ANNEX I

Principal Component Analysis

The Principal Component Analysis is a multivariate choice method. This approach develops a composite index by defining a real valued function over the relevant variables objectively. Given a set of explanatory variables, if we have to select the most important variable or a limited number of variables from the set, Principal Component Analysis helps. The principle of this method lies in the fact that when different characteristics are observed about a set of events, the characteristic with more variation explains more of the variation in the dependent variable compared to a variable with lesser variation in it. Therefore, the issue is one of finding weights to be given to each of the concerned variables. Weight to be given to each of the variables is determined on the principle that the variation in the linear composite of these variables should be the maximum. Once the weight to be given to each of these variables is decided, we can focus on the important variables in order to reduce the noise in the data. A set of assumptions has been used in our method of construction of a composite index. These are:

- the condition of *weak pareto rule* demands that when a state registers values of indicators uniformly higher than those of the other - the former should have a higher ranking than the latter ones;
- the condition of *non-dictatorship* implies that no single indicator should be considered so significant as to determine the final ordering all by itself;
- the condition of *unrestricted domain* implies that the method should be capable of giving the final ranking for all possible data matrices;
- the final condition is that of *independence* from irrelevant alternatives, which demands that while ranking two , the decision must be guided by the values of the indicators for these units under study alone and not by any other irrelevant phenomenon

Given these general assumptions, the composite index is defined as,

$$C_i = W_1x_{11} + W_2x_{12} + W_3x_{13} + \ldots\ldots\ldots\ldots + W_nx_{1n}$$

or, $$C_i = \sum W_i x_{ij},$$

where C_i is the composite index for the i^{th} observation, W_j is the weight assigned to j^{th} indicator and x_{ij} is the observation value after elimination of the scale bias.

It is evident from the above formula that to compute the composite index two major components are to be known, i.e., the weights assigned to the indicators and the observation values after elimination of the scale bias for the available indicators. These two have been discussed below in detail.

Elimination of scale bias

Variables chosen for any analysis are usually measured in different units and are generally 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. The method adopted to standardise the variable is

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

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.

Assigning weights objectively using Factor Analytic Model

Once the bias of measurement is removed from the observations, the crucial problem that remains is that of assigning appropriate weights to the selected indicators.

If one has sufficient insight into the nature and magnitude of inter-relationships among the variables and their implications, one might choose to determine the weights on the basis of independent judgement. This way of constructing an index stands exposed to subjectivity. Assigning equal weight (or no weight) would imply assumption of equal correlation of each indicator with the composite index of importance which would hardly be a realistic approach in this case. Therefore, in this analysis, the weights for individual indicators have been assigned on the basis of the factor analytic model.

Factor Analysis or Principal Component Analysis is a tool used to construct a composite index in such a way that the weights given maximise the sum of the squares of correlation (of the indicators with the composite index). The application of Factor Analysis in this specific case has been accepted in 'objective ranking' of the regions. This method enables one to determine a vector known as the first Principal Component or Factor, which is linearly dependent on the variables, having the maximum sum of squared correlation with the variables.

The weights given to the indicators are chosen in such a way so that the Principal Components satisfy two conditions:

a). The number of Principal Components are equal to the number of indicators and are uncorrelated or orthogonal in nature.

b). The first Principal Component or P_1 absorbs or accounts for the maximum possible proportion of variation in the set of the indicators. This is the reason why it serves as the ideal measure of composite index.

Method

Step 1 We start by taking the simple correlation coefficients of the *k* numbers of indicators. These correlation coefficients may be arranged in a table, which is called the correlation table. The elements of the diagonal would be unity as they are the self-correlated, i.e., the correlation of each X_i with itself ($r_{xi\ xi} = 1$ for all the *i*'s). The correlation matrix is symmetrical, i.e., the elements of each row are identical to the elements of the corresponding columns, since $r_{xi\ xj} = r_{xj\ xi}$.

Correlation Table of the set of K Variables

	X_1	X_2	X_3	X_k	$\Sigma^k_i r_{xi\ xj}$
X_1	$r_{x1\ x1}$	$r_{x1\ x2}$	..	$r_{x1\ xk}$	$\Sigma^k_i r_{x1\ xi}$
X_2	$r_{x2\ x1}$	$r_{x2\ x2}$	..	$r_{x2\ xk}$	
"	..	..	..	..	
"	..	..	..	..	
X_k	..	..	..	..	
"	$r_{xk\ x1}$	..	..	$r_{xk\ xk}$	
$\Sigma^k_i r_{x1\ xj}$	$\Sigma^k_i r_{xi\ x1}$	$\Sigma^k_i r_{xi\ x2}$	$\Sigma^k_i r_{xi\ x3}$	$\Sigma^k_i r_{xi\ xk}$	$\Sigma^k_i \Sigma^k_i r_{xi\ xj}$

Step 2 Sum of each column (or row) of the correlation table is computed, obtaining *k* number of sums of simple correlation coefficient.

$$\Sigma^k_i r_{xi\ xj} = \Sigma^k_i r_{xi\ xj}$$

Step 3 We compute the sum total of the column (or row) sums-

$$\Sigma^k_i \Sigma^k_j r_{xi\ xj}$$

and we take its square roots.

Step 4 Finally, we obtain the factor loadings for the first Principal Component P_1 by dividing each column (or row) sum by the square root of the grand total.

$$a_{ij} = (\Sigma^k_i r_{xi\ xj}) / (\sqrt{\Sigma^k_i \Sigma^k_i r_{xi\ xj}})$$

It should be clear that the loadings thus obtained are the correlation coefficients of the respective indicator with the composite index.

Step 5 The P_1 or the first Principal Component is constructed in the following way

$$P_1 = a_{11} x_1 + a_{12} x_2 + \ldots\ldots\ldots\ldots + a_{1k} x_k$$

Step 6 The sum of the squares of the loading of the Principal Component is called the latent root (or Eigen Value) of this component and are denoted by the Greek letter *l* with the subscript of the Principal Component to which it refers. For example, the latent root of the first Principal Component P_1 is

$$l_1 = [\text{latent root of } P_1]$$
$$= \Sigma_i^k 1^2_1$$
$$= 1^2_1 + 1^2_2 + \ldots + 1^2_k$$

The sum of the latent root of all the Principal Components would be equal to the number of indicators:

$$\Sigma_i^k l_i = k$$

The importance of the latent root or the eigen value lies in the fact that it expresses the percentage of variation in the set of indicators the Principal Component explains. If for example, $l_1 = 2.797$ and the number of variables are 8, then the P_1 expresses -

$l_1 / k = (2.797/8)*100 = 35\ \%$ of the variations of the set of 8 variables.

Tests of significance of the loadings: the loadings in our study have been tested based on the levels of significance of the Pearson Correlation coefficients.

Multi-Stage Principal Component Analysis

In this particular exercise, we have attempted a method of normal or single stage Principal Component Analysis as well as the multi-stage Principal Component Analysis. For performing the single stage Principal Component Analysis, all the indicators are taken together and the procedure discussed above is followed. In case of multi-stage Principal Component Analysis selected variables are divided into well-defined sub-groups depending on the nature of the indicators. Within a sub-group, they have a high degree of inter-correlation, while the canonical correlation between pairs of sub-groups is low on an average. The Principal Component Analysis has then been applied to each of these sub-groups of variables. The first Principal Components obtained from different sub-groups have been treated as a set of new variables and combined at a second stage to obtain the Final Composite Index. It has been argued that this method overcomes the necessity of taking more than one Principal Component in the analysis, since the correlation among the variables in a subgroup are generally high and consequently, the first Principal Component explains an 'adequate' proportion of the variation in the data matrix. However, the results are almost similar in both the procedure followed in this study which are discussed in the section where the results are analysed.

Input Output Table: Step and Hypothetical Illustration

Input Output Table Flow Matrix- Hypothetical Illustration

To explain the concept a highly simplified example is shown in Table below, which contains only four industries. Industries shown in rows are producing industries where as those shown in columns are users.

For example, row 1, industry 1, indicates that it produced Rs 20 lakh worth of products used within the industry; it produced Rs 65 lakh worth sold to industry 2, Rs 50 lakh worth sold to industry 3 and Rs 10 lakh worth sold to industry 4. These intermediate uses totalled Rs 145 lakh. Final products were valued at Rs 245 lakh so total output was Rs 390 lakh. Similarly industry 3 sold Rs 60 lakh worth of output to industry 2, and so on.

Simplified Input-Output Table (Flow Matrix), Value in Rs lakh

As producers	As users						
	Industry 1	Industry 2	Industry 3	Industry 4	Total intermediate uses	Final use	Total use
Industry 1	20	65	50	10	145	245	390
Industry 2	0	30	0	0	30	260	290
Industry 3	50	60	70	15	195	50	245
Industry 4	40	15	50	70	175	200	375
Total Purchases	110	170	170	95	545		
Value added	280	120	75	280		755	
Total output	390	290	245	375			1300

Each producer is also user of intermediate goods, and its purchases are shown in the columns of the I-O table. For example, industry 2 bought Rs 65 lakh worth of industry 1 products and also Rs 30 lakh from within the industry, Rs 60 lakh from industry 3 and Rs 15 lakh from industry 4. Total purchases for this industry were Rs 170 lakh. These industries added value of Rs 120 lakh, so total output was valued at Rs 290 lakh. This must be equal to the total output shown in row 2 for industry 2. Each row shows output allocated according to uses (including final demand), whereas each column shows the costs and profit of producing the output. Row 6 gives value-added by each industry and the sum of its entries; if extended to all sectors in the I-O Table of the Indian economy must yield the GDP. In this form the I-O table is also called the **flow matrix.**

Input Output Table Coefficient Matrix- Hypothetical Illustration

To turn the input-output matrix into a usable tool for calculating the tax multiplier, a crucial assumption is required. If it is assumed that the technology parameters like the ratio of purchases and value added to total production is fixed for every industry as of now and will prevail in future for next 5 years, then this accountant's snapshot of costs becomes an economist's production function with fixed coefficients. It says that for an industry, inputs and costs must expand proportionately with outputs. Input- Output Table above can be converted into matrix of ratios called input-output coefficients; this is done in table below. Each column in table has been divided through by its total, so that the second column, for

example, now gives the ratios of inputs to output for industry 2: each unit requires 0.23 of industry 1 output, 0.10 of industry 2 output, 0.21 of industry 3 output, 0.05 of industry 4 output and 0.41 of value added.

Coefficient Matrix

As producers	Industry 1 (X_1)	Industry 2 (X_2)	Industry 3 (X_3)	Industry 4 (X_4)
Industry 1 (X_1)	0.05	0.23	0.20	0.03
Industry 2 (X_2)	0.00	0.10	0.00	0.00
Industry 3 (X_3)	0.13	0.21	0.29	0.04
Industry 4 (X_4)	0.10	0.05	0.20	0.18
Total Purchases	0.28	0.59	0.69	0.25
Value added	0.72	0.41	0.31	0.75
Total output	1.00	1.00	1.00	1.00

The resulting table of coefficients, known as the **A matrix,** can be seen as a set of production functions for each sector shown in the columns. These fixed coefficient production functions are often called **Leontief production functions.** The elements (coefficients) of I-O tables are usually designated aij; the subscripts referring to the row (i, for input) and column (j) in that order. Thus, a12 is the output of sector 1 needed per unit of sector 2 output, a value of 0.23, while a43 is the 0.20 unit of sector 4 output needed to produce one unit of sector 3 goods. This matrix is suited to tracing direct incidence of taxes.

Input Output Table: Leontief Inverse to Obtain Output Multipliers-Hypothetical Illustration

Thus, for any level of output of the four industries, which we now label X1 through X4, the amount of X1 required would be

$$X1 = a11\ X1 + a12\ X2 + a13\ X3 + a14\ X4 + F1$$

This says that enough X1 must be produced to cover the input needs of each of the producing sectors, given by the input-output coefficients times the level of output, or aij Xj, plus the amount of X1 needed for final demand F1. The same is true for each of the other products, so the complete model is

$$X1 = a11\ X1 + a12\ X2 + a13\ X3 + a14\ X4 + F1$$
$$X2 = a21\ X1 + a22\ X2 + a23\ X3 + a24\ X4 + F2$$
$$X3 = a31\ X1 + a32\ X2 + a33\ X3 + a34\ X4 + F3$$
$$X4 = a41\ X1 + a42\ X2 + a43\ X3 + a44\ X4 + F4$$

F1 through F4 are the final goods required for the economy. The above set of equations may be put in the matrix form as given below:

$$\begin{bmatrix} X1 \\ X2 \\ X3 \\ X4 \end{bmatrix} = \begin{bmatrix} a11 & a12 & a13 & a14 \\ a21 & a22 & a23 & a24 \\ a31 & a32 & a33 & a34 \\ a41 & a42 & a43 & a44 \end{bmatrix} \begin{bmatrix} X1 \\ X2 \\ X3 \\ X4 \end{bmatrix} + \begin{bmatrix} F1 \\ F2 \\ F3 \\ F4 \end{bmatrix}$$

where X= A X + F

X= Gross Output Vector
F= Final Demand Vector
A= Technology matrix (also known as direct requirements matrix)
aij = quantity of good i require directly in the production of one unit of commodity j.

The total (direct and indirect) input requirements needed to produce one additional rupee of output by each industry is obtained from the total requirements matrix.

Using the following identities

X= (I-A)-1 F

X= (rij) F

Where rij is known as Leontief inverse or total requirements matrix.

Assume the Total Requirements Matrix to be as follows:

Leontief Inverse- Total Requirements Matrix-General Formulation

		Producing Industries			
		Industry 1	**Industry 2**	**Industry 3**	**Industry 4**
Supplying Industries	Industry 1	r_{11}	r_{12}	r_{13}	r_{14}
	Industry 2	r_{21}	r_{22}	r_{23}	r_{24}
	Industry 3	r_{31}	r_{32}	r_{33}	r_{34}
	Industry 4	r_{41}	r_{42}	r_{43}	r_{44}
	Output multipliers	Σr_{i1} where i=1,2,3,4	Σr_{i2} where i=1,2,3,42	Σr_{i3} where i=1,2,3,4	Σr_{i4} where i=1,2,3,4

For the hypothetical A matrix given above, the Leontief Inverse is as follows:

Leontief Inverse- Total Requirements Matrix-Hypothetical Example

		Producing Industries			
		Industry 1	**Industry 2**	**Industry 3**	**Industry 4**
Supplying Industries	Industry 1	1.10	0.36	0.33	0.06
	Industry 2	0	1.11	0	0
	Industry 3	0.21	0.41	1.49	0.08
	Industry 4	0.19	0.21	0.40	1.25
	Output multipliers	1.50	2.09	2.22	1.39

The column total gives the output multiplier for that industry.

The steps involved to arrive at the output and employment multipliers are succinctly given below:

Step 1: Setting up the Flow Matrix tracing the flow of output from one industry to another and from industries to final users. In the flow matrix, each row shows output allocated according to uses (including final demand), whereas each column shows the costs and profit of producing the output.

Step 2: Deducing the Coefficient Matrix - When flows are converted into ratios column-wise the resultant matrix is the Coefficient Matrix. (also known as the A matrix). These fixed coefficients imply a Leontief production function.

Step 3: Arriving at the Leontief Inverse Matrix (I-A)-1 also known as the Total Requirements Matrix captures the total (Direct and Indirect) input requirements needed to produce one additional unit of output by each industry.

Step 4: Output Multiplier, defined as the total increase in output generation for one unit increase of final demand in a particular sector can also be obtained from the Leontief Inverse. In the instance of backward linkage, use of a particular commodity induces demand for increased production of inputs which in turn require second stage inputs. These second stage inputs would require further inputs. The geometric progression of "output" at each stage is summed up to obtain the output multiplier effect.

Step 5: Employment Multiplier has also been specified in man-years of additional employment created for an increased output of Rs. 1 lakh of the concerned sector.

List of Indicators for State Level Assessment

Indicators for Environment

Indicators	Sub-Indicators	Indicators of Significance
Market Environment	• ICT exports / total exports • *Competition in the ISP sector:* - Number of Players - Market share of lead players (in per cent) • *Competition in the cellular sector:* - Number of Players - Market share of lead players (in per cent) • *Competition in the Telecom sector:* - Number of Players - Market share of lead players (in per cent) • Range of price charged for internet connection (per 100 hours)	• Number of players in the Telecom sector. • Number of players in the Telecom sector. • Number of players in the ISP sector • Number of players in the Cellular sector
Political and Regulatory Environment	• Does IT policy exist? - When was the ICT Policy initiated? - How often is the ICT Policy revised? • Is there a section in the following sections: - Enabling Policy - Regulatory Policy - Legal Policy - Security Policy • Is there a Performance Matrix of the state for monitoring policies? • Is the issue of IPR addressed in the ICT policy? • Is there effective legal machinery to tackle the problem of piracy of ICT products? • Does a state level action plan exist? • State e-governance mission team (SeMT) been set up for e-governance projects? • Is there a transparent policy for public private partnerships (PPP) for e-governance activities? • Has the government given support to ICT in way of initiatives, priorities, policies and interests? • Time taken to get clearance for starting an ICT business • Does a supplementary budget exist for state level projects? • Has an e-governance committee been set up? • Is there a Mission/Objectives/Strategies and Tactics (MOST) document for e-governance? • Have you enacted the IT ACT 2000 which is applicable to all states? • Are there cyber laws that confer legal status to electronic transactions and documents?	• Proportion of policies taken for e-governance • Proportion of policies taken for ICT companies • Proportion of Security Policies

Political and Regulatory Environment	• Is there a law on regulation of digital signatures and encryption? • Have any concessions been given to industries/companies for ICT activities? • Are subsidized utilities provided to ICT firms? • Any sales tax concessions have been given to ICT companies? • Give the total number of complaints/cases registered relating to IPR • Number of initiatives taken for telecom regulation and ICT trade policy? • Are there any public private partnerships for development of ICT infrastructure?	
Infrastructure Environment	• Number of villages with Village Public Telephones (VPTs) / total villages. • Number of public pay telephones / '000 population. • Waiting time for telephone lines (Number of days). • Total number of telephone mainlines / total population. • Total number of cellular connections / '00 fixed lines. • Number of schools with Internet access / total schools • Number of schools with Computer labs access / total schools. • Number of schools with websites / total schools. • Number of colleges with Internet access / total colleges. • Number of colleges with Computer labs access / total colleges. • Number of colleges with websites / total colleges. • Number of universities offering ICT courses / total number of universities. • Number of universities / Institutes with online courses / total number of universities. • Is there dedicated infrastructure for ICT? - Wireless networks - Optical Fibre Cable (OFC)/Networks - IT parks - State Wide Area Network (SWAN) - State Data Centers (SDCs) • Number of kiosks in rural areas per village • Average distance in kilometres from the nearest - Primary School - Post Office - Public Telephone booth - Computer Training Center - College - Internet Kiosk - Medical Store • Number of public access to the internet (cyber cafes registered)	• Average distance in kilometres from the nearest - Primary School - Post Office - Public Telephone booth - Computer Training Center - College - Internet Kiosk - Medical Store

Indicators for Readiness

Indicators	Sub-Indicators	Indicators of Significance
Individual Readiness	• Percent of total household with the following consumer goods - Television (TV) - Personal Computer (PC) - Telephone - Cellular Phone - Internet Connection - Cable Connection • Number of IT qualified teachers/total teachers. • Total number of Engineering students/total Technical students. • Total MCA Students/ total Technical students • Total BSc (Computer Science) students/total Technical students • Total Diploma in Computer Application students/total Technical students • Total 12th pass (computer science subjects) students/total Technical students • Literacy rate	• Total BSc (Computer Science) students/ total technical students • Total number of engineering students/total technical students. • Total MCA students/total technical students • Per cent of total household with the following consumer goods - Personal Computer (PC) - Telephone - Cellular Phone
Business Readiness	• Total number of IT parks. • Companies registered in IT parks per IT park • Total no. of employment in IT cos/total number of IT parks. • Number of registered training centres / '000 population. • ICT exports to total exports. • Number of ICT jobs to total jobs	• Total no. of employment in IT companies/total number of IT parks. • ICT exports to total Exports
Government Readiness	• Percentage of Government expenditure on - Primary Education - Secondary Education - Under Graduate Education • Does an intranet exist in government departments? • Total number of government websites. • Total number of websites in local language. • Do ERP/online Performance Evaluation System packages exist? • Does a PERT chart exist for new ventures? • Percentage of CICs set up by the Government • Percentage of CICs set up by Private sector • Number of CICs per village • How many ministries use ICT in governance process/ functioning process? • Percentage of internet connections - Dial up - Wide band-not dial-up upto 256 kbps - Broadband (registrations received by BSNL and MTNL, 2005) • Does a separate ministry exist for ICT? • Percentage of top officials trained in ICT/with access to computer training programme. • Number of govt officials with online training programme.	• Proportion of policies taken for ICT Readiness • Percentage of top officials with on-line training programmes • Percentage of government expenditure on secondary education • How many ministries use ICT in governance process/ functioning process?

Indicators for Usage

Indicators	Sub-Indicators	Indicators of Significance
Individual Usage	• Average household monthly expenditure on - Internet Access - Cell phone - Cable Connection - Telephone • Current year to year growth rate in the number of internet users in past 2 years • Per Capita Net State Domestic Product	• Average household monthly expenditure on - Internet Access - Cell phone - Telephone • Per Capita Net State Domestic Product
Business Usage	• Share of companies using - Lease Lines - ISDN - VSAT	• Share of companies using - VSAT - ISDN
Government Usage	• WLL phones in rural areas / total number of villages. • Application of ICT in Agriculture. • Application of ICT in Health services. • Application of ICT in Transportation. • Application of ICT in Energy. • Application of ICT in Trade. • Total number of e-governance projects undertaken. • Have government employee records been computerised? • Facilities available online: - Land records - Movable Property - Stamp paper registration - Utilities billing - Crime registration - Municipality administration - Birth & Death Certificates - Documentation of Policy • Government expenditure on IT/NSDP • Status of accessibility of the information and services by the citizen? • E-governance Training Programmes and Workshops per e-governance project • Number of Participants per e-governance workshop	• Status of accessibility of the information and services to the citizen • Proportion of policies taken for ICT Usage • Total number of e-governance projects undertaken.

Sources of Data for State Level Assessment

Indicators for Environment

Indicators	Sub-Indicators	Source
Market Environment	• ICT exports / total exports • *Competition in the ISP sector:* - Number of Players - Market share of lead players (in per cent) • *Competition in the cellular sector:* - Number of Players - Market share of lead players (in per cent) • *Competition in the Telecom sector:* - Number of Players - Market share of lead players (in per cent) - Range of price charged for internet connection (per 100 hours)	State Government
Political and Regulatory Environment	• Does IT policy exist? - When was the ICT Policy initiated? - How often is the ICT Policy revised? • Is there a section in the following sections: - Enabling Policy - Regulatory Policy - Legal Policy - Security Policy • Is there a Performance Matrix of the state for monitoring policies? • Is the issue of IPR addressed in the ICT policy? • Is there effective legal machinery to tackle the problem of piracy of ICT products? • Does a state level action plan exist? • State e-governance mission team (SeMT) been set up for e-governance projects? • Is there a transparent policy for public private partnerships (PPP) for e-governance activities? • Has the government given support to ICT in way of initiatives, priorities, policies and interests? • Time taken to get clearance for starting an ICT business • Does a supplementary budget exist for state level projects? • Has an e-governance committee been set up?	State Government

	• Is there a Mission/Objectives/Strategies and Tactics (MOST) document for e-governance? • Have you enacted the IT ACT 2000 which is applicable to all states? • Are there cyber laws that confer legal status to electronic transactions and documents? • Is there a law on regulation of digital signatures and encryption? • Have any concessions been given to industries/companies for ICT activities? • Are subsidised utilities provided to ICT firms? • Any sales tax concessions have been given to ICT companies? • Give the total number of complaints/cases registered relating to IPR • Number of initiatives taken for telecom regulation and ICT trade policy? • Are there any public private partnerships for development of ICT infrastructure?	
Infrastructure Environment	• Number of villages with VPTs / total villages. • Number of public pay telephones / '000 population.	Department of Telecommunications (DOT)
	• Waiting time for telephone lines (Number of days). • Total number of telephone mainlines / total population. • Total number of cellular connections /'00 fixed lines. • Number of schools with Internet access /total schools • Number of schools with Computer labs access /total schools. • Number of schools with websites / total schools. • Number of colleges with Internet access / total colleges. • Number of colleges with Computer labs access / total colleges. • Number of colleges with websites / total colleges. • Number of universities offering ICT courses / total number of universities. • Number of universities / Institutes with online courses /total number of universities. • Is there a dedicated infrastructure for ICT? - Wireless networks - Optical Fibre Cable (OFC)/Networks - IT parks - State Wide Area Network (SWAN) - State Data Centers (SDCs) • Number of kiosks in rural areas per village • Number of public access to the internet (cyber cafes registered)	State Government
	• Average distance in kilometres from the nearest - Primary School - Post Office - Public Telephone booth - Computer Training Center - College - Internet Kiosk - Medical Store	Market Information Survey of Households (MISH)

Indicators for Readiness

Indicators	Sub-Indicators	Source
Individual Readiness	• Percent of total household with the following consumer goods - Television (TV) - Personal Computer (PC) - Telephone - Cellular Phone - Internet Connection - Cable Connection	Market Information Survey of Households (MISH)
	• Number of IT qualified teachers / total teachers. • Total number of Engineering students / total Technical students. • Total MCA Students/ total Technical students • Total BSc (Computer Science) students/ total Technical students • Total Diploma in Computer Application students/ total Technical students • Total 12th pass (computer science subjects) students/ total Technical students	State Government
	• Literacy rate	Census of India, 2001
Business Readiness	• Total number of IT parks. • Companies registered in IT parks per IT park • Total number of employment in IT companies/total number of IT parks. • Number of registered training centres/'000 population. • ICT exports to total exports. • Number of ICT jobs to total jobs	State Government
Government Readiness	• Percentage of government expenditure on - Primary Education - Secondary Education - Under Graduate Education • Does an intranet exist in government departments? • Total number of government websites. • Total number of websites in local language. • Do ERP/online Performance Evaluation System packages exist? • Does a PERT chart exist for new ventures? • Percentage of CICs set up by the Government • Percentage of CICs set up by Private sector • Number of CICs per village • How many ministries use ICT in governance process/ functioning process? • Percentage of internet connections - Dial up - Wide band-not dial-up upto 256 kbps - Broadband (registrations received by BSNL and MTNL, 2005) • Does a separate ministry exist for ICT? • Percentage of top officials trained in ICT/with access to computer training programme. • Number of government officials with online training programme.	State Government

Indicators for Usage

Indicators	Sub-Indicators	Sources
Individual Usage	• Average household monthly expenditure on - Internet Access - Cell phone - Cable Connection - Telephone	Market Information Survey of Households (MISH)
	• Current year to year growth rate in the number of internet users in past 2 years	State Government
	• Per Capita Net State Domestic Product	Handbook of Statistics on Indian Economy, RBI
Business Usage	• Share of companies using - Lease Lines - ISDN - VSAT	State Government
Government Usage	• WLL phones in rural areas / total number of villages. • Application of ICT in Agriculture. • Application of ICT in Health services. • Application of ICT in Transportation. • Application of ICT in Energy. • Application of ICT in Trade. • Total number of e-governance projects undertaken. • Have government employee records been computerised? • Facilities available online: - Land records - Movable Property - Stamp paper registration - Utilities billing - Crime registration - Municipality administration - Birth & Death Certificates - Documentation of Policy • Government expenditure on IT/NSDP • Status of accessibility of the info & services by the citizen? • E-governance training progs and workshops per e-governance project • Number of participants per e-governance workshop	State Government

ANNEX V

E-Readiness: State-wise Status Chart

States	Environment	Readiness	Usage	E-Readiness Index Category
Andaman & Nicobar	L6	L6	L5	Least Achiever
Andhra Pradesh	L2	L1	L2	Leader
Arunachal Pradesh	L6	L6	L5	Least Achiever
Assam	L4	L4	L6	Below Average Achiever
Bihar	L5	L5	L6	Below Average Achiever
Chandigarh	L1	L2	L1	Leader
Chattisgarh	L3	L4	L3	Average Achiever
Dadra & Nagar Haveli	L6	L6	L6	Least Achiever
Daman & Diu	L6	L6	L5	Least Achiever
Delhi	L2	L3	L1	Aspiring Leader
Goa	L1	L4	L2	Aspiring Leader
Gujarat	L2	L4	L2	Aspiring Leader
Haryana	L2	L2	L1	Aspiring Leader
Himachal Pradesh	L3	L4	L3	Average Achiever
Jammu & Kashmir	L5	L4	L5	Below Average Achiever
Jharkhand	L4	L3	L4	Average Achiever
Karnataka	L2	L1	L1	Leader
Kerala	L2	L1	L1	Leader
Lakshadweep	L5	L2	L3	Below Average Achiever
Madhya Pradesh	L4	L2	L4	Average Achiever
Maharashtra	L1	L1	L2	Leader
Manipur	L6	L5	L6	Least Achiever
Meghalaya	L4	L5	L3	Below Average Achiever
Mizoram	L4	L5	L2	Below Average Achiever
Nagaland	L5	L6	L6	Least Achiever
Orissa	L4	L3	L4	Average Achiever
Pondicherry	L2	L4	L4	Expectant
Punjab	L1	L1	L2	Aspiring Leader
Rajasthan	L3	L3	L2	Expectant
Sikkim	L3	L5	L3	Average Achiever
Tamil Nadu	L1	L1	L1	Leader
Tripura	L6	L6	L6	Least Achiever
Uttar Pradesh	L2	L2	L3	Expectant
Uttaranchal	L3	L3	L3	Average Achiever
West Bengal	L3	L3	L2	Expectant

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