

E-Readiness Assessment (India)

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ABSTRACT

The Information Age is increasing the gap between the rich and poor, developed and developing countries and creating a society of information haves and have-nots.

Countries with greater powers of acquisition have easier access to new technologies and take greater advantage of them. Given this situation, it is imperative that developing countries redouble their efforts to prepare themselves to successfully meet the challenge and maximize the opportunities that the *Information-Based Economy* offers. This is not an easy job – there are many dimensions and factors associated with what it means to achieve a level of preparedness in the modern *interconnected or digital world*. This paper discusses those dimensions in details in the following pages.

In the *Information Age* countries without high levels of resources can hope to accelerate development if they are able to develop knowledge, which, combined with adequate ICT-related infrastructure, can allow successful integration into knowledge-based economies. But before discussing how we can accelerate development in those areas we need to identify those elements of success.

Department of IT has initiated the process of assessing various States and Central Ministries / Departments across the country to identify the bottlenecks and opportunities w.r.t. the usage of ICT and come out with a National Action Plan. This paper is an effort to share our experience on aspects related to the Methodology, Modeling and other issues related to e-readiness assessment.

I. INTRODUCTION

India has been Assessed a number of times at the Global level.

- *The July 2002 EIU ranking ranks India below Sri Lanka at 43rd out of 60 as E-Business follower.*
- *The January 2001 IDC ranking which found that the 55 countries of the countries navigating the Information Superhighway accounts for the 98% of all IT in 150 countries. It ranked India at 54 and Pakistan at 55 amongst the group of elite 55.*
- *The May 2001 Mc-Connell ranking of E-Readiness Assessment indicates that substantial improvements are needed in area of Connectivity whereas the areas like E-Leadership, E-Business, Information security and Human Capital requires just improvements.*
- *The 2002 Global Technology Index ranks India at 34 just above Russia. The index ranks India at no 1 in area of availability of qualified Engineers.*
- *Other global rankings around, notably from the Centre for International Development (CID), Harvard and the Computer Systems Policy Project on E-Commerce Readiness - none of which rates India highly.*

Each ranking/ assessment looks E-Readiness with different prospective. The focus in most cases had been E-Economy. The government is therefore doing its own assessment. The Assessment was required for it is the first such initiative comparing the different States/ GOI Departments in terms of their preparedness for the networked world.

The assessment will enable:

- Better accountability
- Validation amongst Objectives set
- Healthy Competition

And will help in preparing a National Action Plan.

II. Why E-Readiness?

There are many of factors that promote the countries to be e-ready;

- The enormous advantages that ICT will bring along by. It will not only lead to a Simple, Moral, Accountable, Responsive and Transparent (SMART) Government, it will also lead to making the citizens life easy. ICT promises various social and economical benefits as well.
- Secondly, the countries are facing a threat of being left behind.
- Third, international leaders, foreign donors, and lending agencies are integrating ICT into development and aid programs.
- Again ICT is a key weapon in the war against world poverty. When used properly, it offers a tremendous potential to empower people in developing countries to overcome development obstacles; to address the most important social problems they face; and to strengthen communities, democratic institutions, a free press, and local economies.

An e-readiness assessment, when properly applied in a larger process of evaluation, is a first step towards converting good intentions into planned actions that bring real changes to people's lives. E-readiness assessments are meant to guide development efforts by providing benchmarks for comparison and gauging progress. This is an old process adapted to today's technology realities; determining the current situation in order to plan for the future and advocate specific changes.

E-readiness assessment can also be a vital tool for judging the impact of ICT, to replace wild claims and anecdotal evidence about the role of ICT in development with concrete data for comparison.

III. DEFINING E-READINESS

The **CSPP's guide** to E-Readiness defines an 'e-ready' community as one that has high-speed access in a competitive market; with constant access and application of ICTs in schools, government offices, businesses, healthcare facilities and homes; user privacy and online security; and government policies which are "favorable to promoting connectedness and use of the Network."

The **Asian Pacific Economic Cooperation (APEC)** group defines a country as e-ready that is 'ready' for e-commerce, has free trade, industry self-regulation, ease of exports, and compliance with international standards and trade agreements.

McConnell International defines e-Readiness as the capacity of nations to participate in the digital economy.

World Economic Forum Consultation Report on E-Readiness defines E-Readiness as the ability of the ICT networks to effectively adapt to the social and economic advancement.

Kable and Government Computing Report on Europe's Readiness for E-Government says that Government becomes e-government or E-Ready when the public sector digitizes its processes and interactions, whether internal or external with business or with the public.

The **Center for International Development** at Harvard University the most acclaimed institution in e-Readiness research defines an 'E-Ready' society is one that has the necessary physical infrastructure (high bandwidth, reliability, and affordable prices); integrated current ICTs throughout businesses (e-commerce, local ICT sector), communities (local content, many organizations online, ICTs used in everyday life, ICTs taught in schools), and the government (e-government); strong telecommunications competition; independent regulation with a commitment to universal access; and no limits on trade or foreign investment.

Networked World, a study by Harvard's CID again acclaims that, a "networked world" can be seen as a web of communications networks in which it is possible to send and receive information in a variety of digital formats anywhere in the world using a variety of transmission media and E-Readiness is the preparedness for this Networked World.

...success during the Information Age depends on how widely integrated information and communication technologies are to society in general. New value proposals based on ICTs emerge as individuals begin to accept and understand its use. This behavior and attitude change leads us to creative solutions and new models which can radically transform the way in which commerce, hospitals, schools and government function.

A society's electronic preparedness can be seen as the degree to which the society can participate in the advantages and opportunities of a knowledge-based society, and accept the challenges that such environments pose. We can formally define e-readiness as:

...the degree in which a community is qualified to participate in the Networked World. It is measured by judging the relative advance of the most important areas for the adoption of the ICTs and their most important applications.

III. E-READINESS OBJECTIVE

E-Infrastructure: If the objective is on E-Infrastructure then the focus should be on institutions, hardware and software *Here e-readiness equals computers and access* – computer hardware and network access are required to be e-ready and bridge the digital divide, and government and private initiatives should supply them

E-Economy: If the objective is on e-commerce then the focus should be on ICT Business. *Here e-readiness equals computers, access, and economy* – computer hardware and network access are required for e-readiness, but the market will solve this problem on its own.

E-Society: If the objective is on the society then the focus should be complete population. *Here e-readiness requires basic literacy, poverty, health and other social issues to be addressed first* – computers are useful, but nothing will make a society e-ready and bridge the digital divide until basic literacy, poverty, and healthcare issues are addressed.

E-Governance: If the objective is E-Governance then the focus should be on Government Process Reengineering and faster and transparent means of delivering government services to the citizens. *Here e-readiness equals computers, access, and effective usage of computers* – hardware and access are not enough for real e-readiness, there must be extensive training programs, locally relevant content, and a local ICT sector; and a Business Process Reengineering alongwith.

The definition of Objective will help define the Stake holders in the process

Below is a table highlighting the focus areas of studies done at International level for various countries.

STUDY	Focus
1. APEC (Asia Pacific Economic Cooperation)	E-Commerce Readiness
2. CIDIF (Centre International pour le Dveloppement de l'Inforoute en Francais)	Internet Service Market
3. CSPP (Computer Systems Policy Project)	Existing Infrastructure
4. EIU (Economist Intelligence Unit)	E-Business Readiness
5. IDC	Infrastructure
6. KAM (World Bank, Knowledge Assessment Matrix)	K-Economy
7. MI (McConnell International)	Infrastructure, Digital Economy,

	Education and Government
8. MN (Metric Net)	E-Economy
9. MQ (Mosaic Group)	Internet
10. NRI (CID, Harvard)	Infrastructure, E-Society, Policies, Digital Economy, Education and Government
11. CID (Center for International Development)	Society
12. CIDCM (University of Maryland)	Qualitative Assessment based on past performance and current internet pervasiveness
13. ITU (International Telecommunication Union)	Telecom
14. Mosaic	Economy Focus
15. SIDA (Swedish International Development Cooperation Agency)	Mainly SWOT analysis of a Nation
16. USAID (US Agency for International Development)	Access, Government, People

On the basis of the objective and focus of study any of the above models can be adapted or evolved based on local needs.

IV. COMPONENTS OF E-READINESS / CHOICE OF INDICATORS

Depending upon the objective for Assessment, a model is chosen and indicators under the same worked out for Assessment. The wide range of indicators can be classified in the following main groups:

Network Access: What are the availability, cost and quality of ICT networks, services and equipment?

Networked Learning: Does the educational system integrate ICTs into its processes to improve learning? Are there technical training programs in the community that can train and prepare an ICT workforce?

Networked Society: To what extent are individuals using information and communication technologies at work and in their personal lives? Are there significant opportunities available for those with ICT skills?

Networked Economy: How are businesses and governments using information and communication technologies to interact with the public and with each other?

Network Policy: To what extent does the policy environment promote or hinder the growth of ICT adoption and use?

The various global studies bring out the following indicators for the assessment.

APEC's E-Commerce Readiness Assessment

Six categories are measured for "readiness for e-commerce:"

- basic infrastructure and technology (speed, pricing, access, market competition, industry standards, foreign investment),
- access to network services (bandwidth, industry diversity, export controls, credit card regulation),
- use of the Internet (use in business, government, homes),
- promotion and facilitation (industry led standards),
- skills and human resources (ICT education, workforce), and
- positioning for the digital economy (taxes and tariffs, industry self-regulation, government regulations, consumer trust).

CSPP's Readiness Guide for Living in the Networked World

CSPP's guide carries measurements into five categories:

- infrastructure
- access
- applications and services
- economy; and
- "enablers" (policy, privacy, security, ubiquity).

The Economist Intelligence Unit/Pyramid Research e-readiness rankings

The report measures six areas:

- Connectivity (30%)
- Business Environment(20%)
- E-Commerce Consumer and Business Adoption (20%)
- Legal and regulatory Environment (15%)
- Supporting e-Services (10%)
- Social and cultural Infrastructure(5%)

IDC : Information Society Index

The study is based on four indicators

- Computer infrastructure
- Information Infrastructure
- Internet Infrastructure
- Social Infrastructure

KAM: Knowledge Assessment Matrix

The study is based on four indicators

- Performance Indicator
- Economic Incentives and Institutional Regimes
- Education and Human Resources
- Innovative System
- Information Infrastructure

McConnell International's Risk E-Business: Seizing the Opportunity of Global E-Readiness

The report measures five areas:

- connectivity (infrastructure, access and pricing),
- e-leadership (government policies and regulations),
- information security (intellectual property, privacy, electronic signatures),
- human capital (ICT education, available skilled workforce), and
- e-business climate (competition, political and financial stability, foreign investment, financial infrastructure).

Metric-net: The 2002 Global technology Index

The report measures five areas:

- Knowledge Jobs
- Globalization
- Economic Dynamism and Competition
- Transformation to a Digital Economy
- Technological Innovation Capacity

Network Readiness Index (NRI) CID, Harvard

The Network readiness Index is based on two major indices

- Network Use
- Enabling Factors - Information Infrastructure, Hardware, Software and Support, ICT Policy, Business and Economic Environment, Network Learning, ICT Opportunity, Social Capital, E-Government, E-Commerce, General Infrastructure

CID's Readiness for the Networked World: A Guide for Developing Countries

This guide measures 19 different categories, covering the availability, speed, and quality of network access, use of ICTs in schools, workplace, economy, government, and everyday life, ICT policy (telecommunications and trade), ICT training programs, and diversity of organizations and relevant content online.

CIDCM's Negotiating the Net Model

The framework measures four categories of information for each country:

- Background and history – structural context (economy, education levels, existing infrastructure), political structure and culture (type of government, policy making style), cultural norms (religion, etc).
- Key players in Internet development – responsibilities and objectives of relevant players in government, local and foreign businesses, universities, NGOs, international financial institutions, research groups.
- Internet development and ICT policy over time – access, regulation, competition.
- Negotiations between players in developing the country's Internet - each aspect of Internet development and ICT policy is categorized into one of four stages (pre-commercial, commercial, competitive, and consolidated).

Mosaic's Global Diffusion of the Internet Project

It measures the Internet within a country at a particular point in time by measuring six dimensions:

- pervasiveness (per capita usage),
- geographic dispersion,
- sectoral absorption (usage within major sectors of the economy),
- connectivity infrastructure,
- organizational infrastructure (the state of the Internet service market), and
- sophistication of use.

WITSA International Survey of E-Commerce

It measures the Internet within a country at a particular point in time by measuring eight dimensions:

- Trust
- Technology
- Workforce Issues
- Public Policy
- Taxation
- Business Process
- Costs
- Consumer Attitude

Swedish International Development Cooperation Agency

It measures the Internet within a country at a particular point in time by measuring six dimensions:

- Demographic parameter
- Economic Parameters
- ICT Parameters

U.S. Agency for International Development (USAID)

Detailed case studies of countries using a framework of four P's

- Pipes (Access),
- Public Sector (Government Policies, E-Government),
- Private Sector (Usage),
- People (Training)

World Economic Forum

Three categories are measured for E-Readiness

- Policy
- Basic Infrastructure
- Ground level Projects

V. EVOLUTION OF PARAMETERS

Each indicator for the purpose of assessment is further classified as a summation of various parameters. For example for the indicator Information Infrastructure; Teledensity, Number of Cellular connections, Length of Optical fibre etc will be the parameters.

Identification of Parameters

For each indicator various parameters need to be identified. These parameters can be referred from various global studies or a group of domain experts can evolve the same.

Assigning a Base to Parameters

Along with defining parameters a base needs to be ascertained. Say for example when comparing with different States we don't look into the Number of PC's in the State; we look into Number of PC's per total population of the State.

Categorization of Parameters

The parameters arrived will be categorized as **primary and secondary** and the sources for the same identified. The secondary sources of data can be the published reports, documents, and data on web. Primary data will be collection of information by conducting surveys etc.

Data Collection Strategies

Once the parameters are identified, the next step is to collect authentic data for the same. The data can be collected using various strategies which include:

Quantitative

Questionnaires A set of direct questions about information technology and policy in the state based on the parameters will be asked and primary data collected accordingly.

Statistical methods mathematically analyze prior data on the country to test for relationships between the individual factors, for example, by looking for a casual relationship between Internet access and political democracy.

Qualitative

Best practices use experience learned in other countries or direct comparison with other, similar, countries. This will be based on opinion of Experts

Historical analyses of the unique political, economic and social events in the country use these unique events to explain or forecast information technology in the country

VI. STANDARDIZATION OF DATA

The data that is obtained through surveys and otherwise cannot be used as such, there may be scale bias in the data. Variables chosen for any analysis are usually measured in different units and are therefore not additive. Hence it is necessary to convert them in some standard comparable units such that the initial scale chosen for measuring them do not bias the results.

In the NRI study the hard data was converted into a 1-to-7 scale using linear transformation to be consistent with the overall data.

The NRI model uses the following parametric index”

$$6 \quad x \quad \frac{(\text{Country Value} - \text{Sample Value})}{(\text{Sample Maximum} - \text{Sample Minimum})} + 1$$

Another approach is to do the standardizing of the variables in the following way-

$$x_{ij} = (X_{ij} - X_m) / \sigma$$

where x_{ij} is the scale free observation, X_{ij} is the original observation and X_m is the mean of the series and σ is the standard deviation.

The transformed series now would be scale free and would have a mean of zero and a standard deviation of unity.

VII. ASSIGNMENT OF WEIGHTS

The determination of weights for a parameter can be arrived by the following three methodologies:

Equal Weights

The parameters evolved can be assigned equal weights for the purpose of coming out for a Ranking. But in most cases the same is not advisable for the parameters are not having equal level of importance. A few parameters like teledensity are more important than others like ISDN connectivity.

Subjective Weights

Another approach will be to assign subjective weights based on perception of experts and taking an average of the same. Processes like the Analytical Hierarchical Processes (AHP) can also be used. But again these processes are based on individual perceptions and can be questioned.

Objective Weights

Another approach is to use the statistical techniques of analysis. These techniques will assign weights to parameters based on the observed values. Principal Component Analysis is one such technique of assigning objective weight ages to the parameters.

VIII. RANKING AND COMPARITIVE ANALYSIS

The final ranking can be arrived by multiplying the observed value with the weights of that parameter and thereby constructing an index.

Action plans can then follow highlighting the bottlenecks and the opportunities in various areas.

IX. CONCLUSION

No doubt e-readiness assessments are meant to guide development efforts by providing benchmarks for comparison and gauging progress, but there are a lot of areas, which need to be kept in mind while going for such an assessment. They are:

- Review assessments that have already been done in the area There are a number of prior reports that exists. Among e-readiness projects, greater coordination and foresight is needed to avoid duplication.
- Whenever an E-Readiness assessment is carried out it should be ensured that the results are publicly available. The agency or organization that commissions the assessment should ensure that the results are circulated for wide use—too often this step has been missed
- Reflect the views of all stakeholders in the e-readiness process and throughout implementation.
- Use assessment results effectively to develop an e-strategy that addresses how exactly e-readiness will be improved and ICT used to benefit the country.
- The actions plans should be so made that they are realistic. The plan should comprise small achievable steps that deliver sustainable, scalable, and replicable results. This is the best approach to narrowing the digital divide and ensuring that the valuable resources used to measure e-readiness are not wasted.

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