe, both at the European Union level and at individual country levels. As the concept of the information society began to be replaced by that of a knowledge society there was a parallel shift in identification of indicators and the measures used. The World Bank’s project Information For Development (I4D) changed into Knowledge For Development (K4D) and its methodology and outcome known as Knowledge Assessment Methodology (KAM) and Knowledge Index (KI) respectively, are also noteworthy.

**5.9 World Information Report (WIR) 1997-98**

UNESCO, by its very mandate, has always been the most active of the international agencies, in the information field. In keeping with this tradition, the General Conference of UNESCO at its twenty-eighth session in 1997 decided to address the crucial issues raised by the most recent technological developments in the information field. Member States had felt the urge to concentrate on the linguistic, cultural, social and ethical impact of the information highways and of the new Information and Communication Technologies and needed support for the activities in this field. Accepting the expanded responsibility, UNESCO decided to provide systematic information on some of the significant changes taking place in the information field and in highlighting major issues posed by the new technologies. (UNESCO, 1997)

The objective of the WIR was to present to the non specialist decision makers a description of information services as they existed and to consider the technological developments that were set to modify that description in the years to come and the economic, legal and political consequences of these developments in the present and the future. The report attempted to give a summary of information provision from a global perspective and tried to cover almost all the countries. As the boundaries of the information-provision community are neither clearly defined nor stable at a time of rapidly developing information technologies, the WIR attempted to reflect this moving reality. (UNESCO, 1997)
The purpose was not to develop or use any composite indexes to measure the information activities worldwide, the Report was presented as a state-of-the-art report of the information field and was organized in three broad areas with a region-by-region survey. The three areas were:

1. Information Services Worldwide

Section A
Libraries and information services provided by national libraries and information systems, public libraries, school libraries, special libraries and information services, professional associations, education and training programmes for information personnel, information marketing, publishing and research, bibliographic control, database production and international collaborations both within the region and between the countries of the region

Section B
Archival systems and services, archival legislation, standards, institutions and holdings, technical facilities, budgets, education and training, and professional associations

2. Infrastructure for Information which covered state-of-the-art surveys of computer technology, computerized library systems, information retrieval, interface design and the human aspect of computerization, multimedia technologies, telecommunication technologies, the Internet and also dealt with design criteria for large library buildings.

3. Issues and Trends in which major issues like information society, information highways, economic intelligence, book publishing, access and preservation of archival holdings and unique library materials, copyright in the electronic era, international cooperation and assistance in this field were raised.

The Report concluded with a brief account of international cooperation and assistance in the information field.

5.10 World Communication and Information Report (WCIR) 1999-2000

During the 1996-97 biennium, UNESCO published two reports in the field of communication, information, and informatics: the World Information Report 97-98 and the World Communication Report 1998. Both were well received and it was felt that there was a need to pursue the series of Reports covering these areas. However the convergence among various communication and information technologies due to the development of digital technologies was stronger than ever before and it completely transformed the overall picture. The borderlines between areas which were formerly separate became increasingly blurred. Large business and industrial concentrations on a global scale were taking place, showing a strong movement in the same direction. With a view to provide policymakers and decision-makers with an adequate analysis of the situation, it was decided to publish one single World Communication and Information Report. (UNESCO, 1999)
The objective of the WCIR 1999-2000 was to concentrate on the relation between Information and Communication Technologies (ICTs) and some of their socio cultural impacts. Instead of providing a detailed picture of technology as a vehicle, the report focused on content and on the basis of selected data, described the development of ICTs throughout the world, and aimed at providing a better understanding of their effects in UNESCO’s fields of competence. It also aimed to provide policy and decision makers with an adequate analysis of the state-of-the-art situation of the ICT field.

A selection of the set of data relevant to ICTs was given under three sections in the statistical annexure.

The first section covered selected General Indicators as well as the most important ones concerning Communication and Information. These included Population, GNP per capita, HDI ranking, estimated adult illiteracy rates, and enrollment in tertiary education. Communication and Information Indicators covered Domestic and international postal service, Press (number. of dailies, estimated circulation, newsprint consumption), Libraries (estimated registered users) Telecommunication (estimated mainline and cellular telephones, fax machines, estimated ISDN subscribers, average residential connection charges, telecommunication revenues), and Media (number. of radios and television receivers).

In the second section indicators related to the Trade data for Communication and Information Equipment were presented. These covered major exporters of radio receivers, television receivers, printed matter, computer equipment and telecommunication equipment.

In the third section indicators exclusively related to the Internet were covered. These were number of countries connected, number of Internet hosts and their geographical distribution, estimated number of people online, number of installed PCs, Gender difference in Internet use, Internet access tariffs, Internet traffic, Purchasing on the Internet and estimated number of hosts by top-level domain name.

UNESCO’s operational activities in the field of communication, information, and informatics were summarized in a separate section.

The report attempted to relate information and communication technologies and some of their socio cultural impacts, but no composite indexes were developed to measure impact of ICTs on the society. As per the characteristics of most of the UNESCO World Reports the methodology adopted in this report was also the same i.e. individual specialists were invited to prepare separate chapters in their field of competence. Based on the indicators related to communication and information the report was presented in three parts. Part One dealt with social processes and discussed the impact of ICTs on human development, the media, education, culture and information services. Part Two provided a brief description of technological development and more specifically those in the ICTs themselves, the multimedia and the Internet. Part Three took a geographical approach and beginning with a global view, followed it up by developments in the main regions of the world. (UNESCO, 1999)
5.11 Johoka Index 1960's

The idea of a society moving away from heavy industries into information and knowledge-intensive ones was in circulation in the U.S. and Japan in the 1960s and 1970s. In Japan, Umesao (1963), Hayashi (1967) and Masuda (1981) were early popularizers of the idea of the joho (or johoka) shakai or “informationalized society”. These academic inputs were implemented by the Japanese government, which formulated as early as 1971 “a new national target, ‘Realization of the Information Society’.” They paralleled in some ways the work of Machlup (1962) and Bell (1973) in the U.S., who attempted to quantify the size of the “knowledge industry” and its work force, the “Post-industrial Society”, and relate them to GNP. (Taylor & Zhang, 2007)

Both approaches can best be understood against the backdrop of the economic crises of the 1970s, a time in which the most important role of information technologies was to increase productivity and foster competitiveness. Both highlighted the importance of knowledge to an economy, although taking somewhat different theoretical stances. As far as social effects were considered, they focused on the impact on mass communication in the U.S. and on information flows in Japan, but without being translated into a more coherent general theory. In the U.S., this approach was extended by Porat and Rubin (1977), using a typology of information work divided between primary and secondary information sectors. This foundational work initiated a lively discourse across economics, sociology, development studies and politics.

The “Johoka Index,” probably the first formalized effort, at measuring the information society is noteworthy. It was composed of a simple, summed index of indicators in four categories:

- Amount of information
- Distribution of communication media
- Quality of information activities
- The information ratio of each country

The Johoka Index (Taylor & Zhang, p. 3, 2007) used the approach of counting transmitted vs. “consumed” words and their equivalents in other media (e.g., one minute of colour TV equalled 1,320 words). On this basis, countries were compared, both in the (then) present, and over time. As opined by Taylor and Zhang, it appears in retrospect that, at that point in time, development communications (mass media) was being displaced in importance by development informatization (telecommunications). The related key insight was that the relative importance of the meaning (content) of communications was being overtaken by its volume (transmission).

It was at about this time that telecommunications came to be recognized as a key development tool, as opposed to a mere plaything for the privileged and the powerful. In 1984, a more refined version of the Johoka Index was used by Ithiel de Sola Pool and his colleagues in a comparative study of communication flows in the U.S. and Japan. He compared the quantity of print, electronic and face-to-
face communication as well as the ratio of “words supplied” to “words consumed.” In the early 1980s, the OECD began to collect data, following Porat’s list of categories, for comparison between members. The Johoka Index was followed by the JIPDEC (Japan Information Processing and Development Center) Index in 1986, which was “three dimensional,” incorporating factors for hardware, software and transmission. (Taylor & Zhang, p. 4, 2007)

These early approaches received ample critical reviews. For example, the method of converting images to an estimated number of “words” was a frequent target of criticism. However, even though there were substantial methodological shortcomings, the efforts at quantification embodied the apprehension that something important was going on in the world, and there needed to be some way to measure it. These were first steps. But the question remained, no matter whether what was being counted was words or pictures, sound or video, what exactly did the measures measure?

5.12 European Union Initiatives

Around the turn of the century, in Europe it was recognised that available official statistics were seriously inadequate to chart Europe's progress in an Information Society. The bulk of official statistics continued to be tuned to the economic and social systems typical of a Europe emerging from Word War II, when manufacturing dominated over services, tangible assets over intangibles and traditional over flexible employment models. Many national and supranational statistical agencies began to address these shortcomings and to evolve a new set of statistical indicators, which reflected key aspects of societal development in Europe's increasingly service-oriented, knowledge-driven economies.

The European initiatives focused more on indicator building exercises, benchmarking, goal setting and development of action plans, rather than measuring the situation as it existed.

5.12.1 Statistical Indicators Benchmarking the Information Society (SIBIS) (2001)

Around the turn of the century, in Europe it was recognised that available official statistics were seriously inadequate to chart Europe's progress in an Information Society. The bulk of official statistics continued to be tuned to the economic and social systems typical of a Europe emerging from Word War II, when manufacturing dominated over services, tangible assets over intangibles and traditional over flexible employment models. Many national and supranational statistical agencies began to address these shortcomings and to evolve a new set of statistical indicators, which reflected key aspects of societal development in Europe's increasingly service-oriented, knowledge-driven economies. (e-Europe, 2001)

The OECD created a "Working Party on Indicators for the Information Society” in March 1999. Its work had until then focused especially on issues of measurement relating to electronic commerce (OECD DSTI/ICCPIIS (99) 4/FINAL). It has also produced a proposal for a model questionnaire for a business survey that has already been conducted in 3 of the Nordic Member States (OECD DSTI/ICCPIIS (2000)6). EUROSTAT was participating in these efforts and also had also setup working groups to deal with these issues. (Eurostat, 2007)
EPROS (The European Plan for Research in Official Statistics) responded to the call for research on SINE (Statistical Indicators for the New Economy), by not only conceptual research in that field, but also measurement and exploitation of new indicators (EPROS 2000, p.11). EC and EUROSTAT indicated that "in order to understand the socio-economic impacts of IST, indicators on availability, penetration, activities and use, particularly by households, were needed. A special user survey was undertaken" (EPROS 2000, p 11)

The European Commission under its Information Society Programme took up a project (IST-2000-26276) called Statistical Indicators Benchmarking the Information Society (SIBIS) which ran from January 2001 to September 2003. It took up the challenge of developing innovative information society indicators to take account of the rapidly changing nature of modern societies and to enable the benchmarking of progress in EU Member States. These indicators were tested and piloted in representative surveys in all EU member states, Switzerland and the USA. The SIBIS project was closely related to the e-Europe and e-Europe+ initiatives of the European Union and contributed in measuring the progress of e-Europe actions in the above countries.

5.12.2. e-EUROPE Initiative 2001-10

The European Commission launched the eEurope initiative in December 1999. It was adopted during the extraordinary European Council on Employment, Economic Reform and Social Cohesion towards a Europe of Innovation and Knowledge, which was held in Lisbon in March 2000 (European Union, 2002)

The initiative had technological goals, and was also aimed at increasing and enhancing the economic development of Europe. eEurope attracted a great deal of political attention at the time because of the belief that the Internet, specifically, was a magic tool for economic development. Comparisons were made with the United States of America, which encouraged European policy makers to try to emulate American growth in a European context. The eEurope Action Plan, which was conceived within the framework of eEurope 2002, was designed to make Europe the strongest knowledge-based economy in the world by 2010. Indicators developed through eEurope were designed to monitor progress in that direction.

The key areas of the eEurope initiative were cheaper, faster and safer internet, smart cards and secure electronic access, investing in people and skills, European youth into the digital age, jobs in the knowledge-based economy, e-participation for the disabled, accelerating e-commerce, government and health online, intelligent transport and stimulating the use of the internet. (European Union, 2002)

The European Commission proposed a set of indicators to help and guide its member States towards achieving the goal of becoming knowledge-based economies. The indicators suggested by the eEurope 2002 Action Plan were stimulated by a very basic motivation: to get Europe onto the Internet en masse.
This was based on the realization that to become full participants in the knowledge-based economy, there was a need to change patterns of interaction in economic, social and political activities.

For the purposes of benchmarking, that is, comparison amongst member States with regard to an ideal target, several indicators were chosen. These indicators focused upon such issues as connectivity and use of Internet. Further indicators were related to application areas. Data were also collected by NSOs in collaboration with the Statistical Office of the European Communities, more commonly known as Eurostat. The data collected was simply categorized, and the numbers of indicators were much lower than those of similar exercises.

Collated and compiled data were used by national Governments to encourage increased development in weak areas, and have also been used by the European Commission to present the situation in Europe to the global community, in addition to facilitating dialogue within the European Union on certain pertinent issues.

The impact of e-Europe 2002 was twofold: firstly, it affected the uptake of the Internet in member States, and managed to achieve many of the original goals and targets. Secondly, it managed, albeit in a limited manner, to change the way in which European Information Society (EIS) policy was determined and carried out in the European Union, enabling the Commission to play a different role to the one it had previously assumed in the field. eEurope 2005 sought to encourage the development of a business environment, and many of the indicators of the previous exercise were changed in response to a shift in priorities. It went beyond the accessibility issues and sought to find ways in which the public sector could take advantage of the Internet. This meant a shift in focus from infrastructure to content in the indicators.

e-Europe was seen as a major breakthrough in the use of benchmarking. In this regard added value and contribution of Europe was noted in international as well as regional comparisons and benchmarking. The interesting aspects of the e-Europe case, as in other benchmarking and indicator exercises, were not the indicators or the benchmarks, rather how these were converted into changing or developing results. The e-Europe benchmarking process has been widely disseminated across the globe, with various countries, for example, Japan, adopting the process.

5.13 Information Society Index 2000

International Data Corporation’s (IDC) Information Society Index (ISI) analyzes and forecasts the state of information technology usage and adoption across 50 plus countries around the globe at regular intervals. It provides detailed analysis of IT spending, Internet usage, telecommunications, and social factors. It is projected as a critical global strategic planning tool. Just as GDP measures national income, the ISI measures information capacity and wealth around the world and ranks countries based on their ability to access and absorb information and information technology. (IDC & WT, 2000)
The index, organized into country rankings according to 15 data variables, is intended to assist government planners in measuring the progress of their nations in relation to others and provides financial investors and IT suppliers with a tool for analyzing opportunities, drivers, and inhibitors. The ISI is delivered as a core component of IDC’s Leading IT Indicators service. This service covers the various segments of the information society market, such as Personal computers, IT spending, Internet usage, e-Commerce, Broadband, Wireless, Education levels, and Civil liberties.

IDC’s research in this area addresses certain important issues, and attempts to answer certain questions which are critical for the success of a country or a company working in the field of IT. Important among these are: which are the government policies that have enabled the Nordic countries to develop as advanced information societies? What are the barriers and inhibitors that are preventing IT growth in key emerging markets? What impact will broadband and mobile adoption have on the global information economy in the next five years? Which nations are set to emerge as the hot spots for IT growth?

According to Welch, (1999) Information Societies must have four legs viz. Computer, Internet, Social and Information infrastructure as shown in figure 5.1. Fifty-five countries accounting for 96% of global GDP and 99% of IT expenditures were tracked by IDC in 1999. Their performance on the ISI’s Four Legs was measured on 23 Variables in 1999.

Computer Infrastructure: PCs installed/Capita, Home PCs shipped/Household, Government/Commercial PCs shipped/Non-agriculture workforce, Education PCs shipped/Students & Faculty, Networked PCs%, Software/Hardware spending.

Internet Infrastructure: e-Commerce spending, number of Internet home users, number of Internet Business users, number of Internet education users.

Social Infrastructure: Secondary school enrollment, Tertiary school enrollment, Newspaper readership, Press freedom, Civil liberties.

Information Infrastructure: Telephone lines/household, Telephone faults/lines, Television ownership/capita, Radio ownership/capita, Fax ownership/capita, Cellular phones/capita, Cable/satellite TV coverage.

Figure 5.1 The ISI’s Four Legs
According to the third annual ISI results i.e. 1999 ISI Ranks, United States, Sweden, Finland, Singapore, Norway, Denmark, Netherlands, Australia, Japan, and Canada figured as the first 10 countries. On the other hand, Philippines, Turkey, Saudi Arabia, Peru, Jordan, Egypt, India, China, Indonesia and Pakistan figured as the last ten countries in the list of 55 countries, covered by the Information Society Index.

Countries are placed in four stages of development according to their performance on the Information Society Index. In 1999

- **Strollers** who scored less than the world average included countries like Peru, China, Egypt, India, and Indonesia.

- **Sprinter** countries Argentina, Malaysia, Chile, Mexico, Brazil and Ecuador also scored less than the world average, but were better positioned than the strollers.

- **Striders** Australia, Japan, Canada, UK and Taiwan performed better than the world average. Countries like United States, Norway, Finland, Singapore and Sweden placed

- **Skater** stage of development performed better than the other countries and the world average.

In 2005 the list of 23 indicators was reduced to 15 key variables and 52 nations were included in the ISI study. In the 2006 Information society Index (ISI), the top 10 rankers are Denmark, Sweden, Finland, USA, UK, Holland, Switzerland, Canada, Norway and New Zealand. The survey pointed out some significant differences in spending on IT. While ‘elite’ nations like the above typically spend around 3% of GNP on IT, countries like India and China are currently only spending around 1% of GNP. Denmark and Sweden are currently among the highest spenders on IT, using 3.7% of GNP. IDC forecasts that Denmark will hang onto its pole position on the ISI until 2011, when it expects that the US will nudge Denmark into second place.

According to the Schumpeter’s Wave Theory of Innovation it is now taking less time for innovations to get diffused in the society, (Welch, 1999). It took about 50 years of time for innovations in the field of
electricity, chemicals, and the internal combustion engine to get diffused in the society, 40 years for innovations like Electronics, Petrochemicals, Aviation and just 30 years for innovations in the field of Digital networks, Software, and New Media.

Though it is taking less time for the innovation to get defused in the society, the reality is that the gaps are widening. Gaps between the US and the rest of the world, between the Striders and Sprinters, between the 50 plus ISI countries and the 150 other countries of the world with 40% of the population, 4% of GDP and less than 1% of IT spending and gap within developing countries are widening.

Based on the results of ISI rankings countries and companies can decide where they should invest. According to Welch sustained investment in all four infrastructures is the key to a society’s development, as is political will. (Welch, 1999)

5.14 The KAM Methodology and the Knowledge Index

With sustained use and creation of knowledge at the center of the economic development process, an economy essentially becomes a Knowledge Economy i.e. is one that utilizes knowledge as the key engine of economic growth. It is an economy where knowledge is acquired, created, disseminated and used effectively to enhance economic development.

The World Bank has observed that the successful transition to the Knowledge Economy typically involves elements such as long-term investments in education, developing innovation capability, modernizing the information infrastructure and having an economic environment that is conducive to market transactions. These elements have been termed as the pillars of the Knowledge Economy and together they constitute the Knowledge Economy framework. (World Bank, 2008a)

More specifically, the four pillars of the Knowledge Economy (KE) framework are:

- An economic incentive and institutional regime that provides good economic policies and institutions that permit efficient mobilization and allocation of resources and stimulate creativity and incentives for the efficient creation, dissemination, and use of existing knowledge.

- Educated and skilled workers who can continuously upgrade and adapt their skills to efficiently create and use knowledge.

- An effective innovation system of firms, research centers, universities, consultants, and other organizations that can keep up with the knowledge revolution and tap into the growing stock of global knowledge and assimilate and adapt it to local needs.

- A modern and adequate information infrastructure that can facilitate the effective communication, dissemination, and processing of information and knowledge.
5.14.1 The Knowledge Assessment Methodology (KAM)

The transition to becoming a knowledge economy requires long-term strategies that focus on developing the four KE pillars. Investments in the four knowledge economy pillars are necessary for sustained creation, adoption, adaptation and use of knowledge in domestic economic production, which will consequently result in higher value added goods and services. This would tend to increase the probability of economic success, and hence economic development, in the current highly competitive and globalized world economy. (World Bank, 2008a)

Initially this means that countries need to understand their strengths and weaknesses, and then act upon them to develop appropriate policies and investments to give direction to their ambitions and mechanisms to enable the policy makers and leaders to monitor progress against the set of goals.

To facilitate this transition process, the World Bank Institute’s Knowledge for Development (K4D) Program has developed the Knowledge Assessment Methodology (KAM), which is an Internet-based tool that provides a basic assessment of countries’ and regions’ readiness for the knowledge economy. The KAM is a user-friendly interactive diagnostic and benchmarking tool that is designed to help client countries understand their strengths and weaknesses by comparing themselves with neighbours, competitors, or other countries that they may wish to emulate based on the four KE pillars.

Comparisons in the KAM are made on the basis of 83 structural and qualitative variables that serve as proxies for the four knowledge economy pillars. The data on which the KAM is based are all published by reputable institutions that are at the forefront of gathering and producing country statistics that are reliable and internationally consistent. The most recent version of the KAM, KAM 2008, is able to provide assessments of a country or region position in terms of the Knowledge Economy on:

- A global scale, when compared to 140 countries that are available in the KAM database;
- A regional scale, when compared with countries in the same region
- The basis of human development, when compared with other countries in the same category of human development and
- The basis on income levels, when compared with other countries of the same income level category.

All the variables are normalized on a scale from 0 (weakest) to 10 (strongest), and all 140 countries are ranked on an ordinal scale. The KAM thus reports the relative performance of countries on the knowledge economy. Ease of use, transparency, accessibility over the Internet, are some of the reasons due to which the KAM has been widely used by government officials, policy makers, researchers, representatives of civil society, and the private sector. The KAM has also been used by multilateral and bilateral aid agencies, research institutions, consultants and others to undertake preliminary single or multi-country knowledge economy assessments. Using this methodology the World Bank produces two
indexes i.e. the Knowledge Economy Index (KEI) and the Knowledge Index (KI) as shown in figure 5.2.

5.14.2 The Knowledge Index 2008

The KAM Knowledge Index (KI) measures a country’s ability to generate, adopt and diffuse knowledge. This is an indication of overall potential of knowledge development in a given country. Methodologically, the KI is the simple average of the normalized performance scores of a country or region on the key variables in three Knowledge Economy pillars – education and human resources, the innovation system and information and communication technology (ICT) (World Bank, 2008b)

Figure 5.2 Knowledge Indexes

The Index allows for cross-country comparison and comparison of the same country’s performance over time. The Index is comprised of nine indicators that serve as proxy for the education, innovation and information and communication technology pillars of the knowledge economy. From the Education and Human Resources pillar, three indicators are taken viz. Adult literacy rate (% age 15 and above), Secondary enrolment and Tertiary enrolment. The Innovation System pillar includes three indicators viz. Researchers in R&D, per million population, Patent applications granted by the USPTO, per million population, and Scientific and technical journal articles, per million population. From the third pillar of Information Infrastructure, indicators included are Telephones per 1,000 persons, (telephone mainlines + mobile phones), Computers per 1,000 persons, and Internet users per 10,000 persons.
According to KAM2008 the Nordic countries remain among the best performers in the KI. Sweden is ranked 1st, with Denmark and Netherlands following closely at the 2nd and 3rd places respectively. Finland and Norway rank 4th and 5th. The four KE pillars in these countries are all well developed in a balanced manner.

5.14.3 The Knowledge Economy Index 2008

The KAM Knowledge Economy Index (KEI) is an aggregate index that represents the overall level of development of a country or region in the Knowledge Economy. It summarizes performance over the four KE pillars and is constructed as the simple average of the normalized values of the 12 knowledge indicators of the basic scorecard. These include the nine indicators used for the KI plus three additional indicators viz. tariff and non tariff barriers, the regulatory Quality and the rule of law.

An overview of the various attempts to describe and measure development, technological achievement, information and information society indicate that many attempts have developed composite indexes which use multiple indicators and proxies. Methods most commonly used were goalpost or benchmarking, factor analysis, and normalization. The overview also suggests the close connection between all these concepts. Most of the attempts though focusing on one, did include directly or indirectly the other two.

REFERENCES


