Important factors of BPR for ICT in Education Institutes at Delhi (India)

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Abstract- The premise of this research paper is to identify the important factor of Business Process Re-engineering(BPR) with an aim to improve the efficiency of institutions by eliminating redundant efforts / activities. This empirical study takes on primary data concerning to BPR of fifty institutes of Delhi i.e., Union territory of India. Important factors have been identified using data reduction technique Principal Component Analysis (PCA)[Tool: SPSS version 20.0]. The result states that among twenty numbers of different attributes three attributes are significant.

Index Terms- Information and Communication Technology(ICT), Business Process Re-engineering(BPR), Principal Component Analysis(PCA)

I. INTRODUCTION

During the rise of the Internet, governments on all continents have discovered the amazing potential that technology opens up for education (Kumpulainen, Kari. 2007). ICT integration also helps us to make education more accessible and affordable. ICT can be implemented in any institution with the help of reengineering.

As per the present scenario, the total number of universities in India is 567 of which 42 are Central Universities, 285 State Universities, 130 Deemed Universities and 112 Private Universities. In Delhi, there are 4 Central Universities, 5 State Universities, and 11 Deemed Universities. There are 395 Colleges running under these Universities. In all these Colleges and Universities, there are different infrastructures in use.

This research covers the prime institutions of Delhi to find out different BPR policies, strategies or procedures adopted by different institutions to incorporate IT in different prime institutions of Delhi.

According to **Hammer and Champy (1993)** "Reengineering is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance such as cost, quality, service and speed."[5]So BPR is the starting points of re-design any business activity without this change is not feasible. There are different observations given by different authors for BPR as explained in the following section. To carry on the present research work a vast literature available on BPR was thoroughly reviewed.

The brief description of literature studied from 1990 to 2013 is given below.

The concept of BPR was first presented by **Devenport and Short(1990).** They stated that BPR as an extension of industrial engineering.[2] **Davenport & Short (1990**) described BPR is the analysis and design of workflows and processes within and between organizations and its relationship with IT[2]. **Teng et al. (1994)** explained BPR as "the critical analysis and radical redesign of existing business processes to achieve breakthrough improvements in performance measures."[11] **Sprawls** stated that Re-engineering is effected by changing educational needs, alternative learning opportunities, availability of Digital technology, and Enhancing performance of both students and teachers.[9] **Bizhan** explained re-engineering is a radial redesign of organization processes by using power of modern technology and power of people involved in operation.[7] **Malhotra(1998)**, stated that BPR is "the analysis and design of workflows and process within and between organization"[6] **Subramanian et. al.(1999)**, have stated that re-engineering is must for this ever-changing world is which is driven by the three Cs: Customer, Competition and Change.[10] According to **Gunasekaran and Kobu(2002),** BPR required organizational restructuring, changes in employee's behaviour with a view to accommodating and facilitating radical changes for achieving dramatic improvements in business performance with the help of IT.[4] **Fagan (2003)**, described the approaches that have been used to classify e-commerce and e-government IT applications and explores their relevance to higher education.[3] **Balaji(2004)**, focussed on the impact of BPR as a tool for improving efficiency and performance in an educational institute in New Zealand.[1] **Apeejay Stya Education Research Foundation(2013),** had given the objective of re-engineering to be the enhancement of both the effectiveness and the efficiency of various educational activities.[8]

After reviewing the above literature, it is concluded that none or very few studies were carried out in reference to prime institutions of Delhi. This research work is definitely an attempt to fill up this gap.

II. METHODOLOGY

The methodology used to collect data for this research is through survey and interview method. For this research hypothesis taken into consideration is:

There is wide variation in the BPR practices, its adoption, advantages / opportunities to different educational institutions and different users.

Hypothesis is an assumption or proposed phenomenon for which some method requires to test it.

Thus to justify the above hypothesis it was necessary to analyze the important parameters among various attribute by using the data reduction techniques. For this statistical package called SPSS version 20.0 is used. A methodology of PCM a statistical data mining technique is used for analyzing the primary data. PCM is a statistical approach that can be used to analyze interrelationships among a large number of variables and to explain these variables in terms of their common underlying dimensions (factors). The statistical approach involving finding a way of condensing the information contained in a number of original variables into a smaller set of dimensions (factors) with a minimum loss of information.

For conducting factor analysis first the reliability of data is checked, then co-relation between different variables are checked and to conduct PCM variance in different variables their communality is analyzed. Then through extraction method variance is computed and component matrix is taken out to give result of main factors extracted as explained in the following section.

III. ANALYSIS INTERPRETATION

For analyzing data through PCA factor analysis has been done on data of fifty institutions to identify the important parameters among various attribute by using data reduction techniques. For the purpose the reliability of the primary dataset has been checked. To check the reliability Cronbach's Alpha statistics technique is used as given in Table 1.

Table 1 Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.760	.745	9

If the result of this operation is less than .5; then it states that the data is not reliable for the application of Factor Analysis but as given in Table 1 value of Cronbach's Alpha is .745. This means further analysis can be done but whether PCM can be applied on that data, there is need to apply KMO and Bartlett's Test as shown in Table2. In KMO and Bartlett's Test where KMO tells the proportion of common variance in our variables. If this is greater than .50 we can proceed with the analysis. In this work it is .739 which is positively acceptable. The Bartlett's Test of Sphericity tells us if the correlation matrix is factorable. The significant value tells us 0 and we should proceed to the formal PCA analysis as shown in Table 3.

Table 2 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.739
Bartlett's Test	Approx. Chi-Square	332.193
	Df	36
	Sig.	.000

The first section of Table 3 shows the Initial **Eigen values** or amount of variance in the original variables accounted for by each component. The **% of Variance** column gives the ratio, expressed as a percentage, of the variance accounted for by each component to the total variance in all of the variables. The **Cumulative %** column gives the percentage of variance accounted for by the first n components. For example, the cumulative percentage for the second component is the sum of the percentage of variance for the first and second components. For the initial solution, there are as many components as variables, and in a correlations analysis, the sum of the eigen values equals the number of components. Since that eigen values greater than 1 be extracted, so the first three principal components form the extracted solution.

Table 3 : Extraction Method: Principal Component Analysis. (Total Variance)

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.674	51.929	51.929	4.674	51.929	51.929	3.721	41.346	41.346
2	1.782	19.805	71.734	1.782	19.805	71.734	1.967	21.858	63.205
3	1.147	12.744	84.478	1.147	12.744	84.478	1.915	21.273	84.478
4	.435	4.834	89.312						
5	.333	3.696	93.007						
6	.241	2.673	95.680						
7	.175	1.946	97.626						
8	.128	1.418	99.044						
9	.086	.956	100.000						

Sum of Square column of the Table 3 shows the extracted components. They explain nearly 84% of the variability in the original 09 variables, so we can considerably reduce the complexity of the data set by using these components, with only a 16% loss of information

Table 4 : Extraction Method: Principal Component Analysis

	Component		
	1	2	3
Senior Management Support	**.927**	.145	-.060
Do you prefer web based services instead of manual services?	**.911**	.085	.024
Lack of training facilities	**.892**	-.045	.219
Clear BPR/ management policies and procedures	**.881**	-.079	.206
Reluctance among staff to use electronic resources/ employee resistance	**.714**	-.052	.578
Difficult to recruit or retain ICT qualified staff	**.621**	.482	-.325
Lack of budget for ICT	-.374	**.807**	.300
Lack of digital qualified staff in the library	.280	**.774**	-.417
Inadequacies of existing digital resources	-.549	.509	**.590**

In Table 4 Component matrix has been a countercheck to Table 3 Total Variance. The table shows that in the 09 item of variable set there are three factors, which are accounted for the study. The bold numbers in the column 2 states that the numbers in-group frame the factor 1. Similarly, column number 3 having four bold numbers frames the component of second factor and for factor 3 there is only one item.

Factor 1 (**Management Policy and Inadequate Budget**) states that highest total number for initial Eigen value is 4.674 and this value is framed by grouping of six item set. The highest component score is .927 and the minimum is .621. The factor states that even senior management staff support to opt for web based services, but lack of budget for providing training among the non-technical people causes less interest for opting the training. Management / BPR policies also affect the new recruitments. **Factor 2(Unqualified Staff)** stands at the second rank with the initial Eigen value of 1.782 as its total number. This value is the combination of two attributes whose component score range lies from .807 to .774. The idea for framing this factor is that the lack of budget causes the non-awareness among the staff to opt for web-based services. **Factor 3(Inadequate Digital Resources)** explains the third status with the initial Eigen value of 1.147 as its total number. This value is the combination of only one attributes whose component score is .590. This factor retains the outliers in the sense that this item was usually opted by exceptional respondents only. This factor believes that Inadequacies of existing digital resources may be issue of concern.

IV. CONCLUSION

After analyzing the result, it is well understood that there are three factors which are accounted for data reduction using PCA in factor analysis. So after analysing the result, it has been stated that only 3 factors are important, so we need not to take all the attributes but we can consider only 3 factors for further analysis to explore BPR policies of different institutions of other states also.

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