Executive Summary

- ICTs are increasingly being recognized as essential tools of economic development.
- The contribution of ICT can be viewed at two different but interrelated levels- ICT growth and ICT diffusion.
- Unlike old technologies, which are more demand driven, ICT is more supply driven and leaves greater scope for diffusion.
- The government is very much proactive in the context of improving ICT performance in the country. The state governments are also actively participating in the process with direct policy level competition.
- E-Readiness study has increasingly become popular and a platform to compare different level of state development.
- ICT's role is relevant for both for "developing" and developed states as revealed in the findings of the study.

Unique Features of the E-Readiness Report, 2005

- Output and employment multipliers - state wise for major states.
- Comparative analysis of state level rankings over the three-year period since inception of the e-Readiness in India.
- State level strategies based on the insights from the above two-multipliers and comparative analysis.

For the first time, output and employment multipliers of the key states in India for the software, hardware and ICT composite segments have been calculated to assess the catalytic effect of ICT on economic development in these states. The second unique feature of this report is the comparative analysis of the e-readiness status of Indian states over a three-year period (2003 to 2005). This helps us not only to evaluate but also to monitor state performance. These rankings help us to understand whether states have adopted strategies/action plans to improve their network readiness index. The report also brings out the key factors that states should address to tune up their e-readiness rankings.

Output and Employment Multipliers

The multipliers of the states for the software sector have been derived from the all India multiplier figures of the software sector using the ratios of employment/output and input/output. The table below shows the output and employment multipliers of a few major states of the country.

Software sector-Output Multiplier and Employment Multiplier

State	Output Multiplier	Employment Multiplier
Delhi	1.41	2.35
Chandigarh	1.92	1.49
Maharashtra	3.22	0.32
Andhra Pradesh	1.15	3.87
Karnataka	1.45	0.23
Kerala	1.64	2.56
Tamil Nadu	1.46	0.67
Punjab	1.11	2.27
Haryana	1.62	2.00
Rajasthan	1.42	5.40
Uttar Pradesh	1.31	1.43
West Bengal	1.41	2.18
Orissa	1.38	4.34
Madhya Pradesh	1.84	5.45
Gujarat	2.25	1.30

- The output multiplier for the software sector varies from 1.11 to 3.22 including the unitary impact of the software sector.
- The employment multiplier for the software industry is in the range of 0.23 to 5.45 man-years per lakh of output in 2001-02 prices.
- In "developing" states like Orissa, Madhya Pradesh, Rajasthan etc., the employment multiplier is high whereas the output multiplier is low, thus, indicating the existence of low technical applications and high involvement of labour especially in the IT enabled services in the state.

- The "horizontal" diffusion level of ICT in these developing states would be far higher than the developed states where the output multiplier is high indicating higher "vertical" diffusion and the employment multiplier is low.
- In developed states like Maharashtra, Gujarat etc., the vertical linkages are higher due to the use of high technical input. Thus, information technology plays a unique role in both advanced states as well as "developing" states.

To arrive at the composite ICT sector's output and employment multipliers, we used a weighted average of the output multiplier of the hardware sector and the software sector in key states. The weights being the ratio of national output of the hardware and the software sector.

Output Multiplier and Employment Multiplier for ICT Sector

	ICT Sector (Hardware + Software)	Hardware Sector	Software Sector
1. Output Multiplier	2.3	2.5	2.2
2. Employment multiplier (man-years per rupees lakh of output)	0.36	0.18	0.38

For example, per NASSCOM data, the total turnover of IT sectors had increased from USD 7.09 billion in 2000 to USD 28.4 billion in the year 2005, a CAGR of 32 percent since FY 2000 in current prices. Thus the employment generated in the year 2005, since the beginning of the year 2000 using composite employment factor for ICT sector 0.36 is 3.45 million man years. Thus, the ability to create employment by the ICT sector indeed is quite high as brought out by the above illustration.

For the ICT sector as a whole, the output multiplier is 2.3 viz Rs 2.3 lakh increase in output of the economy for every Rs one lakh increase in output of the sector under consideration including the unitary impact of this sector. Similarly, the ICT sector creates an employment of 0.36 man years for every Rs one lakh of output of the sector.

Thus, we see that ICT can make leapfrogging possible; it does not accentuate differences but encourages economic development. The states have comparative advantage; developed states like Maharashtra, Tamil Nadu etc can attract a pool of technical talent whereas "developing" states like Rajasthan, Madhya Pradesh can offer opportunities for for employment associated with IT. Thus, ICT has a role to play in both technically advanced as well as developing states.

Framework of Analysis for E-Readiness Index of the States in India 2005

This is based upon the following premises:

- There are three important stakeholders to consider in the development and use of ICT: individuals, business and governments;
- The degree of usage of ICT by (and hence the impact of ICT on) the three stakeholders is linked to their degrees of readiness (or capability) to use and benefit from ICT
- There is a general macroeconomic and regulatory environment for ICT in which the stakeholders play out their respective roles.

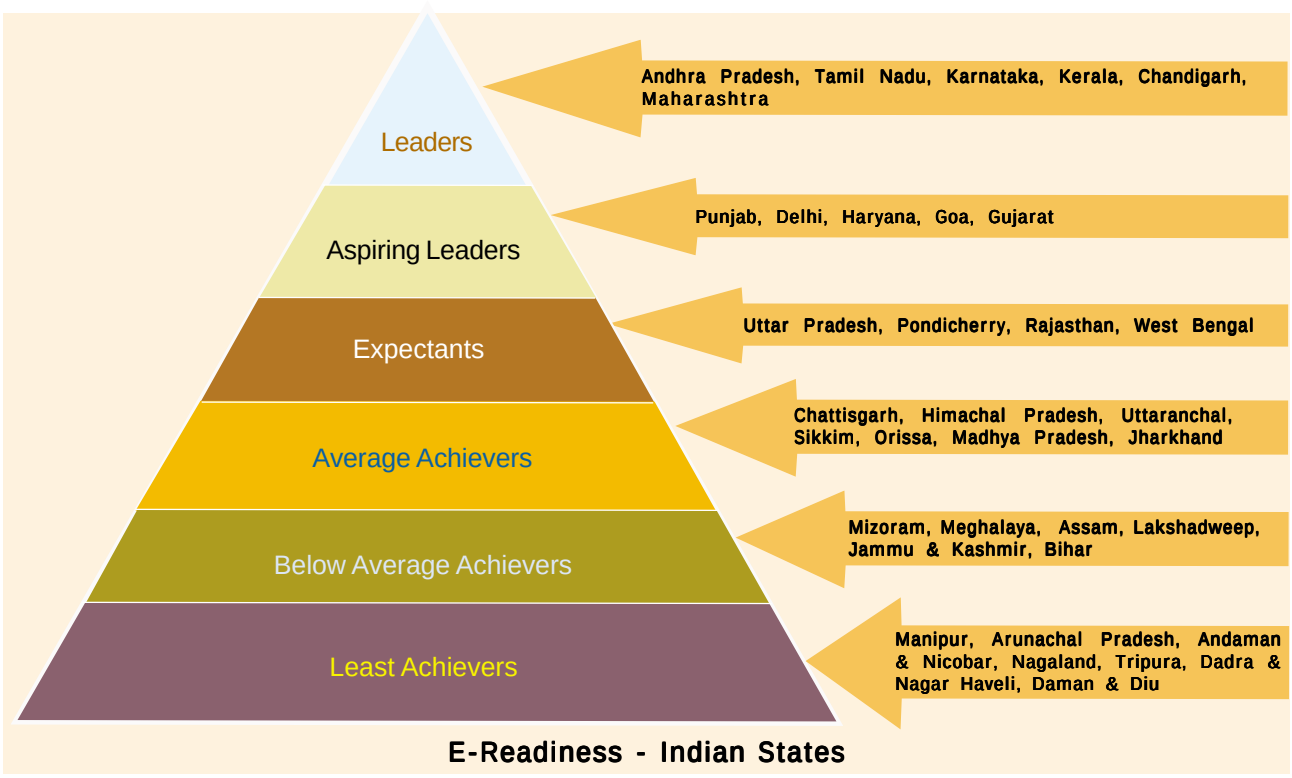
The e-readiness index developed by us is composed of variables that fall into three broad categories 'Environment', 'Readiness' and 'Usage'.

Methodology

We measure e-readiness of the states through an empirical model using Principal Component Analysis (PCA). This is a multivariate analytical tool. PCA helps in determining the most important variable or a limited number of variables from a given set of explanatory variables. This approach develops a composite index by defining a real valued function over the relevant variables objectively. We have used a multi-stage Principal Component Analysis to construct the e-readiness index of the states. The following steps were used in constructing the e-readiness index:

1. First we used PCA to combine the indicators and construct indices for each sub-group.
2. In the second step we combined these sub-group indices (using PCA) under each group index to arrive at next level of aggregation (Environment Index, Readiness Index and Usage Index).
3. Finally, we constructed the aggregate E-readiness Index by combining the Environment, Readiness and Usage indices (again through PCA).

The PCA analysis generated the weights to be assigned to the indicators of e-readiness optimally. The model has



E-Readiness - Indian States

assigned almost equal weights to all three indicators indicating that they are almost equally important (with environment having a slightly higher relative weight) in the overall index of e-readiness.

Sub-Index: Environment

Competitive market environment, education and access to communication facilities significantly affect the environmental readiness of the states. Competition among players in the ICT sector gives the consumers better quality products at affordable prices. Education makes people capable of harnessing the advances in technology and access to communication facilities aid in enhancing the e-readiness of the states.

The categorisation of the states based on "Environment sub-index" shows that the number of states in the level 6 category has significantly reduced in comparison to last year. This implies that states have taken initiatives to provide a sound environment for ICT development.

Sub-Index: Readiness

Variables of significance for individual readiness primarily depend on the level of education of individuals. Here again, education emerges as an important variable. Thus, the state governments should lay special emphasis on enhancing expenditure on education. Government readiness depends significantly on availability of on-line training programmes for officials and provision for usage of ICT as a governance tool.

Sub-Index: Usage

Income is a significant variable in the Usage sub-index. A state may have state of the art facilities, a number of institutions imparting ICT education, but it is ultimately income of potential users that determines the usage of ICT across states. As far as the government is concerned, in all three categories, the greater the engagements of the state government in this sector the better the e-readiness of the state.

The categorisation of the states based on "Environment sub-index" shows that in this category more states are in the above average level (Level 4) than the other two categories. However, seventeen states are still below average. The relative standings of all three categories show that there is a lot yet to be achieved in terms of balanced regional development of ICT.

Comparison of Ranking

For the last three years, states have been ranked according to their e-readiness status. This yearly exercise has assumed importance over the years as the Government of India accords considerable emphasis to this report as

a stock taking mechanism, to understand the situation regarding e-readiness or preparedness of the states.

While comparing the rankings for 2004 and 2005, it can be observed that the states of Bihar (up four places), Jharkhand (up four places), Rajasthan (up six places) and Uttaranchal (up seven places) are the states, which have significantly improved their positions in the last year.

- The state of Bihar has significantly improved in indicators representing market and infrastructure environment, business and individual readiness.
- Jharkhand, has done exceedingly well and has improved its ranking through good performance in political & regulatory and infrastructure environment indicators, government and individual readiness indicators.
- Rajasthan a state which is performing well in terms of income growth and poverty alleviation in the last few years has significantly improved its ranking in the year 2005 over 2004. Factors responsible for such changes are political and regulatory and infrastructure environment indicators, government readiness indicators and individual and government usage indicators.
- Uttaranchal the state with the greatest improvement in ranking between 2004 and 2005, has done well in political and regulatory and market environment indicators, government and individual readiness indicators and business and government usage indicators.

It is clear that political and regulatory, government readiness and government usage are indicators that have helped most of these states to improve their rankings in terms of e-readiness between 2004 and 2005.

Validation by Case Studies

The case studies examine the "impact/outcome" of the ICT initiatives. These have not been restricted to simply performance evaluation of the ICT projects but also examine

- whether the state was able to bring about effective process reengineering,
- whether ICT was a catalyst in bringing about changes in the infrastructure supply
- whether ICT was a catalyst in bringing about changes in the institutional framework
- whether there were any legislative changes made
- whether the project brought about any effective change in policy as a result of increased awareness in demand from institutional stakeholders.
- whether there was a reasonable spread across income groups as well as remote less developed geographical regions

In these case studies we also examine whether the e-governance/ e-readiness initiatives have integrated or empowered the marginalized sections (Sen's Approach); whether the 'value addition' to information, the intermediate product has been maximum (Brown's Approach) and whether the initiative is sustainable, scalable at sufficient pace and whether the initiative is profitable so that the private sector can become a partner of the development process

Indicators of Significance for the States: An Aggregate Analysis

Based on the quantitative analysis, indicators that emerge as important and should be given priority by the states while addressing e-readiness issues are:

Political and Regulatory Environment

- Proportion of policies taken up for e-governance
- Existence of cyber laws in the state

Infrastructure Environment

- Access to social and educational infrastructure. Factors that are important here include: average distance in kms to the nearest primary school, post office, public telephone booths, computer training centers, college, internet kiosks, medical store etc., All these variables turn out to be crucial..

Individual Readiness

- Household penetration of computers, telephones and mobiles is a very important variable of individual readiness. Training of users in government owned computer kiosks has been a significant factor in the north-eastern region.

Business Readiness

- Setting up of IT parks and increasing the number of IT companies This matches with the findings that competition matters. However, in the case of ISP and cellular limited competition is only possible due to technological constraints such as minimum number of subscribers to be viable per operator etc

(natural market concentration rider for stable long term operators)

- Incentive regimes for IT companies
- Dedicated infrastructure for IT companies

Government Readiness

- Expenditure on education since education of users is an important ingredient
- Use of ICT in government functioning is critical, for example, use of ICT in public delivery systems enhances government usage significantly.
- Number of government officials undertaking/ undertaken online training programmes
- States that take initiative in opening up of technical colleges gain a competitive advantage over other states in the ICT segment

Government Usage

- Number of e-governance projects undertaken by the state government as a regulator and provider of infrastructure plays an enabling role. While govt as probably the largest single user can help expand the market.

State Level strategies

The state level strategies for a few states are discussed succinctly in the table below:

State	Bottleneck Parameters	Sub-Indicators	Key Indicators to be tackled	Policy Changes	Action Plan
Andhra Pradesh	Environment	Market Infrastructure	Competition in the telecom sector Distance from the nearest primary school college internet kiosks etc	– Market Environment needs to be improved – Impetus to ICT education needs to be provided	– Increasing the density of internet kiosks
Karnataka	Environment	Political & Regulatory	Proportion of policies for ICT	Only state to have Secretary level official heading the e-governance wing. -Needs to institutionalize the set up	– SeMT (e-governance mission teams) needs to be set up if not already in place – Institutionalise PPP model in e-governance activities
Chandigarh	Readiness	Individual	Total Number of – engineering students to total technical students – MCA Students to technical students – B.Sc Computer Science/ technical students	Provide impetus to higher education	Give financial support to colleges and provide incentives to colleges to increase the no. of seats in technical courses
Delhi	Environment	Political & Regulatory	Proportion of policies for e-governance/ security -	- Proactive political & regulatory environment -need of the hour Impetus to education	- ICT policy revised-section on regulatory & legal policy - Have a supplementary budget for e-governance

State	Bottleneck Parameters	Sub-Indicators	Key Indicators to be tackled	Policy Changes	Action Plan
					projects - Introduce transparent policy for PPP for e-governance projects
Delhi	Readiness	Individual	- No. of engineering/ technical students - Proportion of policies for ICT readiness		
Haryana	Readiness	Government	Government expenditure on secondary education	- Provide impetus to higher education	- Increase outlay in annual budget for secondary education - Give financial support to colleges & provide them incentives to increase the number of seats available in technical courses
Goa	Readiness	Business	- Employment in IT cos/total no. of IT parks - ICT exports to total exports	- Develop a policy environment for introduction of ICT applications - Introduce a policy to facilitate ICT export from the state	- Give concessions to industries for ICT activities - Provide incentives like tax concessions to attract investment to build IT parks - Set up internet kiosks to facilitate accessibility
	Usage	Government	- Status of accessibility to information & services to citizens - Proportion of policies taken up for ICT usage		
Gujarat	Readiness	Individual	Percentage of total households with computers	- Fiscal incentives for computer manufacturing in the state - Special budget allocations for secondary education - Outlay in budget for ICT awareness - Policy for setting up govt kiosks to spread awareness	- Loans at low interest to citizens for purchase of computers - Financial support to colleges & incentives to increase seat in technical courses - Concessions to industries/companies for ICT activities - Increasing the density of internet kiosks
		Government	Government expenditure on secondary education		

State	Bottleneck Parameters	Sub-Indicators	Key Indicators to be tackled	Policy Changes	Action Plan
Uttar Pradesh	Environment	Infrastructure	Distance from the nearest computer training center, internet kiosks etc	- Specific policy for introduction of CICs - Specific budget allocation for secondary education & incentives for higher education etc - Introduce a policy to facilitate ICT exports from the state	- Open internet kiosks which can be set up in schools, markets etc & provide internet & training facilities like CICs in the north east - Give financial support to set up engineering colleges - Give concession to industries/companies for ICT activities
	Readiness	Individual	Total number of engineering students to total technical students		
Rajasthan	Environment	Infrastructure	Distance from the nearest college, medical center etc	- Continue the progressive steps till date - Proactive policy by the government for infrastructure development	- Give financial support to private entrepreneurs for setting up institutes for higher education - Increase the density of internet kiosks
Chattisgarh	Environment	Infrastructure	Distance from the nearest post office public telephone, computer training centre, etc	- Special budget allocation for infrastructure development - Provide impetus to higher education - Address issue of IPR in ICT policy	- Give financial support to private entrepreneurs to improve the density of colleges & equity in distribution of education - Introduce a section on security & legal policy in state ICT policy

Key Findings

- Our analysis of the e-readiness of the states reveals that the southern states like Andhra Pradesh, Karnataka, Tamil Nadu and Kerala have remained leaders over the three-year period, while the northern states of Chandigarh, Haryana, and Rajasthan have shown vast improvements. Apart from these, Sikkim from the north eastern region has done exceedingly well
- The output and employment multipliers calculated for key Indian states show that ICT plays an important role in states, irrespective of their stage of development. Developing states like Rajasthan and Madhya Pradesh have a high employment multiplier and low output multiplier indicating the existence of high involvement of skilled labour in the IT services area, whereas the high "vertical linkages" in the developed states of Maharashtra and Gujarat is shown by the high output multiplier and low employment multipliers.
- Another important observation is that old technologies are demand driven and take time to penetrate whereas new technologies like ICT are more supply driven in the sense that the rate of diffusion is very high in this technology in both developed and developing regions and thus proactive role of government in all states will yield positive results in economic development. Therefore, there is greater scope in these technologies for diffusion agents to influence the diffusion process, implying that the outlay for the ICT sector should be increased substantially in order to achieve maximum benefits of ICT.

Introduction