CHAPTER 7

SUMMARY, CONCLUSIONS AND SUGGESTIONS

7.1 SUMMARY

The process of constructing the Information Index has been described in the earlier chapters. This chapter analyses the entire process highlighting the theoretical and empirical issues faced at each stage and describes how they were resolved. Many of these issues have been directly or indirectly referred to throughout the report. However it is considered useful to bring them all together in the present chapter. Further the chapter also highlights the strengths and limitations of the index constructed and the applications to which the constructed index could be put.

Phase I: Conceptualisation

The first step was to conceptualize and state in clear terms the scope of information index. At this stage the multiple definitions of information had to be examined to identify a useful definition which was clear and near to the LIS discipline and was context independent. The UNISIST definition was found most suitable to help identify possible indicators.

A related conceptual issue was to decide which facets of information needed to be covered by the proposed information index. Information is a multifaceted concept used in several disciplines. Even in the LIS context the term has several facets some of them not quantifiable. Thus, for example, quality, up-to-dateness, relevance could not be measured in the abstract but would depend on the user and the context it was used. The issue of selecting practically feasible facets of information was resolved by limiting the index to cover the three basic facets with which the LIS profession is more concerned viz. information generation, information communication and information use. Further since these facets depend substantially on the technological and the socio-cultural environments they too were considered. Based on this understanding a model was prepared. The facets included were conveniently referred to as ‘information infrastructure’.

Another issue which needed to be addressed was the meaning and relationship of various terms. The review of literature indicated that several attempts had been made in the last fifty years to measure related concepts and various indexes had been constructed. These varied from information society index, knowledge index, knowledge economy index to technology opportunity index, network readiness and human development index etc. These indexes had been compiled to measure information or knowledge used in a society to leverage its economic development and were frequently constructed by economists. The present study is an attempt to create a tool which could be used by LIS profession
to measure the present and potential extent of information generation, communication and use, the technical support and socio economic conditions to facilitate the information infrastructure.

**Phase II: Operationalisation**

In the second phase of the project the issue of translating the selected facets into representative indicators had to be addressed. Each of these concepts could be represented by several indicators; these were identified through the literature, other indexes and expert opinion. The process yielded a long list. Though conceptually many of these were relevant it was not practical to include them all, hence a shorter list of select indicators was compiled. In this phase both theoretical and empirical issues had to be faced. The theoretical issue faced here included the overlapping nature of an indicator to represent more than one facet of the information infrastructure, e.g. number of research scholars could be used to represent both information generation and use, similarly number of newspapers could be an indicator of information generation as well as communication. While number of libraries could indicates both the communication and use of information. However since all three concepts of information generation, communication and use were to be included in the information index, it was decided that their placing in any one facet would not make any major difference. Unitization of indicator values was another issue to be faced. Wherever possible the global pattern was followed, e.g. the tertiary gross enrollment ratio is calculated as percentage of total population in the appropriate age group. At other times the availability of data in a particular format made it necessary to use a different method of unitizing. For example, radios penetration is usually measured as number of radio sets per 100 persons, however in India data is available as number of households having radio sets as one of the asset hence this had to be used.

**Phase III: Data Collection**

In this phase empirical issues were more significant. In spite of best of efforts attempts to collect data on each of the short-listed indicators were not always successful. These empirical concerns further reduced the number of indicators which could be used.

In many cases when data was available, it was not segregated state wise, let alone district wise. These empirical constraints resulted in: (i) Giving up the idea of constructing district wise index for Gujarat State and to (ii) Finding alternate sources for those indicators for which segregated state-wise data were not available.

Keeping in mind the restricted availability of relevant data a separate Basic Sub Index of 12 indicators of information generation (4 indicators) communication (5 indicators) and use (3 indicators) was compiled. While many of the traditional information infrastructure of a print-based society were covered several of the modern indicators of information had not been included. To crate the
Information Index which balanced both traditional and modern information infrastructure the ERI index scores were used as the second sub index.

The ERI, developed for the Planning Commission, had included several indicators which were useful in the present study, e.g. teledensity, number of computers, number of Internet users, government policy etc. The ERI had been computed on the bases of values of these indicators and only the final index scores were available. Since it was not possible to find values of each separate indicator, the final index scores for each state are used.

The Basic Index and ERI together covered a majority of relevant short listed indicators of information infrastructure and the technical support needed for it. Some of the political issues had also been included. However the indicators representing socio economic environment were not sufficiently covered. To meet this gap it was decided to use the NHDI which is recognized as a measure of the development of a region. Since the NHDI 2001 had been constructed for only 15 states it further compelled the present study to limit itself only to these 15 states.

Phase IV: Data Processing

The use of NHDI and ERI values meant that the number of indicators to be processed was significantly reduced. The data of the indicators of basic index was collected from various government and semi government sources. These data was unitized generally based on the population figures, so as to make them comparable. After deriving comparable values per unit, the theoretical issue of how to further process this data had to be resolved. Two theoretical techniques were considered, the goalposts as used by HDI and the normalization method used by KI. The normalization method was chosen for the present study since the use of goalposts could be considered more subjective. The datasets available and used were not of the same time series; however this had to be accepted.

Phase V: Index Construction

There is no standardized procedure for giving weightage to the different indicators and the decision usually depends on the rational arguments of the indexer. Since the indicators of the Basic Index reflected the three core facets of information generation, communication and use it was decided to group the 12 indicators into three sub indexes. These three sub indexes were then combined with equal weightage to form a Basic Sub index. At this stage, the decision had to be taken on how much weightage had to be given to the values of the three sub indexes - The Basic Index, ERI and NHDI. It was argued that since the Basic Sub Index reflected the traditional information infrastructure while the ERI represented the electronic information infrastructure, both these sub indexes should have equal weightage. The NHDI covered socio economic environmental factors which are not as central to the information infrastructure, as the indicators in the other two indexes; hence it was decided to give it a
weightage of 0.5. With this weightage to each of the three components, the Information Index was compiled.

7.2 FINDINGS

The Information Index when applied to the 15 major Indian states showed that the level of information infrastructure varied considerably across the states. Karnataka was placed at the first position, while Bihar ranked last, and Gujarat was ranked at mid position of 8. In terms of scores West Bengal is at the mid point. This means that nine out of the fifteen states were above the median point. It must be acknowledged that each of the three component sub indexes influenced the scores and ranks of the final Information Index.

Both the traditional and electronic information infrastructure is poor in Assam, Bihar, Madhya Pradesh and Orissa. Traditional information infrastructure is also weak in Rajasthan and West Bengal. The electronic information infrastructure is best developed in Karnataka, Kerala, Haryana, Punjab and Tamil Nadu, whereas the traditional information infrastructure is good in Kerala, Karnataka, Maharashtra, Tamil Nadu, and Punjab. The low values of NHDI in Andhra Pradesh, Gujarat, Karnataka, Madhya Pradesh, and Tamil Nadu have also affected the final scores of Information Index. The Information Index showed a close correlation with human development.

7.3 CONCLUSIONS

The study had begun with six specific objectives. Each of the objectives and the way in which these are fulfilled is described in the following section.

1. **Review the attempts made to measure Information infrastructure and related concepts like e-Readiness, Information Society, etc.**

The above objective is met by reviewing reports and indexes which measure development including human development (4), Technological progress (4) and Information and Knowledge related attempts (7). These are described in Chapter 5 in greater detail. This review revealed a total of 269 indicators and 8 methodologies used in constructing a composite index.

2. **Identify the indicators used in various attempts**

The various attempts had used a large number of indicators; frequently an indicator was represented in different ways. The full list of 269 indicators is presented in Annexure B which is grouped into 12 broad categories: These includes 1 Demography and health, 2 Economy and labour, 3 Infrastructure 4 Political climate 5 Education and research, 6 Newspaper and publishing, 7 Libraries, 8 Telephones (Landline & Cellular), 9 Computers, 10 Internet, 11 Media, and 12 General ICT.
3. **Select appropriate indicators for an Information Index in the Indian context**

Keeping in view the need to develop an Information Index from the perspective of LIS profession in India, a model of information infrastructure has been developed. This model has at its core three information activities; namely information generation, information communication and information use. These core activities are placed in the context of technical support and the larger socio economic environment. A list of 40 indicators to represent these five concepts is prepared which is given in table 3.2 in chapter 3. The identified indicators include many of the most frequently used indicators of various indexes.

4. **Develop a methodology for construction of an Information Index to measure information infrastructure of a society**

Data of each of the identified indicators is collected for 15 major Indian states for which the Information Index is constructed. The data is then unitized and normalized. Sub-indexes for information generation, communication and use are constructed by aggregating the normalized scores for the indicators in their respective section. To represent the concept of technical support ERI value is used and for socio economic environment NHDI value is used. All individual sub-indexes are then aggregated by giving a weightage 1 to the three core sub indexes and the technology support sub-index, and a weightage of 0.5 to the sub index for socio economic environment. Based on this methodology an Information Index for any particular geographic region(s) can also be constructed. It should be noted that such a process would require a lot of desegregated data currently not easily available.

5. **Construct an Information Index for various Indian States**

Although one should use indicators of all the five components of information infrastructure independently to construct an Information Index as far as possible, based on the empirical issue of non-availability of data presently, a modified methodology which reduced the number indicators, has been adopted in the present study. The research report describes this methodology in Chapters 3 and 6, particularly section 6.2 and 6.5. When the developed information index was applied to 15 major Indian states, Karnataka scored highest while Bihar was at the lowest position. There was a lot of variance across the states.

6. **Compare the constructed Information Index with National Human Development Index to observe the relationship between the two.**
The developed Information Index was correlated to the NHDI in order to check the relationship between information and development. A strong positive correlation of 0.810 was found between the two indexes.

The research study has developed and successfully applied the Information Index to 15 states of India. The present research study has used authoritative nation wide government data to construct the information index; hence it has a strong base. The use of available indexes has made a seemingly impossible task, possible. Measurement is used as a tool in social science research more often to provide an ordinal value rather than provide standardized nominal values. The present study too has created a tool to compare the status of information infrastructure development in the different states.

This is not to say that the Information Index is perfect tool. There are several limitations of the constructed Information Index. The indicators included sometimes represented more then one concept and were overlapping. The exclusion of some significant indicators has meant that the Information Index is not comprehensive. The inclusion of ERI and NHDI has also meant that some non-significant indicators have been included. Secondly, the lack of data for all the Indian states as well as at the sub-state level was a major limitation. Only fifteen states could be covered and the desire to do a district-wise comparison within Gujarat could not fructify. Further the varying data time series has meant that the Information Index could not capture the information infrastructure for a fixed time period. Since the data ranged from 2001 to 2008 the information index presents the picture of the prevalent situation in the first decade of the twenty first century.

Further it is very likely that the presence of large metropolises, the location of IT hubs and level of industrialization have strongly influenced the final index. Thus for example the scores of Karnataka minus the data for Bangalore, or Haryana minus Gurgaon or even Uttar Pradesh minus NOIDA could have been significantly lower.

7.4 APPLICATIONS OF THE INFORMATION INDEX

The process of measurement is an integral component in all disciplines. The present study is perhaps the first attempt to measure information infrastructure as understood by the LIS profession. The LIS discipline has earlier developed various measures and standards of effectiveness and impact. However many of these are related to the internal functioning of libraries. No attempt has been made by the LIS profession to try and measure the level of information infrastructure in a society. Although a few reviews at the global level have been made, they do not provide a measurable standard for comparison. Earlier global attempts had sought to measure information society, knowledge society, and knowledge economy. All of them had a socio economic focus. Other attempts at creating an index had sought to measure what they termed ‘e-Readiness or Network Readiness’.
The first benefit of this index is that it draws attention of various stakeholders of the society to an increasingly important sector. Information binds people together, contributes to education and economic development of society. It also helps in the transmission of culture, and provides recreation. Information infrastructure variations also reflect variations in economic and social development. Development has an important informational dimension. Poor people often lack access to information that is vital to their lives and livelihood, such lack of information adds to the vulnerability of the people concerned. (UN, 2010)

Policy makers, Governments, NGOs and corporates who are concerned with giving an impetus to the development process will find an Information Index useful in different ways. The overall index values of different states and regions provide a comparison which will help the stakeholders to access their own position vis-à-vis the other regions. For example The Information Index constructed in the present study indicates that the states of Assam, Bihar and Orissa need to consider the development of information infrastructure as part of their development strategy. The scores on each indicator would help in identifying the particular aspect of information infrastructure which needs to be strengthened. A closer analysis of the indicators that make up the index would help in identifying the areas of concern. For example the Information Index of West Bengal is pulled down by the low enrollment in higher education and the low expenditure on R&D, in Gujarat the low level of government expenditure on education resulted in its lower position on the Information Index. On the other hand the reduced e-Readiness level of Madhya Pradesh had an effect in bringing down in its overall level, although in terms of traditional information infrastructure in was better off. Thus a detail analysis of the index would help national and state governments in developing appropriate policy. Further in implementing development policies the index suggests the kind of data to be collected to help monitor the progress. Individual ministries and departments e.g. Education or Science & Technology, Culture, IT, can also get a clear picture of where the development focus should lie. NGOs and corporates can support the development of common facilities like e-chaupals, cyber cafes, public libraries, village knowledge centres etc along the lines of services provided by ITC and M S Swaminathan Foundation, to give further impetus

7.5 SUGGESTIONS AND RECOMMENDATIONS

It is suggested that similar Information Indexes be constructed on a regular basis following the methodology suggested in the chapter 6. For the Index to be as comprehensive as possible state wise and district wise desegregated data needs to be made available. In is heartening to note that the Census 2011 has included many of the parameters which could be useful in the construction of the Information Index. In addition to the government, industrial and the professional associations should make known, data of their particular sector, e.g. number of telephones, mobiles, computers, libraries etc. Further the government agencies should release the data collected by them more regularly and quickly. With the
present state of ICT development, more particularly the management information systems this should not be very difficult.

It is also suggested that such an Information Index be also developed for a specific wards of cities or villages by collecting primary sample data. The index so constructed could be then checked against observations and other qualitative data. This procedure will further validate the Information Index.

A Final Word

Information infrastructure developments in the last two decades have lifted India into a position of power. The use of the Y2K opportunities by the Indian software industry and the impact of mobile telephones are success stories in the path of India’s development. Recognition of the role of information in development and the components of information infrastructure will help the country identify, overcome and quicken the pace of development. By crating a tool kit of measures, benchmarks and standards for information infrastructure the LIS profession can contribute to this development and fulfill its role in society.
REFERENCES