EDUCATIONAL DEVELOPMENT INDEX (EDI)

A SUGGSESTIVE FRAMEWORK FOR COMPUTATION

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EDUCATIONAL DEVELOPMENT INDEX (EDI): A SUGGSESTIVE FRAMEWORK FOR COMPUTATION *

1. GENERAL BACKGROUND

The basic purpose of computing an Educational Development Index (EDI) is to know position of a state vis-à-vis other states. The EDI can be computed at different levels of education, such as, primary, upper primary, elementary and other levels of education. By using EDI's of one or more levels of education, a composite indicator can also be worked out.

The weights in the computation of an EDI are determined by using Factor Loadings and Eigen Values from Principal Component Analysis (PCA).

1.1 OBJECTIVES

The main objectives of the present module are as follows:

- To demonstrate computation of an Education Development Index (EDI)
- To discuss level (spatial as well as educational level) at which EDI can be computed
- To discuss and present a set of suggestive indicators for computing an EDI and also classification of indicators into different groups
- To discuss points for consideration while constructing an indicator in terms of data availability and nature of an indicator
- To demonstrate steps to compute normalized values towards computing an EDI
- To demonstrate step-by-step use of SPSS to use Principal Component Analysis to decide factor loadings and weights; and
- To anlayse and interpret an EDI and its implications.

1.2 A FEW POINTS OF CAUTION

The following points may be considered while computing an EDI:

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- Depending upon the requirement, an EDI can be workout at state, district and other levels.
- Similarly, an EDI can be computed separately for Primary, Upper Primary, Elementary and other levels of education.

    - Primary Stage/Level of education will consist of all the Primary Schools/Sections irrespective of the type of schools; and
    - Upper Primary Stage /Level of education will consist of all the Upper Primary Schools/Sections irrespective of the type of schools.

- Depending upon an educational level, the set of indicators may vary from one level to another level of education.
- Generally EDI is computed based on the Stock Statistics i.e. one year data but the same can also be computed over a period of time to judge the performance of a state/district vis-à-vis other states/districts. If computed over a period of time, the same would also reflect on the position of a state in a year compared to the same in the previous year(s).
- While computing an EDI, it is advisable to use the same source of data for all the states/districts. However, if required different indicators can be used from different sources, if the same is not available from a single source.
- If a particular indicator is not available in case of a state/district, the same can be obtained from other sources as an exception and can be treated as a proxy to the original indicator. The other way to deal with such eventualities is to treat such observations as missing values. The SPSS software has provision to deal with missing values. However, depending upon the total number of observations, the software may not allow unlimited number of missing observations. Alternatively, the missing values can also be replaced by means i.e. average of all states/districts
- It should be ensured that variables/indicators used in computing an EDI confine to the same point of time (year) across educational states/districts.

1.3 SUGGESTIVE INDICATORS

- The variables presented below to compute an EDI are suggestive in the nature. As many as 22 indicators have been suggested which are further re-grouped into the following four sub-groups (see Diagram 1).
    - Access
    - Infrastructure
    - Teacher's; and
    - Outcome
- The re-grouping of indicators in four groups would help in assessing the overall situation in a state/district with particular reference to a sub-group.
- The re-grouping of indicators is also suggestive in nature and can be modified in view of state-specific requirements.
- Depending upon the objective and availability of data, other variables/indicators can also be considered in compiling an index or a few of the proposed variables/indicators can also be dropped out.
- In the present note, an EDI is proposed to be separately complied for Primary and Upper Primary levels of education which are then used to obtain a composite indicator for the entire elementary level of education; and
- If the data is available separately for the Elementary level of education, it is advisable to use this set of data then based on the indices (EDIs) of Primary and Upper Primary level of education in computing an EDI for Elementary level of education.

1.4 TYPE of INDICATORS

- A cursory look at the set of 22 indicators (see Table 1 and also Diagram 1) reveals that they are either positive or negative.
- Some of the indicators are POSITIVE (such as Percentage of Female Teachers and Gross Enrolment Ratio) and a few others, NEGATIVE indicators (such as Percentage of Habitations not Served and Pupil-Teacher Ratio).
- In view of this they are required to be first NORMALIZED before any statistical tool is applied.

Structure of EDI

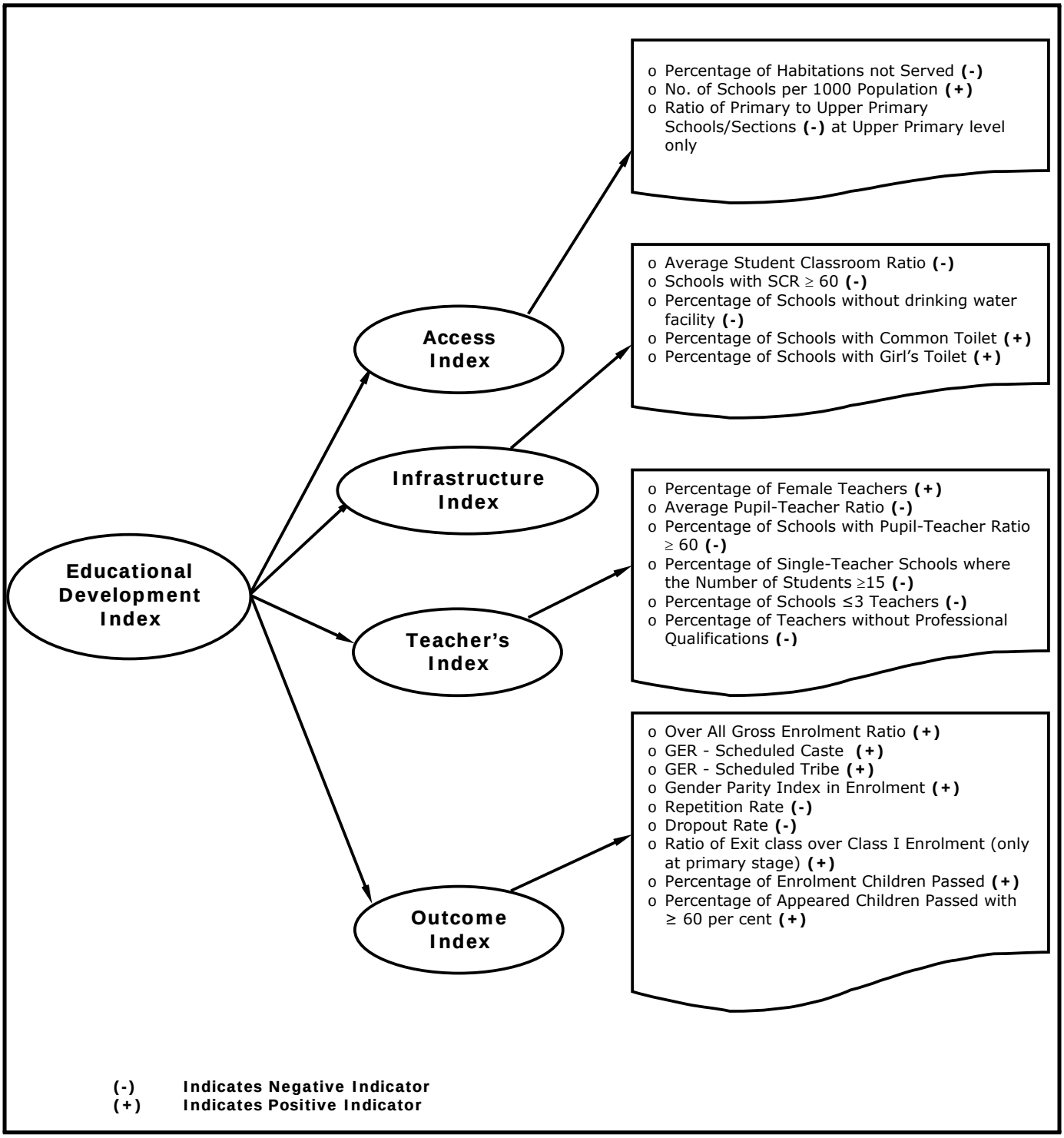


Diagram 1

Table 1

Suggestive Indicators for Computing EDI

Component	Indicators	Type of Indicators*
ACCESS	Percentage of Habitations not Served	Negative
	No. of Schools per 1000 Population	Positive
INFRASTRUCTURE	Average Student Classroom Ratio	Negative
	Schools with SCR ≥ 60	Negative
	Percentage of Schools without drinking water facility	Negative
	Percentage of Schools with Common Toilet	Positive
	Percentage of Schools with Girl's Toilet	Positive
TEACHERS	Percentage of Female Teachers	Positive
	Average Pupil-Teacher Ratio	Negative
	Percentage of Schools with Pupil-Teacher Ratio ≥ 60	Negative
	Percentage of Single-Teacher Schools where the Number of Students ≥15	Negative
	Percentage of Schools ≤3 Teachers	Negative
	Percentage of Teachers without Professional Qualifications	Negative
OUTCOME	Over All Gross Enrolment Ratio	Positive
	GER - Scheduled Caste	Positive
	GER - Scheduled Tribe	Positive
	Gender Parity Index in Enrolment	Positive
	Repetition Rate	Negative
	Dropout Rate	Negative
	Ratio of Exit class over Class I Enrolment (only at primary stage)	Positive
	Percentage of Enrolment Children Passed	Positive
	Percentage of Appeared Children Passed with ≥ 60 per cent	Positive

* Type of indicators depends upon the nature of the indicator. In view of type of an indicator (positive or negative), the best and worst cases would be determined by considering all the observations.

2. CONVERTING RAW DATA INTO NORMALIZED VALUES

2.1 The following procedure is adopted in converting raw data into normalized form. First the Best and Worst values in a indicator are identified. The BEST and the WORST values will depend upon the nature of a particular indicator. In case of a positive indicator, the HIGHEST value will be treated as the BEST value and the LOWEST, will be considered as the WORST value. Similarly, if the indicator is NEGATIVE in nature, then the LOWEST value will be considered as the BEST value and the HIGHEST, the WORST value. Once the Best and Worst values are identified, the following formula is used to obtain normalize values:

$$NVij = 1 - \left(\frac{\{\text{Best } Xi - \text{Observed } Xij\}}{\{\text{Best } Xi - \text{Worst } Xi\}} \right)$$

Normalized Values always lies between 0 and 1. For demonstration, of the above formula, two indicators falling under the component of Infrastructure are chosen and presented below in Table 2. The first one is Average Student-Classroom Ratio (SCR)

which is a negative indicator. Therefore, the highest SCR (92.59) is treated as the WORST value and the lowest (22.70) as the BEST value. Similarly other indicator that is presented is the Percentage of Schools with Boys' Toilet which is a positive indicator. Therefore, the highest 95.48 is considered as the BEST value and the lowest, 31.70, as the WORST value. By using the formula of the Normalized Value presented above, the values for different states have been computed which is presented in the Table 2.

Table 2

Indicators and its Normalized Values

State	Average SCR (X_1)	Normalized X_1 =(1-((22.70- Observed Value)/(22.70 -92.59))	Percentage of School with Boy's Toilet (X_2)	Normalized X_2 =(1-(95.48-Observed Value)/(95.48-31.70))
➢ State 1	22.70 **(BEST)**	1.0000	35.00	0.0517
➢ State 2	26.56	0.9448	66.77	0.5499
➢ State 3	26.49	0.9458	48.72	0.2669
➢ State 4	34.51	0.8310	37.28	0.0875
➢ State 5	**92.59 (WORST)**	0.0000	55.91	0.3796
➢ State 6	25.84	0.9551	32.69	0.0155
➢ State 7	33.85	0.8405	31.70 **(WORST)**	0.0000
➢ State 8	43.01	0.7094	40.91	0.1444
➢ State 9	33.30	0.8483	73.33	0.6527
➢ State 10	38.03	0.7807	95.48 **(BEST)**	1.0000

- By following the above procedure Normalized Values are obtained for all the indicators. For ease in the computation process MS-EXCEL can be used.
- Please ensure that you consider Normalized Values at least up to four or more decimal points;

All indicators as well as their Normalized Values are presented in the Annexure 1 and 2.

3. PRINCIPAL COMPONENT ANALYSIS (PCA)

Once the Normalized Values are obtained for all the indicators across Districts/States, the next step is to assign FACTOR LOADINGS and WEIGHTS. PRINCIPAL COMPONENT ANALYSIS (PCA) is used to compute the Factor Loading and Weights of these indicators.

- The objective of Principal Component analysis is to reduce the dimensionality (number of indicators) of the data set but retain most of the original variability in the data.
- The first PRINCIPAL COMPONENT accounts for as much of the variability in the data as possible, and each succeeding component accounts for as much of the remaining variability as possible.
- PCA can be performed by using a statistical package having provision for PCA. One such package is the STATISTICAL PACKAGE FOR SOCIAL SCIENCES (SPSS); and
- If SPSS package is not available, other statistical packages having provision for PCA may be used.

The illustrations, procedures and steps required for undertaking PCA have been demonstrated by using the SPSS software version 10.0.5.

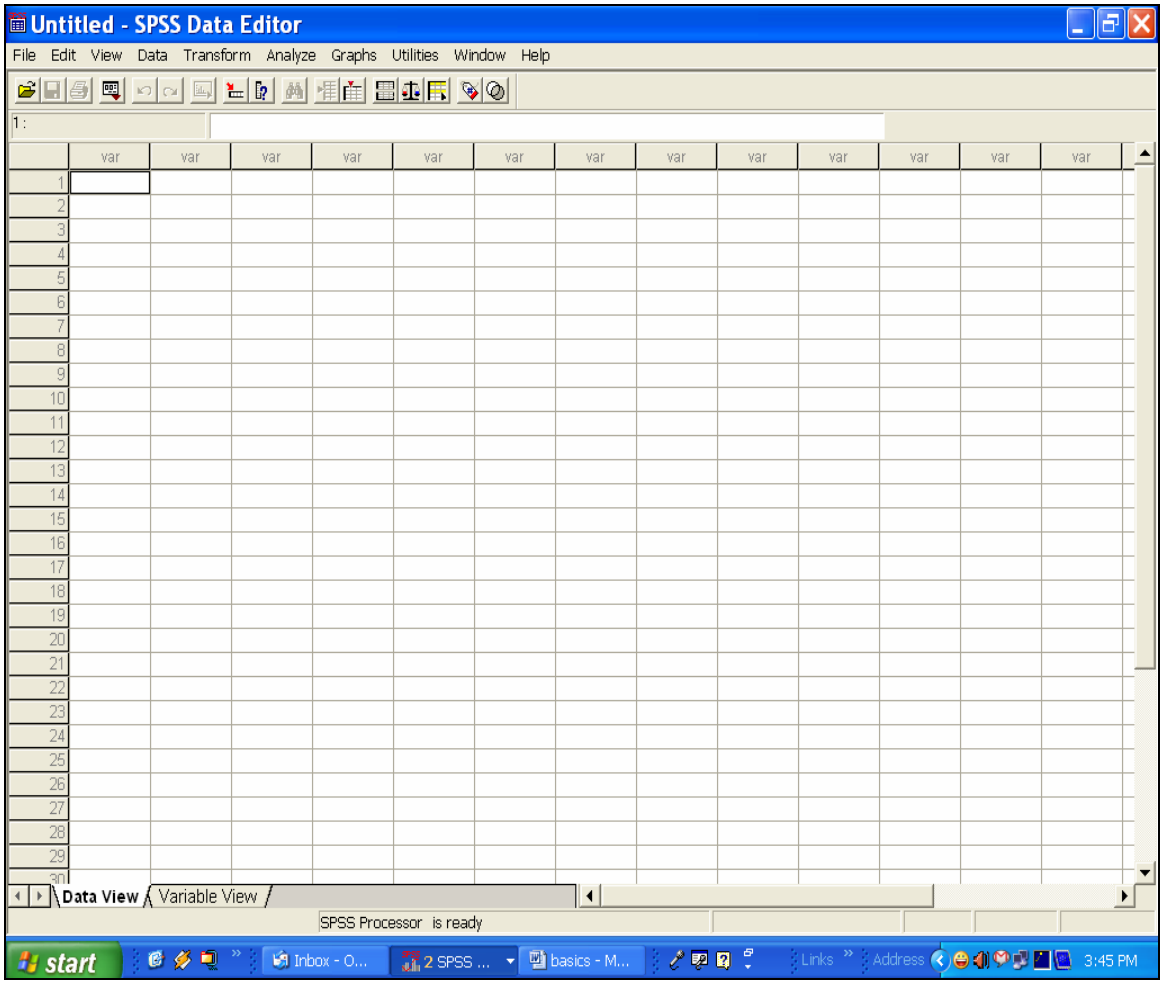
STEP 3.1

Once the SPSS software is initialised on the Desktop from the MENU BAR select:

FILE \ NEW\ DATA

Data Widow will appear as shown below in Figure 3.1.

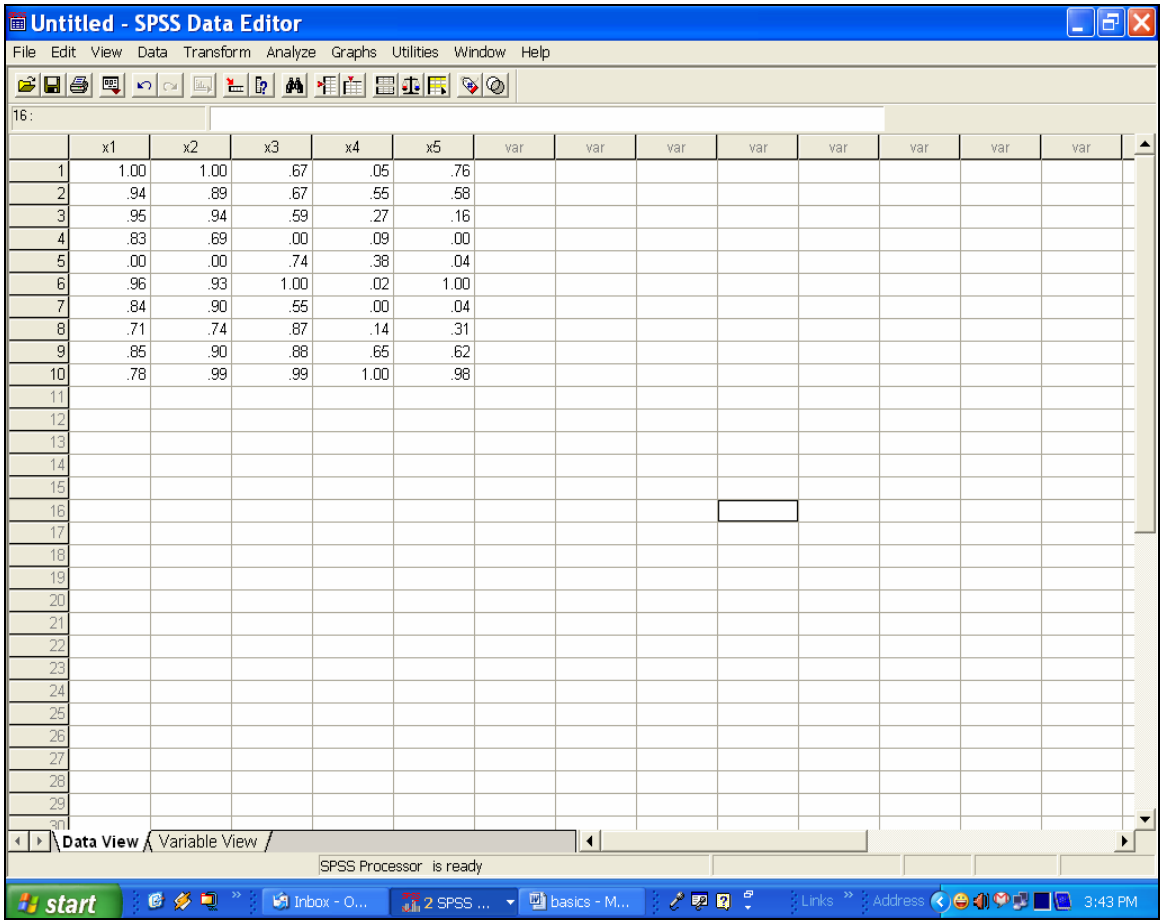
Figure 3.1



STEP 3.2

From the EXCEL FILE containing Normalized Values created above, SELECT DATA CELLS carefully and PASTE it into the DATA EDITOR of SPSS as shown in the Figure 3.2 below. It is suggested to SELECT and COPY all the indicators simultaneously.

Figure 3.2

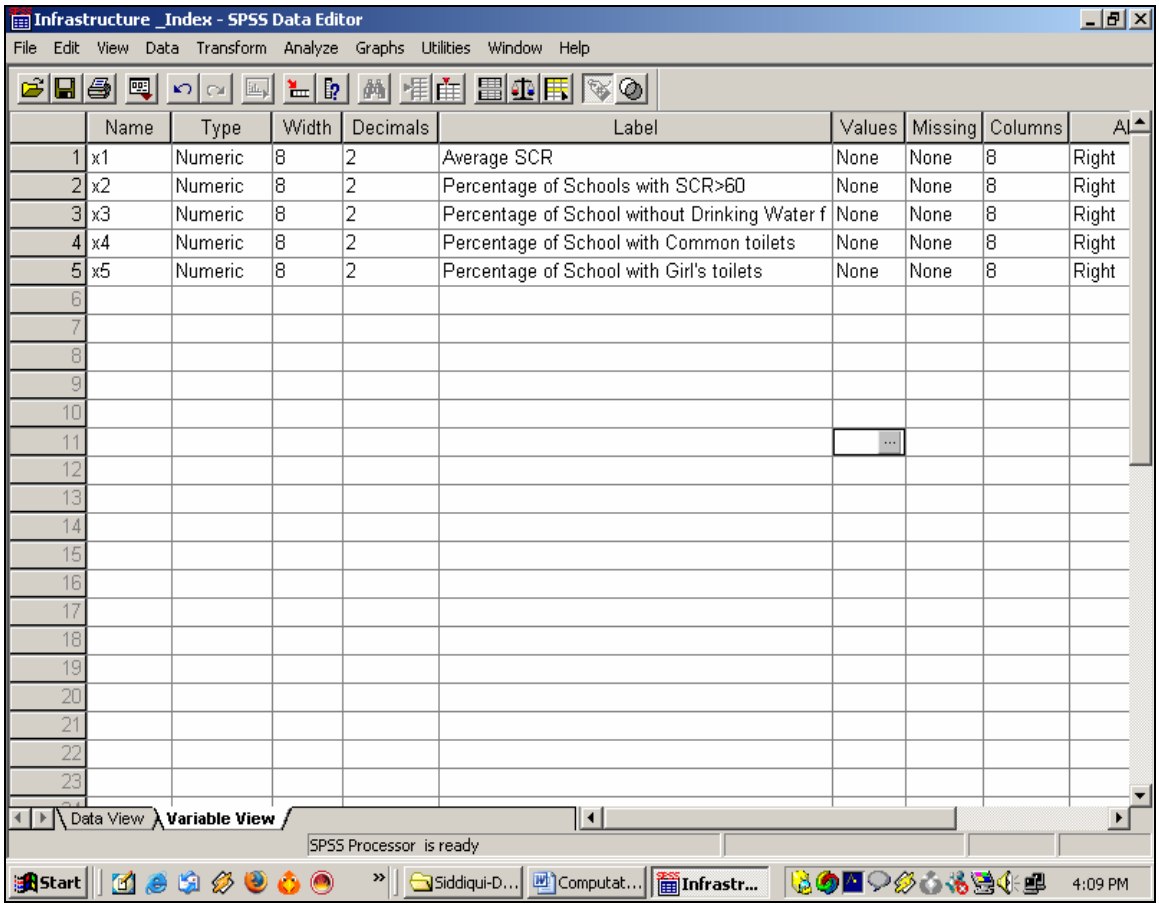


STEP 3.3

The next step is to define each indicator that has been copied from, MS EXCEL File.

- ✓ Click VARIABLE VIEW, which is displayed below the left hand corner of the SPSS Window.
- ✓ Name each variable one by one (up to 8 or less characters) and provide other requisite information as displayed in the top MENU BAR (Name, Type, Width, Decimals, Label, Values etc). The screen would look like as presented below in Figure 3.3.

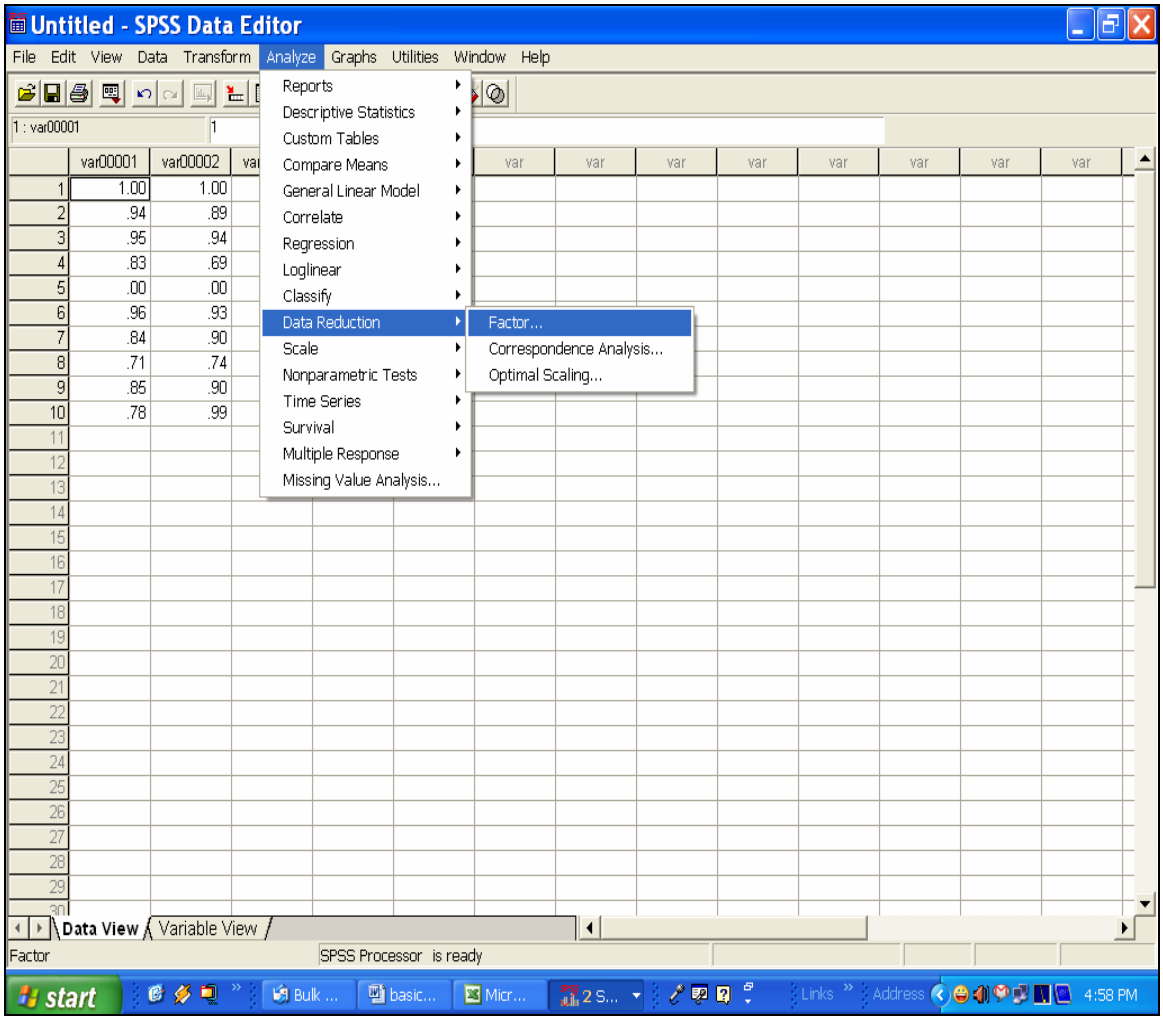
Figure 3.3



STEP 3.4

Go to the Menu Bar and select ANALYZE\ DATA REDUCTION\ FACTOR and Click on FACTOR. Please see the screen below (Figure 3.4).

Figure 3.4



STEP 3.5

The next important task is the Selection of the Variables.

- ✓ You will see all the variables in the list (see Figures 3.5 and 3.6).
- ✓ From the list of variables, select all the variables under a sub-group for which you require to develop an Index. For example, if you need to develop an Index for Infrastructure, you need to select all the variables (say 5 variables) concerning Infrastructure.
- ✓ This is to be repeated while developing Indices for other sub-groups, such as Access , Teachers & Outcome Index.

Figure 3.5

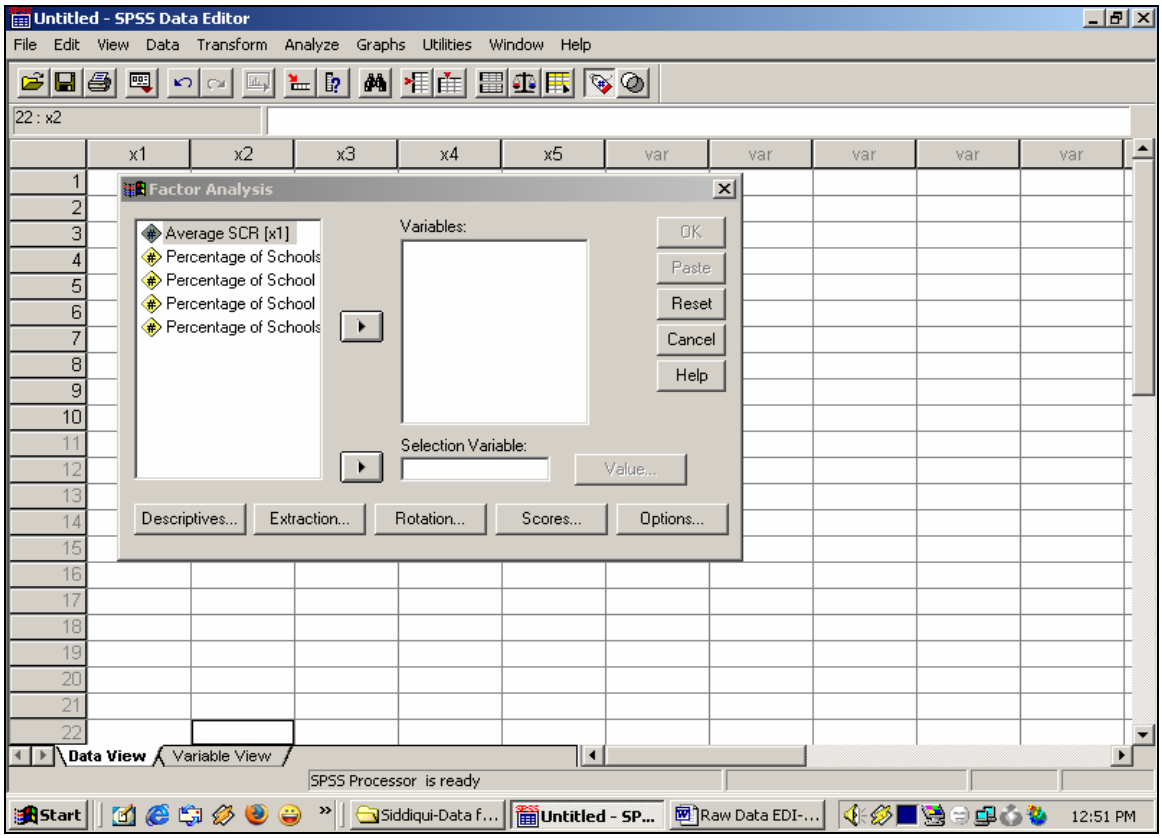
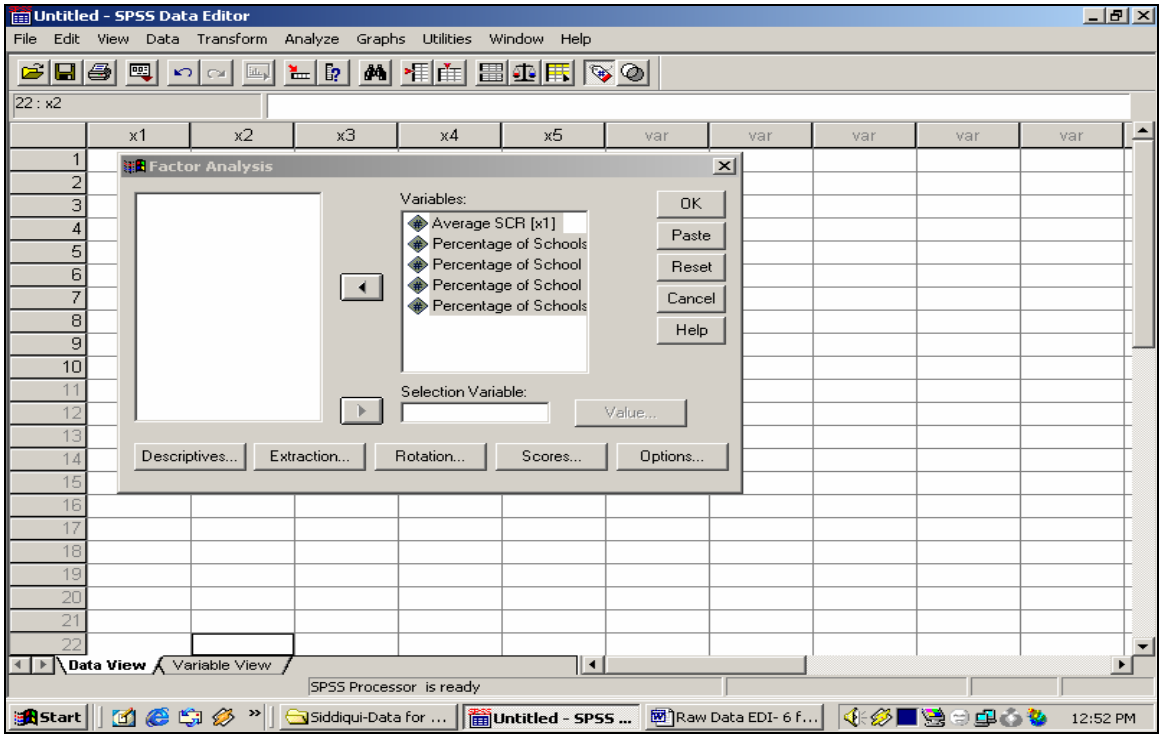


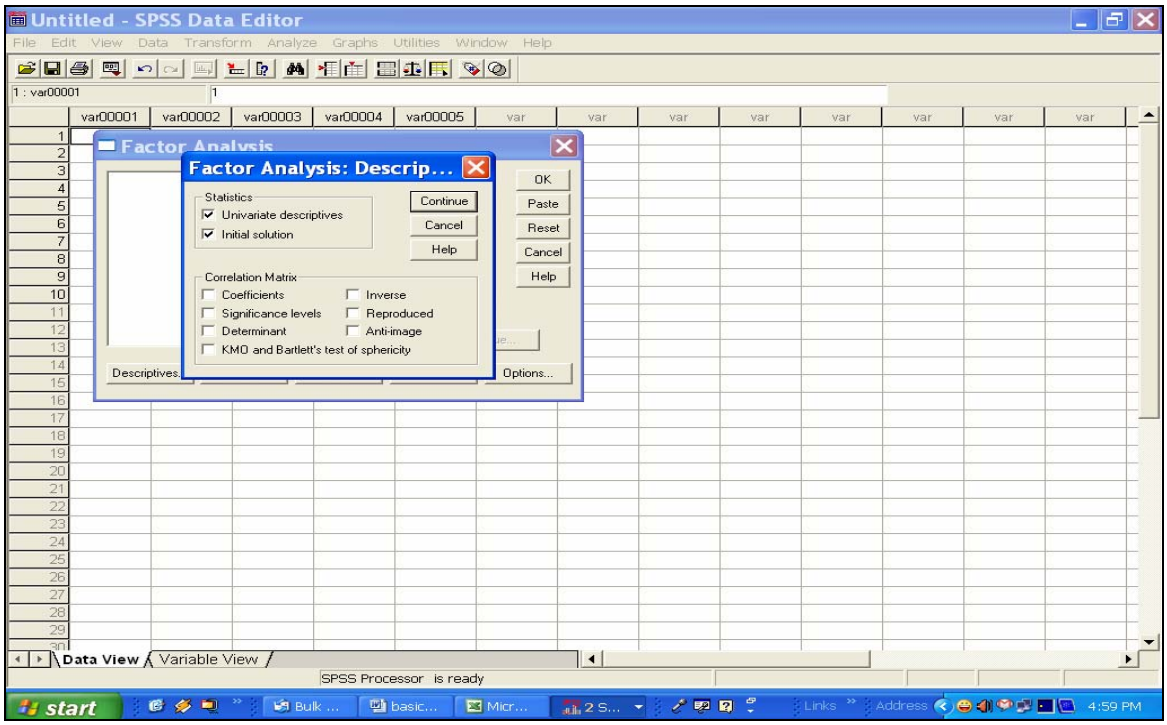
Figure 3.6



STEP 3.6

Select DESCRIPTIVES and UNIVARIATES DESCRIPTIVES and Click Continue (see Figure 3.7)

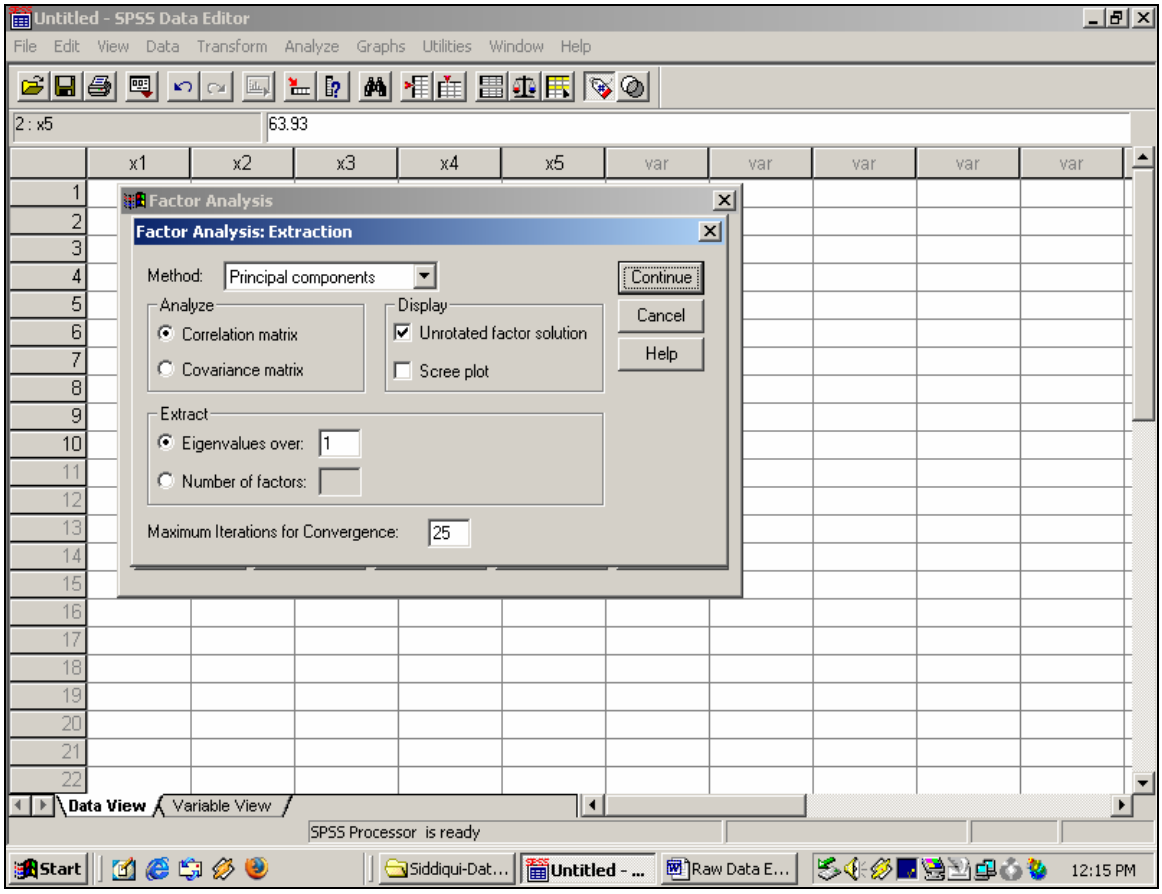
Figure 3.7



STEP 3.7

Click EXTRACTION. By default, Principal Components, Correlation Matrix, Un-rotated Factor Solution and EIGEN VALUES over 1 are selected. The screen will appear as shown below in Figure 3.8. Click Continue.

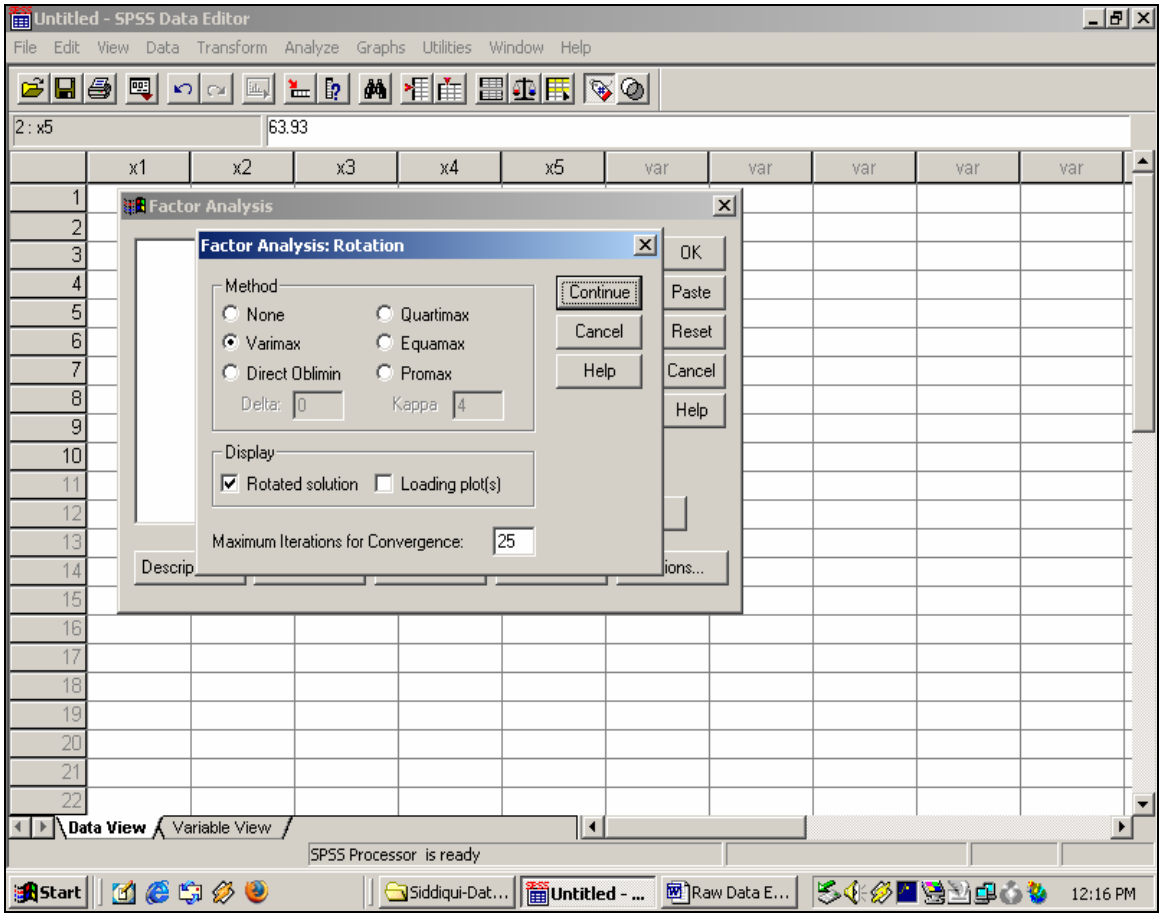
Figure 3.8



STEP 3.8

Click ROTATION. Select VARIMAX. By default ROTATED SOLUTION and MAXIMUM ITERATIONS for CONVERGENCE will be enabled. Click CONTINUE (see Figure 3.9).

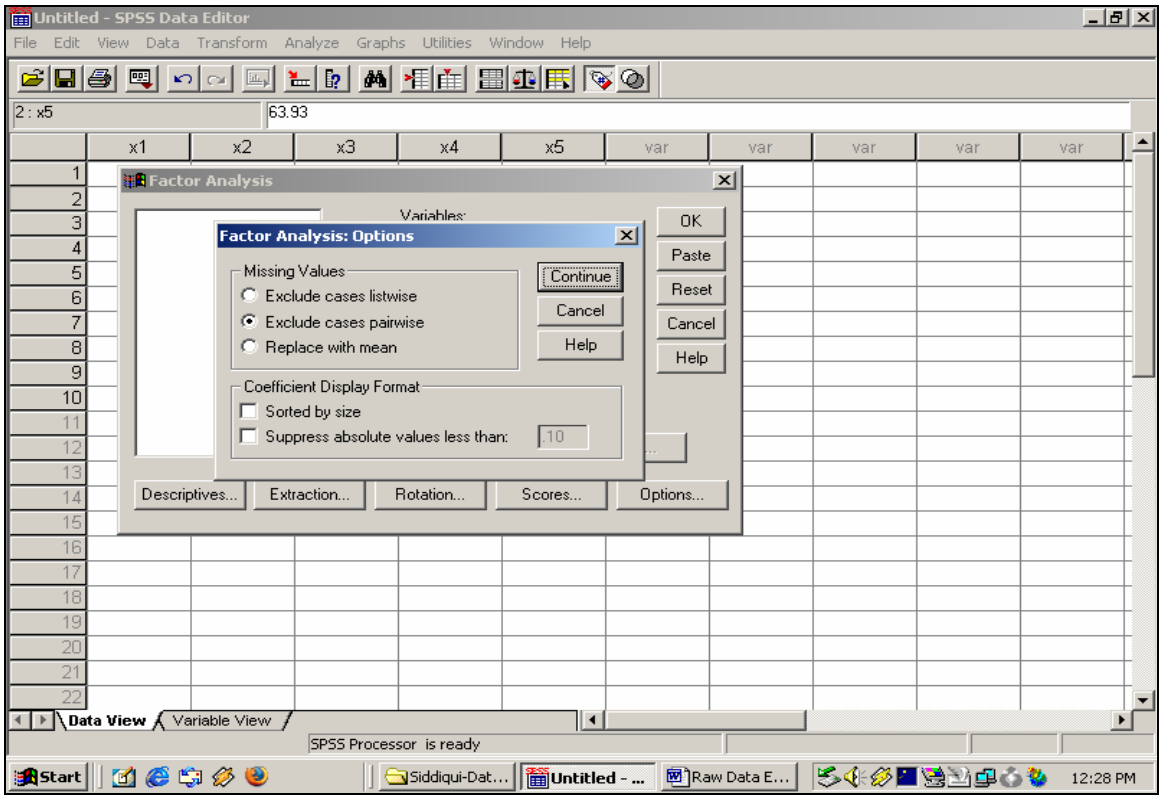
Figure 3.9



STEP 3.9

Click OPTION: Option selection is optional. Use this step only when some values in the variables selected are missing (not available). Click Continue and then Click OK (see Figure 3.10). In case of No Missing Values, we finish the exercise at STEP 3.8 and Click OK after the option ROTATION is selected.

Figure 3.10



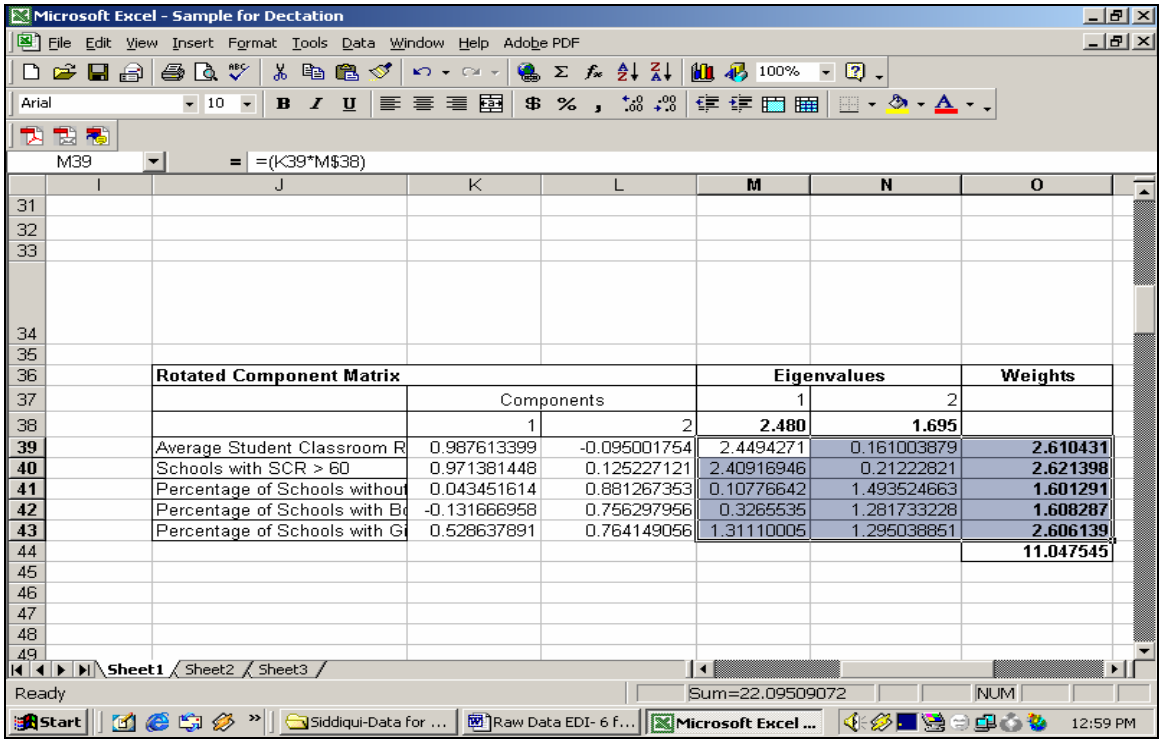
STEP 3.10

SPSS OUTPUT

- Through the DESCRIPTIVE STATISTICS (Annexure 3, Table 10.1) total number of observations used in case of each variable can be known. In case of found missing values then the appropriate box as described above in the STEP 3.9 should be checked.
- Next table that needs to be analysed is the TOTAL VARIANCE EXPLAINED presented in SPSS Output (Annexure 3, Table 10.2).

- Identify Initial Eigen Values (Total) which is more than one. In this case, it is 2.480 and 1.695. Number of Eigen Values having above 1 varies from data set to set.
- According to the number of Eigen Values above 1, the same number of Components will be extracted for each variable as shown in Rotational Component Matrix presented in Table 10.4 of Annexure 3. In the present example, since two Eigen Values are above 1, two Components have been extracted.
- Select the Rotational Component Matrix from Table 10.4 of Annexure 3 and EIGEN VALUES from Table 10.2 (Annexure 3, table 10.2) and paste the same in the EXCEL WROKSHEET (see Figure 3.11).
- Multiply 1st EIGEN VALUE (For example 2.480) with 1st EXTRACTED COMPONENT COLUMN (0.987613399, 0.971381448, 0.043451614, - 0.131666958 and 0.528637891) and 2nd EIGEN VALUE (1.695) with 2nd COMPONENT COLUMN (- 0.095001754, 0.125227121, 0.881267353, 0.756297956 and 0.764149056).
- Consider ABSOLUTE VALUES (irrespective of sign, Negative values are treated as Positive (Figure 3.11).
- Sum up the values obtained in case of each variable (For example for the first variable, 2.449427096 and - 0.16100388, the sum obtained is 2.610430975. Note that - 0.16100388 is considered as + 0.16100388). 2.610430975 is treated as the weight for the first variable. Similarly, weights for other variables are obtained.
- Add all weights to obtain Grand Total of all weights. Thus, 2.610430975, 2.621397671, 1.601291084, 1.608286732 and 2.606138898 are added to obtain a total of 11.04754536.

Figure 3.11



STEP 3.11

- Copy Normalized Values from Annexure 2 along with the Variable Names into the EXCEL WORKSHEET as shown in Figure 3.12.
- Copy the Weights obtained in the previous step (see Figure 3.11) and copy the same on top of the column as shown in the Figure 3.12.
- Multiply each value in different columns by the respective Weights presented on the top of the column and obtain the sum of each multiplication which is then divided by the total Weights presented above in the column to obtain an Infrastructure Index.

The following formula is used to determine the Index

$$I = \frac{\sum_{i=1}^{n} X_i \left(\sum_{j=1}^{n} \left| L_{ij} \right| . E_j \right)}{\sum_{i=1}^{n} \left(\sum_{j=1}^{n} \left| L_{ij} \right| . E_j \right)}$$

Where I is the Index, X_i is the i^{th} Indicator ; L_{ij} is the factor loading value of the i^{th} variable on the j^{th} factor; E_j is the Eigen value of the j^{th} factor

- For example for State 1 it is calculated as follows:

  (2.610430975 x 1.00 + 2.621397671 x 1.00 + 1.601291084 * 0.67 + 1.60828673 * 0.05 + 2.6061389 * 0.76)/11.04755 = 0.7572518. This is an Index for a set of indicators for State 1. The procedure is repeated to obtain Indices for all the remaining states (Figure 3.13).

Weight	2.610430975	2.621397671	1.601291084	1.60828673	2.6061389	11.04755
State 1	1.00	1.00	0.67	0.05	0.76	0.7572518

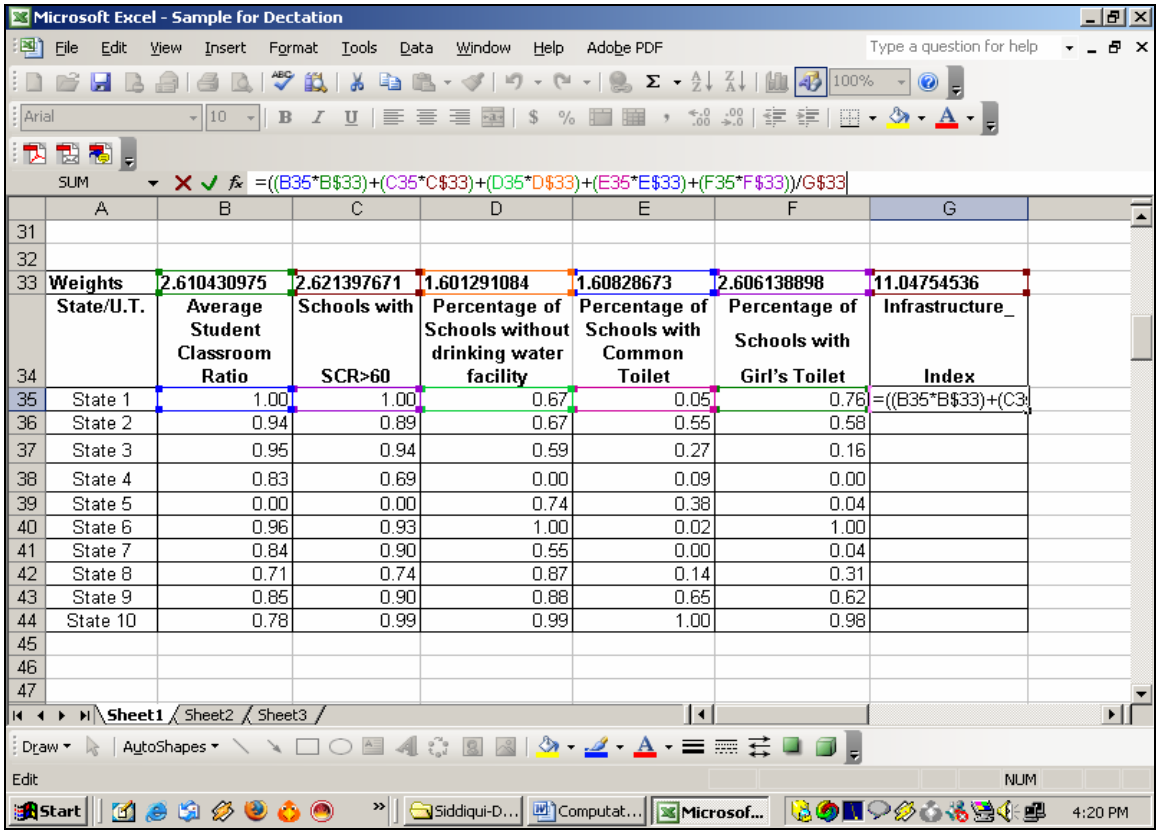
- The indicator obtained is an Index for the first set of component i.e. Infrastructure which is then assigned ranks in the ascending order (Figure 3.14). For illustration, this is produced for all the states in Table 3. State 10 with Index 0.939476 is termed having the BEST infrastructure, and State 5 with Index 0.172016, the worst state having Rank 10.
- Compare the Index with the maximum value i.e.1. State 10 with an Index value of 0.94, shows that the State is very comfortable with regard to Infrastructure in its schools/sections imparting Primary education. Where as, State 5 with an Index as low as 0.17 is not comfortable with regard to infrastructure in its Primary schools/sections and hence need much improvement.

Table 3

Infrastructure Index and Ranks

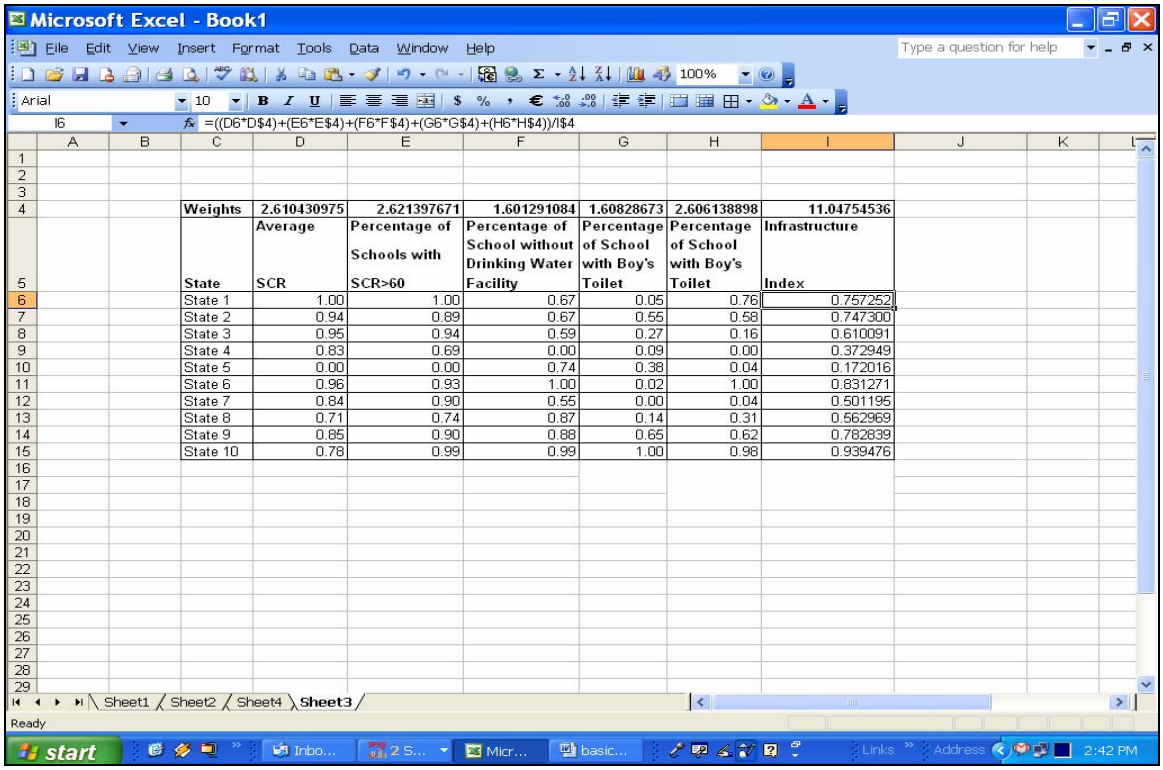
State	Infrastructure Index	Rank
State 1	0.757252	4
State 2	0.747300	5
State 3	0.610091	6
State 4	0.372949	9
State 5	0.172016	10
State 6	0.831271	2
State 7	0.501195	8
State 8	0.562969	7
State 9	0.782839	3
State 10	0.939476	1

Figure 3.12



	A	B	C	D	E	F	G
31							
32							
33	Weights	2.610430975	2.621397671	1.601291084	1.60828673	2.606138898	11.04754536
34	State/U.T.	Average Student Classroom Ratio	Schools with SCR>60	Percentage of Schools without drinking water facility	Percentage of Schools with Common Toilet	Percentage of Schools with Girl's Toilet	Infrastructure_ Index
35	State 1	1.00	1.00	0.67	0.05	0.76	=((B35*B$33)+(C3
36	State 2	0.94	0.89	0.67	0.55	0.58	
37	State 3	0.95	0.94	0.59	0.27	0.16	
38	State 4	0.83	0.69	0.00	0.09	0.00	
39	State 5	0.00	0.00	0.74	0.38	0.04	
40	State 6	0.96	0.93	1.00	0.02	1.00	
41	State 7	0.84	0.90	0.55	0.00	0.04	
42	State 8	0.71	0.74	0.87	0.14	0.31	
43	State 9	0.85	0.90	0.88	0.65	0.62	
44	State 10	0.78	0.99	0.99	1.00	0.98	
45							
46							
47							

Figure 3.13



	A	B	C	D	E	F	G	H	I	J	K
1											
2											
3											
4			Weights	2.610430975	2.621397671	1.601291084	1.60828673	2.606138898	11.04754536		
5			State	Average SCR	Percentage of Schools with SCR>60	Percentage of School without Drinking Water Facility	Percentage of School with Boy's Toilet	Percentage of School with Boy's Toilet	Infrastructure Index		
6			State 1	1.00	1.00	0.67	0.05	0.76	0.757252		
7			State 2	0.94	0.89	0.67	0.55	0.58	0.747300		
8			State 3	0.95	0.94	0.59	0.27	0.16	0.610091		
9			State 4	0.83	0.69	0.00	0.09	0.00	0.372949		
10			State 5	0.00	0.00	0.74	0.38	0.04	0.172016		
11			State 6	0.96	0.93	1.00	0.02	1.00	0.831271		
12			State 7	0.84	0.90	0.55	0.00	0.04	0.501195		
13			State 8	0.71	0.74	0.87	0.14	0.31	0.562969		
14			State 9	0.85	0.90	0.88	0.65	0.62	0.782839		
15			State 10	0.78	0.99	0.99	1.00	0.98	0.939476		
16											
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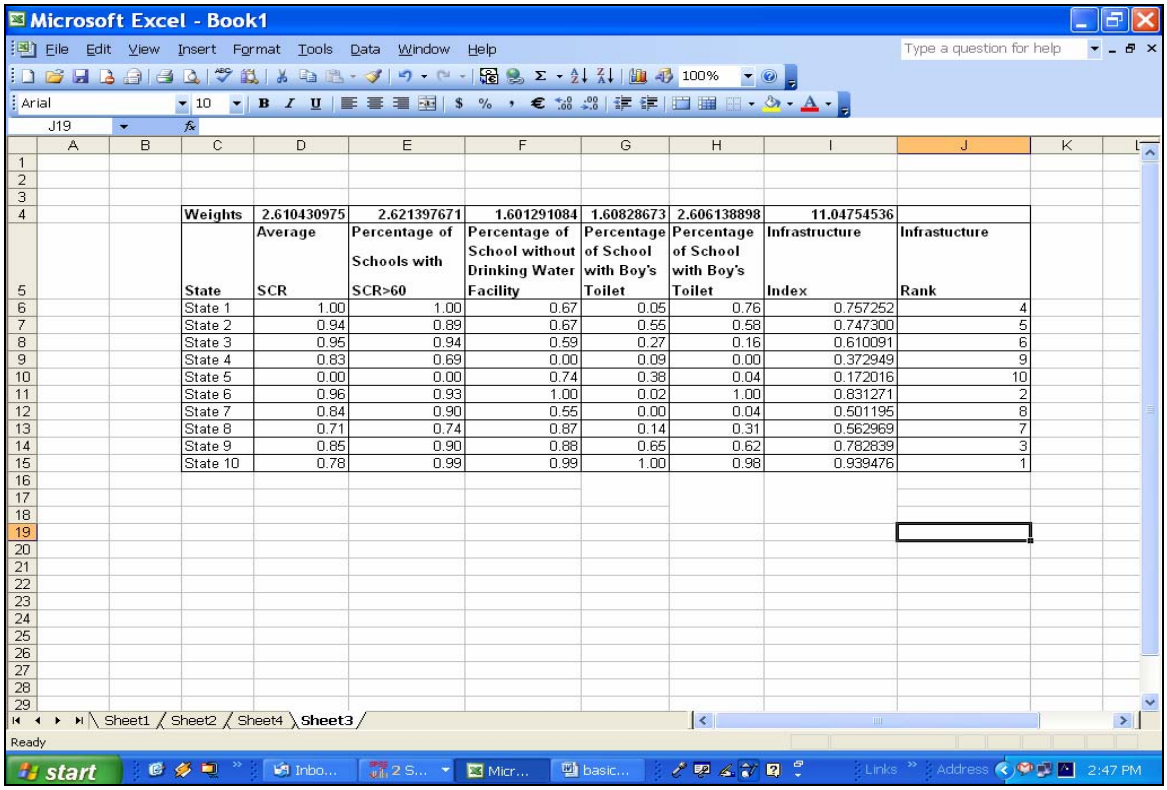
Figure 3.14



Microsoft Excel - Book1

	A	B	C	D	E	F	G	H	I	J	K
4			Weights	2.610430975	2.621397671	1.601291084	1.60828673	2.606138898	11.04754536		
5			State	Average SCR	Percentage of Schools with SCR>60	Percentage of School without Drinking Water Facility	Percentage of School with Boy's Toilet	Percentage of School with Boy's Toilet	Infrastructure Index	Infrastucture Rank	
6			State 1	1.00	1.00	0.67	0.05	0.76	0.757252	4	
7			State 2	0.94	0.89	0.67	0.55	0.58	0.747300	5	
8			State 3	0.95	0.94	0.59	0.27	0.16	0.610091	6	
9			State 4	0.83	0.69	0.00	0.09	0.00	0.372949	9	
10			State 5	0.00	0.00	0.74	0.38	0.04	0.172016	10	
11			State 6	0.96	0.93	1.00	0.02	1.00	0.831271	2	
12			State 7	0.84	0.90	0.55	0.00	0.04	0.501195	8	
13			State 8	0.71	0.74	0.87	0.14	0.31	0.562969	7	
14			State 9	0.85	0.90	0.88	0.65	0.62	0.782839	3	
15			State 10	0.78	0.99	0.99	1.00	0.98	0.939476	1	

STEP 3.12

- By following the same procedure (Steps 3.1 to 3.11), Indices are to be computed for each set of indicators such as ACCESS, TEACHERS and OUTCOME. The outcome for Primary level is presented in Figure 3.15. Compare your Indices with this set of Indices.
- Run Principal Component Analysis (PCA) on these Indices. Every Index (four in number) is treated as a variable.
- We will get SPSS output in the form of Eigen Values and Extracted Component Matrix as shown in next Data Window (Figure 3.16).
- From SPSS Output re-arrange the Eigen Values and Extracted Component Matrix and calculate Weights by following the procedure as explained above. We will get the Window as shown in Figure 3.16.
- REPEAT the above Steps to get an EDI for Primary Level. The Data Window would like as presented in Figure 3.17.
- Based on the EDIs, assign RANK in ascending order as shown in Figure 3.18. The Highest Index with RANK ONE will be treated as the BEST and the LOWEST Index, with last rank will be treated as the WORST so far as the Primary level of education is concerned among 10 states used in computation of EDI.
- Compare individual state EDI separately in case of each group of indicators with the maximum 1 and identify the states that need improvement.

Figure 3.15

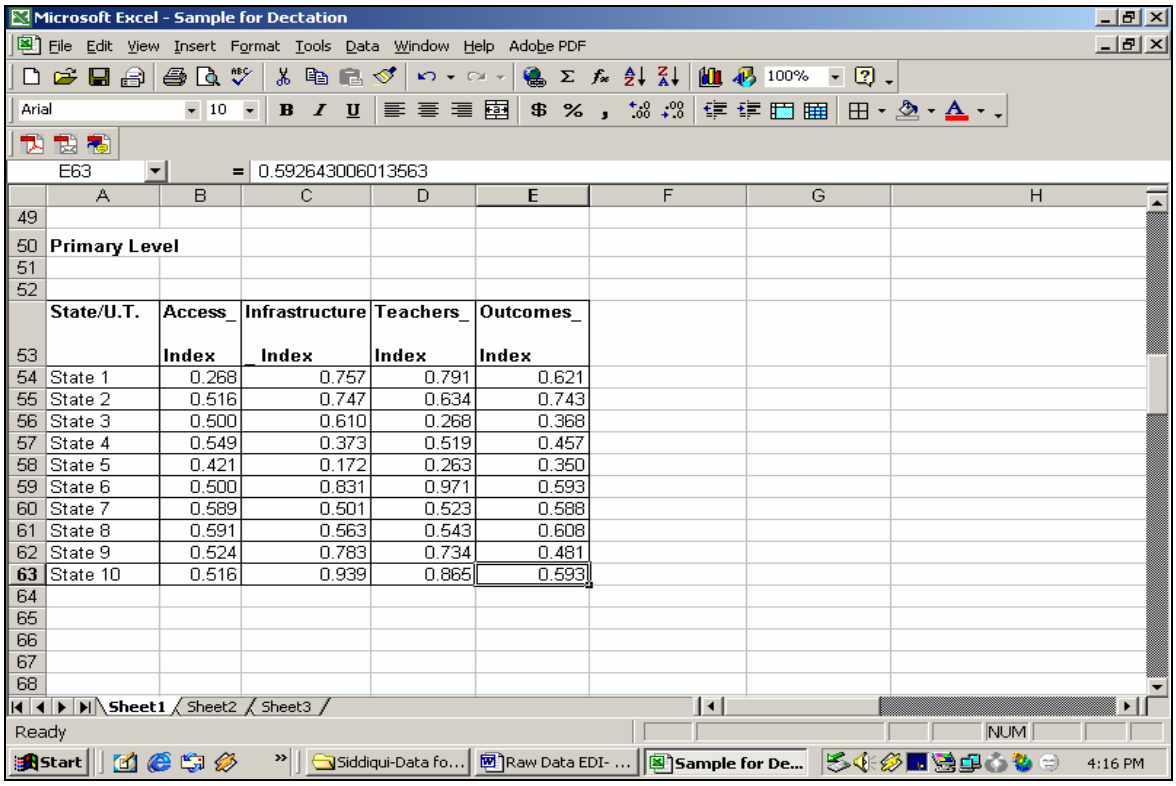


Figure 3.16

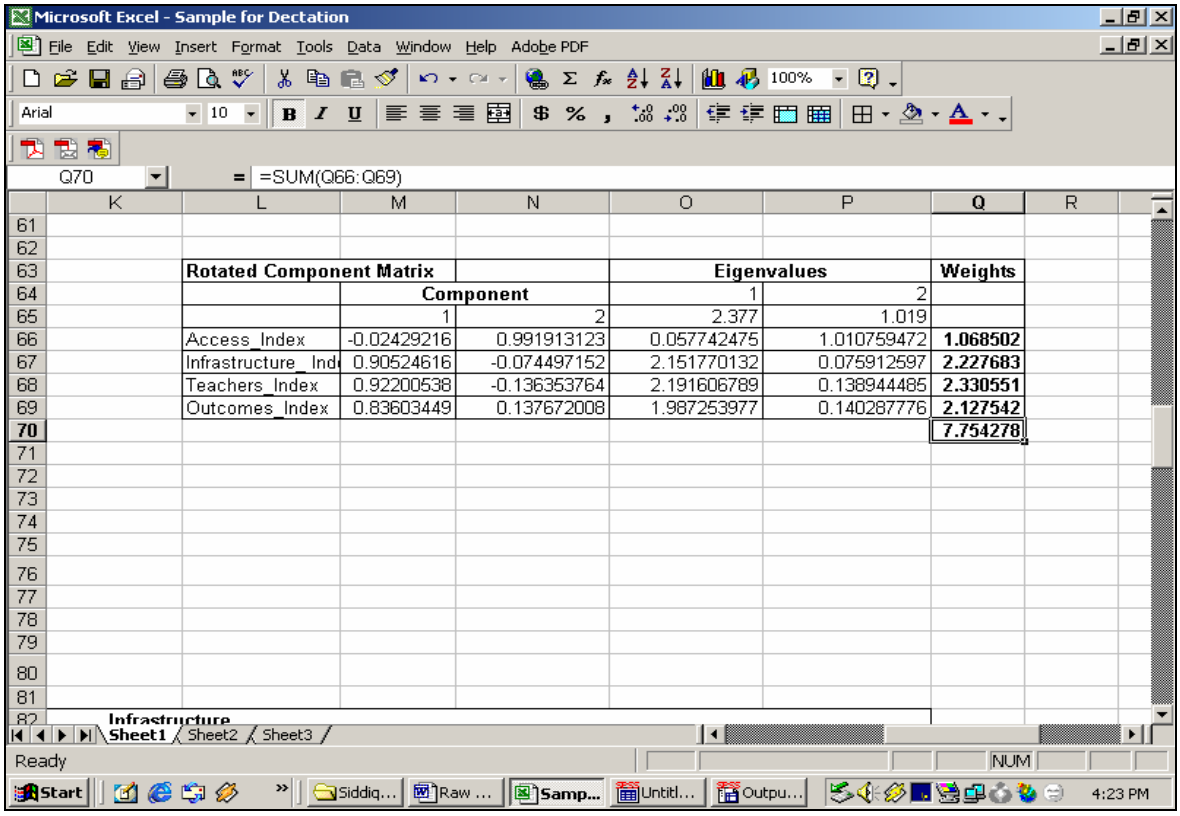


Figure 3.17

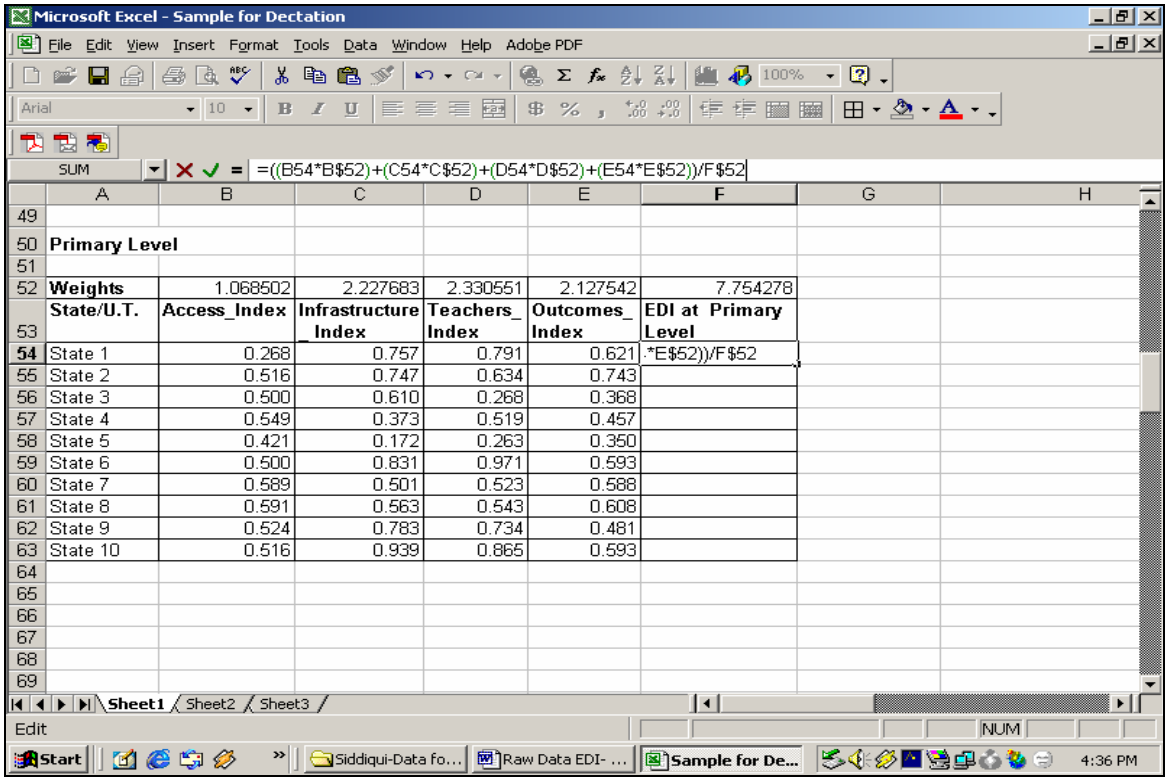
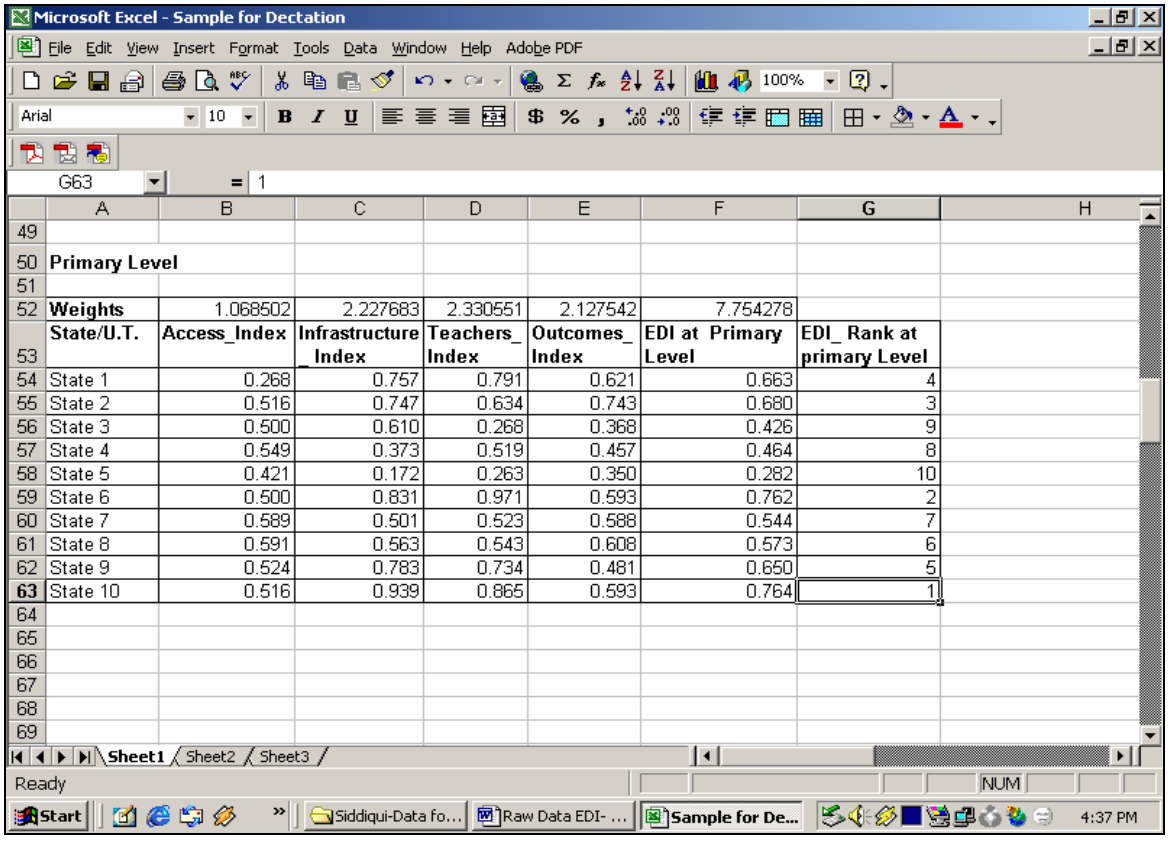


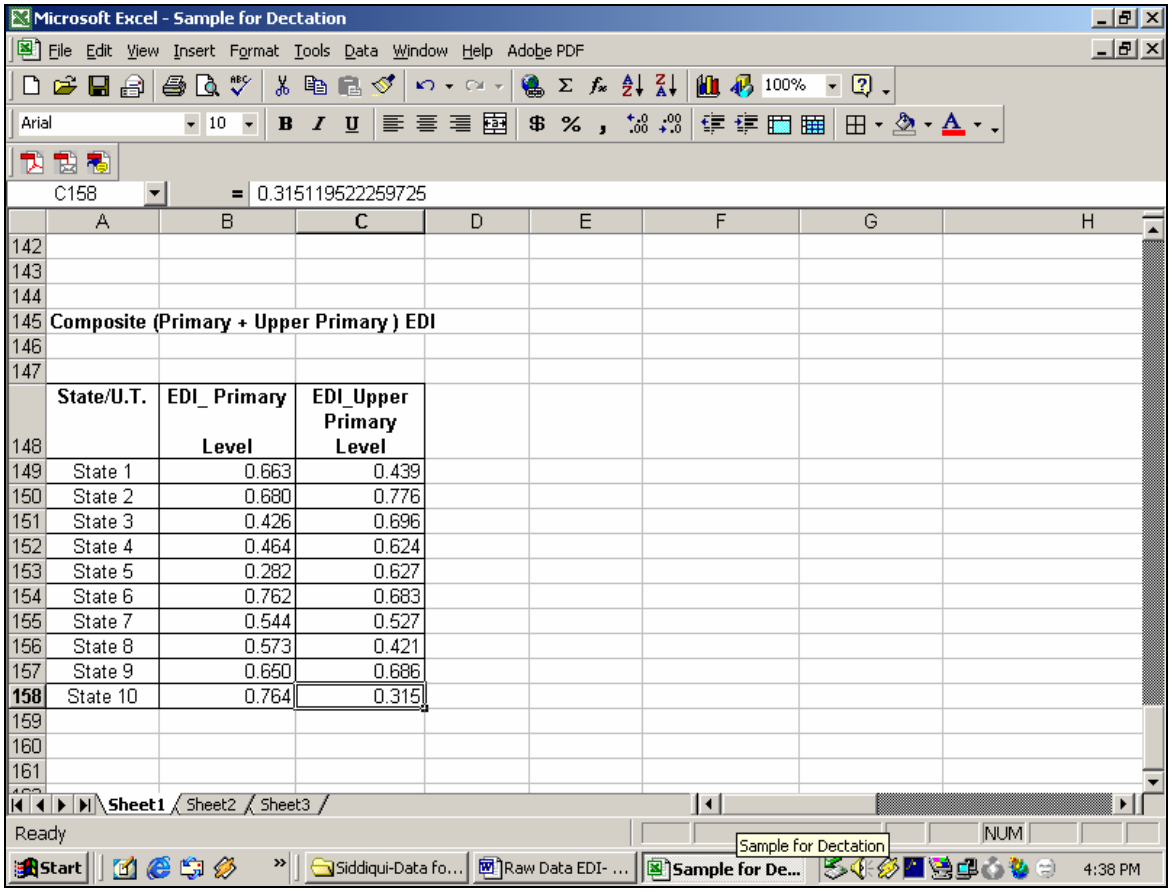
Figure 3.18



STEP 3.13

- ✓ Repeat the exercise for Upper Primary level of education.
- ✓ Compute EDI with the help of raw data provided in the Annexure VIII to X.
- ✓ The first step would be to compute an EDI for each sub-group of indicators which are then used to compute Composite EDI for the Upper Primary level of education.
- ✓ Compare your EDI with the EDI presented in the Figure 3.19

Figure 3.19



STEP 3.14

- ✓ The next step is to obtain a Composite EDI for the Primary and Upper Primary level of education combined.
- ✓ For this purpose separate EDIs obtained above for the Primary and Upper Primary level of education would be treated as 2 variables (see Figure 3.19).
- ✓ Principal Component Analysis is then applied (as demonstrated above) to obtain factor loading which is than used to obtain a Composite Indicator for the Primary and Upper Primary level of education.
- ✓ Please see the Annexure IX and compare your results presented in Figure 3.20 to 3.21.

Figure 3.20

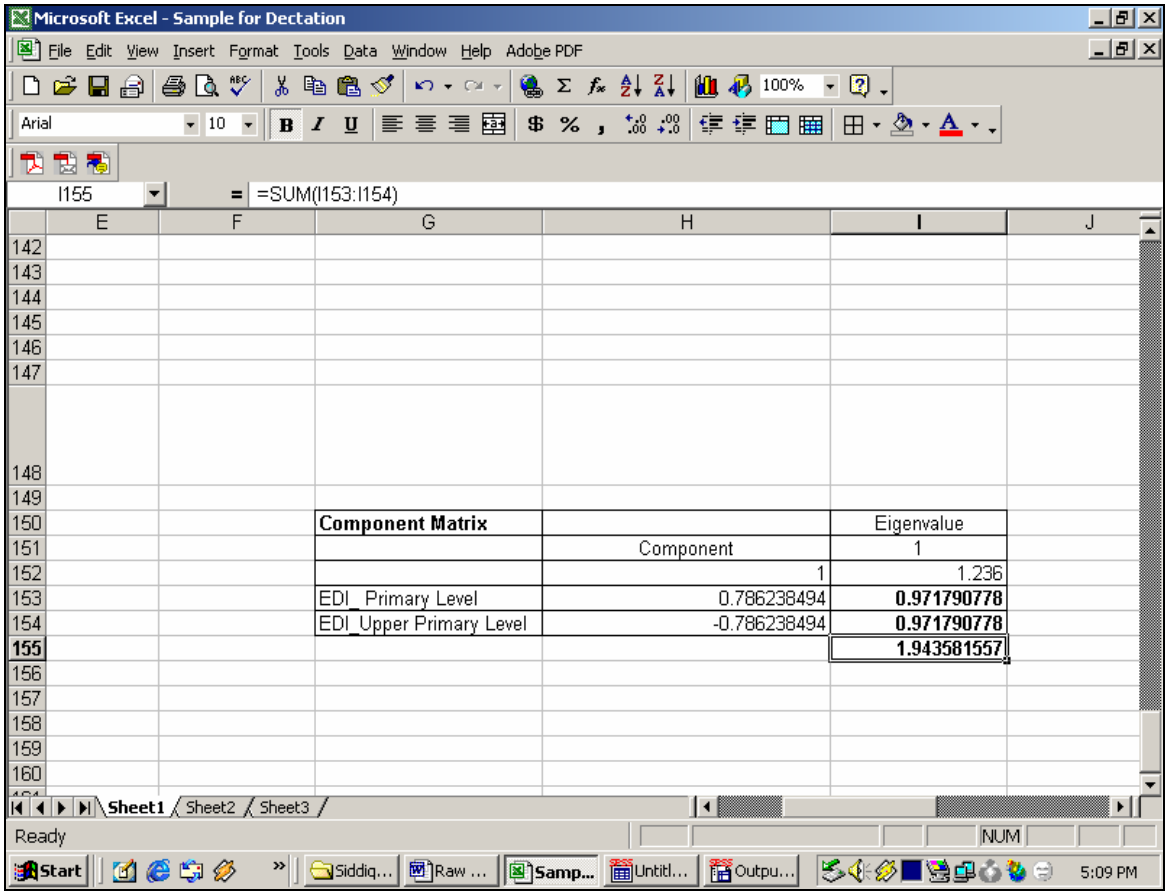


Figure 3.21

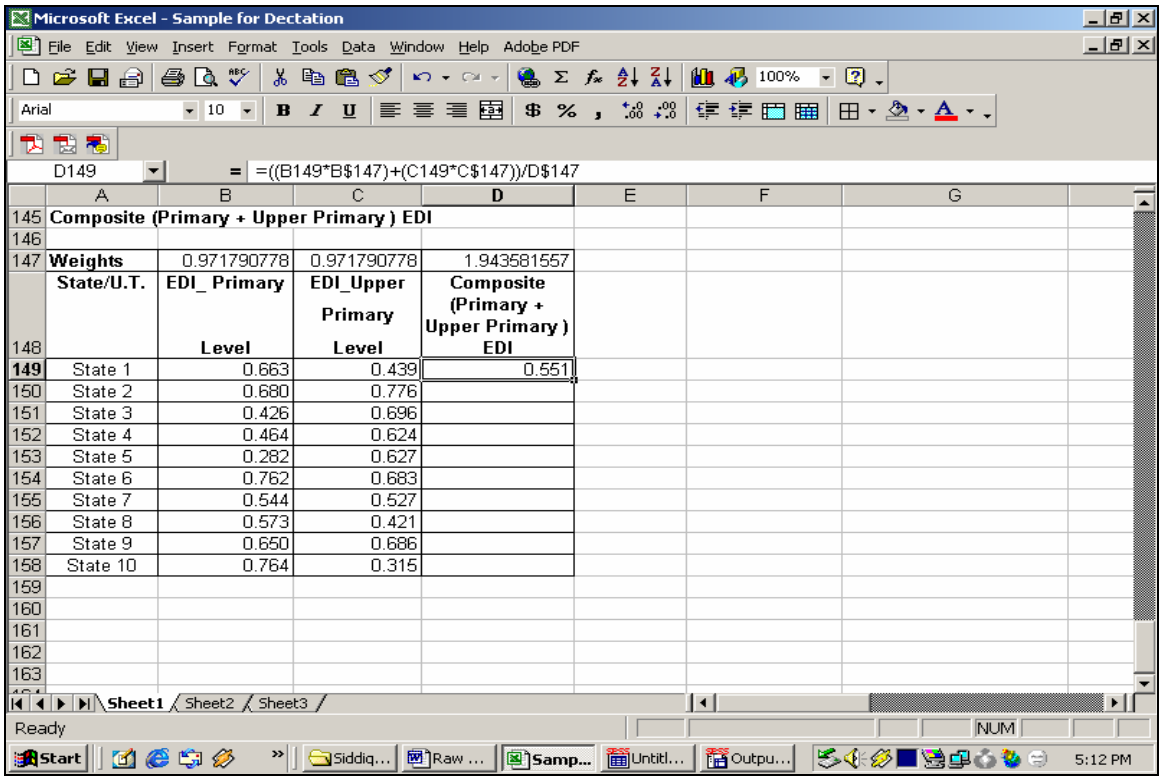


Table 3.14

Composite EDI and Ranks at Primary and Upper Primary Level

State	Primary Level		Upper Primary Level		Composite: Primary & Upper Primary	
	EDI	Rank	EDI	Rank	EDI	Rank
State 1	0.663	4	0.439	8	0.551	5
State 2	0.680	3	0.776	1	0.728	1
State 3	0.426	9	0.696	2	0.561	4
State 4	0.464	8	0.624	6	0.544	6
State 5	0.282	10	0.627	5	0.454	10
State 6	0.762	2	0.683	4	0.723	2
State 7	0.544	7	0.527	7	0.535	8
State 8	0.573	6	0.421	9	0.497	9
State 9	0.650	5	0.686	3	0.668	3
State 10	0.764	1	0.315	10	0.539	7

Table 3.14 presents separate EDI for Primary and Upper Primary level of education as well as a Composite EDI for these levels of education. The results should be analysed separately for each level of education and within each level, separately for Access, Infrastructure, Teachers and Outcome indices. State 10 with highest EDI (0.764) and

Rank 1 can be treated as the best at Primary level followed by the State 6 (EDI= 0.762 , Rank 2) and State 2 (EDI 0.680, Rank 3). Similarly State 5 (EDI 0.282 , Rank 10) is treated as the worst among 10 States. However, the positioning of states in case of Upper Primary level of education is not same. State 10 with EDI 0.315 is termed as the worst and State 2 (EDI 0.776 , Rank 1), the best one at Upper Primary level. Similarly the Composite EDI may also be analysed. It is advisible to analyse EDI value than only rank.

Annexure I

Raw Data: Primary Stage/Level

State	ACCESS		INFRASTRUCTURE				
	Percentage of Habitations Not Served	No of Schools per 1000 Population*	Average SCR	Percentage of Schools with SCR≥60	Percentage of School without Drinking Water Facility	Percentage of School with Common Toilet	Percentage of Schools with Girl's Toilet
State 1	46.51	6.35	22.7	1.67	10.83	35.00	77.50
State 2	25.27	10.42	26.56	8.95	10.81	66.77	63.93
State 3	68.83	23.55	26.49	5.80	13.36	48.72	31.85
State 4	17.96	9.56	34.51	22.92	31.72	37.28	19.48
State 5	18.90	4.25	92.59	70.48	8.58	55.91	22.76
State 6	0.00	1.71	25.84	6.41	0.64	32.69	96.15
State 7	30.33	15.22	33.85	8.86	14.71	31.7	22.64
State 8	7.83	8.16	43.01	19.32	4.55	40.91	43.18
State 9	2.44	3.52	33.30	8.89	4.44	73.33	66.67
State 10	0.00	2.42	38.03	2.53	0.93	95.48	94.55

*6-11 year child population

TEACHERS						
State	Percentage of Female Teachers	Average PTR	Percentage of Schools with PTR ≥ 60	Percentage of Single Teacher Schools where the Number of Students ≥15	Schools with ≤3 Teachers	Percentage of Teachers without Professional Qualifications
State 1	52.48	16.94	0.38	4.17	37.50	4.09
State 2	43.94	26.70	2.72	6.29	62.24	14.95
State 3	32.88	24.50	6.77	35.48	72.47	75.2
State 4	34.51	28.51	9.89	0.00	75.30	37.62
State 5	26.84	67.93	51.24	7.90	57.16	42.63
State 6	83.24	25.65	2.78	0.00	1.67	4.12
State 7	33.69	31.09	8.94	10.17	73.94	15.08
State 8	51.75	41.36	13.33	15.24	63.81	15.24
State 9	81.46	53.34	10.77	0.00	30.77	31.46
State 10	74.74	39.17	6.52	0.32	13.52	5.28

OUTCOME									
State	Overall Gross Enrolment Ratio	Scheduled Castes GER	Scheduled Tribes GER	Gender Parity Index	Repetition Rate	Dropout Rate	Ratio of Exit Class over Class I Enrolment	Percentage of Enrolled Children, Passed	Percentage of Appeared Children Passed with > 60 per cent & Above Marks
State 1	69.17	**89.11**	95.23	0.96	**7.91**	**13.90**	104.84	98.83	34.95
State 2	95.84	91.17	79.57	0.98	4.39	18.03	89.99	99.46	71.41
State 3	152.55	**78.39**	94.99	0.90	16.9	4.59	35.74	82.62	19.28
State 4	83.63	64.15	68.02	0.97	2.42	27.78	6.24	98.86	29.36
State 5	92.19	69.51	84.78	0.80	13.27	12.83	45.90	93.63	34.80
State 6	72.50	67.46	**88.01**	0.83	3.44	0.00	96.45	93.80	50.99
State 7	130.42	94.86	111.15	0.95	14.05	2.95	58.88	89.35	45.72
State 8	123.45	105.92	96.70	0.89	**8.90**	**5.78**	55.34	93.27	49.32
State 9	73.08	112.39	113.71	0.86	**7.67**	**6.91**	27.00	91.48	44.95
State 10	85.44	67.37	**83.33**	0.89	7.08	5.35	79.06	96.04	53.34

Annexure II

Normalized Values: Primary Level/Stage

State	ACCESS		INFRASTRUCTURE				
	Percentage of Habitations Not Served	No of Schools per 1000 Population*	Average SCR	Percentage of Schools with SCR≥60	Percentage of School without Drinking Water Facility	Percentage of School with Common Toilet	Percentage of Schools with Girl's Toilet
State 1	0.32	0.21	1.00	1.00	0.67	0.05	0.76
State 2	0.63	0.40	0.94	0.89	0.67	0.55	0.58
State 3	0.00	1.00	0.95	0.94	0.59	0.27	0.16
State 4	0.74	0.36	0.83	0.69	0.00	0.09	0.00
State 5	0.73	0.12	0.00	0.00	0.74	0.38	0.04
State 6	1.00	0.00	0.96	0.93	1.00	0.02	1.00
State 7	0.56	0.62	0.84	0.90	0.55	0.00	0.04
State 8	0.89	0.30	0.71	0.74	0.87	0.14	0.31
State 9	0.96	0.08	0.85	0.90	0.88	0.65	0.62
State 10	1.00	0.03	0.78	0.99	0.99	1.00	0.98

* 6-11 year population

Normalized Values: Primary Level/Stage

TEACHERS						
State	Percentage of Female Teachers	Average PTR	Percentage of Schools with PTR ≥ 60	Percentage of Single Teacher Schools where the Number of Students ≥15	Schools with ≤3 Teachers	Percentage of Teachers without Professional Qualifications
State 1	0.45	1.00	1.00	0.88	0.51	1.00
State 2	0.30	0.81	0.95	0.82	0.18	0.85
State 3	0.11	0.85	0.87	0.00	0.04	0.00
State 4	0.14	0.77	0.81	1.00	0.00	0.53
State 5	0.00	0.00	0.00	0.78	0.25	0.46
State 6	1.00	0.83	0.95	1.00	1.00	1.00
State 7	0.12	0.72	0.83	0.71	0.02	0.85
State 8	0.44	0.52	0.75	0.57	0.16	0.84
State 9	0.97	0.29	0.80	1.00	0.60	0.62
State 10	0.85	0.56	0.88	0.99	0.84	0.98

Normalized Values: Primary Level/Stage

OUTCOME									
State	Overall Gross Enrolment Ratio	Scheduled Castes GER	Scheduled Tribes GER	Gender Parity Index	Repetition Rate	Dropout Rate	Ratio of Exit Class over Class I Enrolment	Percentage of Enrolled Children, Passed	Percentage of Appeared Children Passed with > 60 per cent & Above Marks
State 1	0.00	0.52	0.60	0.89	0.62	0.50	1.00	0.96	0.30
State 2	0.32	0.56	0.25	1.00	0.86	0.35	0.85	1.00	1.00
State 3	1.00	0.30	0.59	0.56	0.00	0.83	0.30	0.00	0.00
State 4	0.17	0.00	0.00	0.94	1.00	0.00	0.00	0.96	0.19
State 5	0.28	0.11	0.37	0.00	0.25	0.54	0.40	0.65	0.30
State 6	0.04	0.07	0.44	0.17	0.93	1.00	0.91	0.66	0.61
State 7	0.73	0.64	0.94	0.83	0.20	0.89	0.53	0.40	0.51
State 8	0.65	0.87	0.63	0.50	0.55	0.79	0.50	0.63	0.58
State 9	0.05	1.00	1.00	0.33	0.64	0.75	0.21	0.53	0.49
State 10	0.20	0.07	0.34	0.50	0.68	0.81	0.74	0.80	0.65

Annexure III

SPSS OUTPUT: Primary Level, Infrastructure Index

(Please refer to **Step 3.8** in the text)

10.1 Descriptive Statistics

	Mean	**Std. Deviation**	**Analysis N**
Average SCR	.7860	.2904	10
Percentage of Schools with SCR>60	.7980	.2975	10
Percentage of School without Drinking Water Facility	.6960	.2912	10
Percentage of School with Common Toilet	.3150	.3301	10
Percentage of School with Girl's Toilet	.4490	.3898	10

10.2 Total Variance Explained

	Initial Eigen Values	% of Variance	Cumulative %	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total			Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**2.480**	49.603	49.603	**2.480**	49.603	49.603	2.218	44.353	44.353
2	**1.695**	33.895	83.498	**1.695**	33.895	83.498	1.957	39.145	83.498
3	0.624503	12.490	95.988						
4	0.184967	3.699	99.687						
5	0.015636	.313	100.000						

Extraction Method: Principal Component Analysis.

10.3 Component Matrix

	Component	
	1	2
Average SCR	.751	-.648
Percentage of Schools with SCR>60	.865	-.459
Percentage of School without Drinking Water Facility	.545	.694
Percentage of School with Common Toilet	.330	.693
Percentage of School with Girl's Toilet	.873	.318

Extraction Method: Principal Component Analysis.
A 2 components extracted.

10.4 Rotated Component Matrix

	Component	
	1	2
Average SCR	0.987613399	-0.095001754
Percentage of Schools with SCR>60	0.971381448	0.125227121
Percentage of School without Drinking Water Facility	0.043451614	0.881267353
Percentage of School with Common Toilet	-0.131666958	0.756297956
Percentage of School with Girl's Toilet	0.528637891	0.764149056

Extraction Method: Principal Component Analysis.

Annexure IV

SPSS OUTPUT: Primary Level, Access Index

(Please refer to **Step 3.12** in the text)

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Percentage of Habitations not Served	.6830	.3236	10
Availability of Schools per 1000 population	.3120	.3085	10

Total Variance Explained

	Initial Eigen values			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**1.820**	91.010	91.010	1.820	91.010	91.010
2	.180	8.990	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component
	1
Percentage of Habitations not Served	-.954
Availability of Schools per 1000 population	.954

Extraction Method: Principal Component Analysis.
a 1 components extracted.

Annexure V

SPSS OUTPUT: Primary Level, Teacher's Indicators

(Please refer to **Step 3.12** in the text)

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Percentage of Female Teachers	.4380	.3767	10
Average Pupil-Teacher Ratio	.6350	.3009	10
Percentage of Schools with Pupil-Teacher Ratio ≥ 60	.7840	.2862	10
Percentage of Single-Teacher Schools where the Number of Students ≥15	.7750	.3088	10
Percentage of Schools ≤3 Teachers	.3600	.3578	10
Percentage of Teachers without Professional Qualifications	.7130	.3170	10

Total Variance Explained

	Initial Eigen Values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**3.033**	50.553	50.553	3.033	50.553	50.553	2.897	48.279	48.279
2	**1.801**	30.009	80.562	1.801	30.009	80.562	1.937	32.283	80.562
3	0.741253	12.354	92.916						
4	0.241006	4.017	96.933						
5	0.174661	2.911	99.844						
6	0.009373	0.156	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix

	Component	
	1	2
Percentage of Female Teachers	0.878367	-0.131119
Average Pupil-Teacher Ratio	0.248716	0.935072
Percentage of Schools with Pupil-Teacher Ratio ≥ 60	0.535439	0.812641
Percentage of Single-Teacher Schools where the Number of Students ≥15	0.719634	-0.422864
Percentage of Schools ≤3 Teachers	0.850447	-0.262438
Percentage of Teachers without Professional Qualifications	0.819718	-0.030522

Extraction Method: Principal Component Analysis.
a. 2 components extracted.

Rotated Component Matrix

	Component	
	1	2
Percentage of Female Teachers	0.871956	0.168562
Average Pupil-Teacher Ratio	-0.076527	0.964553
Percentage of Schools with Pupil-Teacher Ratio ≥ 60	0.234594	0.944481
Percentage of Single-Teacher Schools where the Number of Students ≥15	0.819321	-0.159372
Percentage of Schools ≤3 Teachers	0.889313	0.035434
Percentage of Teachers without Professional Qualifications	0.783181	0.243918

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 3 iterations.

Annexure VI

SPSS OUTPUT: Primary Level, Outcome Indicators

(Please refer to **Step 3.12** in the text)

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Over All Gross Enrolment Ratio	.3440	.3376	10
GER - Scheduled Caste	.4140	.3572	10
GER - Scheduled Tribe	.5160	.3045	10
Gender Parity Index in Enrolment	.5720	.3406	10
Repetition Rate	.5730	.3304	10
Dropout Rate	.6460	.3009	10
Ratio of Exit class over Class I Enrolment (only at primary stage)	.5440	.3273	10
Percentage of Enrolment Children Passed	.6590	.3048	10
Percentage of Appeared Children Passed with ≥ 60 per cent	.4630	.2796	10

Total Variance Explained

	Initial Eigen Values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**3.682**	40.909	40.909	3.682	40.909	40.909	2.786	30.953	30.953
2	**2.055**	22.835	63.745	2.055	22.835	63.745	2.344	26.046	56.999
3	**1.402**	15.575	79.320	1.402	15.575	79.320	2.009	22.321	79.320
4	0.936069	10.401	89.721						
5	0.504011	5.600	95.321						
6	0.269953	2.999	98.320						
7	0.102955	1.144	99.464						
8	0.041336	0.459	99.924						
9	0.006874	0.076	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix

	Component		
	1	2	3
Over All Gross Enrolment Ratio	-0.72743	-0.24375	0.30422
GER - Scheduled Caste	-0.36324	0.567115	0.614386
GER - Scheduled Tribe	-0.72648	0.523136	0.199887
Gender Parity Index in Enrolment	-0.3454	-0.08526	0.810204
Repetition Rate	0.878257	0.176294	-0.02553
Dropout Rate	-0.66781	0.551955	-0.4105
Ratio of Exit class over Class I Enrolment (only at primary stage)	0.285302	0.689205	-0.2252
Percentage of Enrolment Children Passed	0.949325	0.151182	0.092174
Percentage of Appeared Children Passed with ≥ 60 per cent	0.416812	0.748077	0.083668

Extraction Method: Principal Component Analysis.
a 3 components extracted.

Rotated Component Matrix

	Component		
	1	2	3
Over All Gross Enrolment Ratio	-0.715069096	0.410272217	-0.038393823
GER - Scheduled Caste	0.066839054	0.894434305	0.16295361
GER - Scheduled Tribe	-0.146703767	0.837640592	-0.343862796
Gender Parity Index in Enrolment	0.047289432	0.201940434	0.860223887
Repetition Rate	0.725599514	-0.382422904	0.361005502
Dropout Rate	0.008182705	0.488833331	-0.824687844
Ratio of Exit class over Class I Enrolment (only at primary stage)	0.723785652	0.156510301	-0.242390724
Percentage of Enrolment Children Passed	0.737465347	-0.372549976	0.499921202
Percentage of Appeared Children Passed with ≥ 60 per cent	0.807425984	0.291389956	0.059221633

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 6 iterations.

Annexure VII

SPSS OUTPUT: Primary Level COMPOSITE Index

(Please refer to **Step 3.12** in the text)

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
Access_Index	0.4974	0.0941	10
Infrastructure_ Index	0.6276	0.2325	10
Teachers_Index	0.6111	0.2361	10
Outcomes_Index	0.5402	0.1231	10

Total Variance Explained

	Initial Eigen Values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**2.377**	59.421	59.421	2.377	59.421	59.421	2.369	59.228	59.228
2	**1.019**	25.481	84.902	1.019	25.481	84.902	1.027	25.675	84.902
3	0.423191	10.580	95.482						
4	0.180713	4.518	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix

	Component	
	1	2
Access_Index	-0.099075	0.987252
Infrastructure_ Index	0.908287	-0.005973
Teachers_Index	0.929666	-0.066388
Outcomes_Index	0.823262	0.200369

Extraction Method: Principal Component Analysis.
a. 2 components extracted.

Rotated Component Matrix

	Component	
	1	2
Access_Index	-0.024292	0.991913
Infrastructure_ Index	0.905246	-0.074497
Teachers_Index	0.922005	-0.136354
Outcomes_Index	0.836034	0.137672

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 3 iterations.

Annexure VIII

Raw Data: Upper Primary Stage/Level

State	ACCESS		INFRASTRUCTURE				
	Percentage of Habitations Not Served	No of Schools per 1000 Population*	Average SCR	Percentage of Schools with SCR≥60	Percentage of School without Drinking Water Facility	Percentage of School with Common Toilet	Percentage of Schools with Girl's Toilet
State 1	**26.45**	6.88	38.15	13.44	14.57	**43.20**	**19.44**
State 2	12.30	4.42	27.24	3.88	3.24	53.07	**87.70**
State 3	**9.50**	4.35	24.94	4.70	5.46	74.42	79.48
State 4	21.74	7.74	27.59	6.58	13.45	64.14	59.13
State 5	23.74	**8.34**	20.37	**0.91**	19.70	84.85	59.70
State 6	25.69	5.27	27.32	7.60	**3.15**	52.66	75.14
State 7	20.09	7.16	44.57	29.36	19.57	70.58	28.58
State 8	21.57	2.97	32.92	12.67	7.57	**85.33**	75.81
State 9	14.66	7.77	**18.42**	2.15	**22.62**	75.53	56.97
State 10	20.56	**1.75**	**60.01**	**49.39**	7.22	59.32	76.87

* 11-13+ year child population

Raw Data: Upper Primary Stage/Level

TEACHER'S						
State	Percentage of Female Teachers	Average PTR	Percentage of Schools with PTR ≥ 60	Percentage of Single Teacher Schools where the Number of Students ≥15	Schools with ≤3 Teachers	Percentage of Teachers without Professional Qualifications
State 1	32.67	37.78	12.04	2.58	41.38	15.17
State 2	64.85	26.17	4.85	0.00	**3.88**	**1.06**
State 3	59.78	28.62	8.06	3.22	22.26	18.37
State 4	26.90	30.66	8.83	1.99	14.55	9.69
State 5	42.93	**20.72**	**3.33**	**0.00**	1.52	**62.34**
State 6	**65.97**	29.18	9.62	0.73	9.71	5.63
State 7	27.21	23.23	4.30	0.36	10.5	58.38
State 8	**24.91**	49.51	30.29	**13.78**	**58.36**	22.02
State 9	29.38	25.61	6.00	1.90	46.26	24.50
State 10	31.90	**64.86**	**51.05**	0.18	6.43	24.80

Raw Data: Upper Primary Stage/Level

OUTCOME								
State	Overall Gross Enrolment Ratio	Scheduled Castes GER	Scheduled Tribes GER	Gender Parity Index	Repetition Rate	Dropout Rate	Percentage of Enrolled Children, Passed	Percentage of Appeared Children Passed with > 60 per cent & Above Marks
State 1	48.29	59.19	68.14	0.86	3.45	**47.74**	91.43	13.10
State 2	71.63	**111.73**	*	1.04	**0.00**	31.81	92.69	31.97
State 3	54.51	76.36	*	0.88	12.15	32.89	**66.00**	26.04
State 4	62.10	65.29	66.88	**0.62**	9.19	**16.64**	87.01	**46.01**
State 5	74.97	46.07	78.08	**1.14**	20.39	29.93	68.99	14.50
State 6	**106.21**	95.66	**117.98**	0.93	4.18	33.67	95.53	45.33
State 7	83.86	75.96	59.81	0.95	15.14	29.28	86.79	**13.06**
State 8	**41.95**	**41.53**	56.71	0.83	1.29	19.05	**97.56**	38.43
State 9	62.33	102.51	86.32	0.95	5.31	36.50	93.32	25.11
State 10	66.13	98.38	**49.85**	0.96	**21.72**	28.08	78.20	19.69

* Missing value

Annexure IX

SPSS OUTPUT: Primary & Upper Primary COMPOSITE Index

Descriptive Statistics

	Mean	Std. Deviation	Analysis N
EDI_ Primary Level	.5808	.1549	10
EDI_Upper Primary Level	.5794	.1476	10

Total Variance Explained

	Initial Eigen Values			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**1.236**	61.817	61.817	1.236	61.817	61.817
2	.764	38.183	100.000			

Extraction Method: Principal Component Analysis.

Component Matrix

	Component
	1
EDI_ Primary Level	.786
EDI_Upper Primary Level	-.786

Extraction Method: Principal Component Analysis.
a 1 components extracted.

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