SIX SIGMA IN HIGHER EDUCATION: RELATING CLASSROOM DELIVERY AND CONTENT WITH SIX SIGMA

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ABSTRACT:

The objective of this study is to measure the effectiveness of classroom teaching with respect to commerce and management streams. Also to develop a measure of higher education service quality from student`s view and how can we improve the student satisfaction by using the tools of six sigma. Six Sigma is a methodology which has been successfully implemented in many service industries. Data for this research was collected from the primary stake holders of education services i.e. the students, who voluntarily took part in this research and the data was analysed using factor analysis.

KEYWORDS:

SIX SIGMA, HIGHER EDUCATION, QUALITY IMPROVEMENT, ACADEMIC DELIVERY, ACADEMIC CONTENT, STUDENT SATISFACTION.

INTRODUCTION:

The education sector in India is developing exponentially and has acquired the status of a service providing industry. New universities (real and virtual) have come up which has highly affected the demand and supply of students, resulting in forcing the institutes to think upon innovative ways to improve the service quality perceived by different stake holders as valuable. The challenges in Higher Education sector has increased greatly in recent times due to globalisation, technological advancement and increase in number of higher education institutes that offer skill-based learning. Furthermore, economic forces also impose pressure on the higher education institutes for cost cutting and indirectly suffering in quality. According to UNESCO data, India has one of the lowest public expenditure rates on education per student, compared to other Asian countries, which is inadequate for a country aspiring to create a pool of skilled works person to fuel our economic growth. Jobs in the real world have also become highly competitive as the employers can choose from a large number of potential applicants. According to the All India Survey on Higher Education (2016-17) data, there is an approximate increase of 35% in the number of universities in India in the past 8 years Total enrolment in higher education has been estimated to be 35.7 million. About 79.4% of the students are enrolled in Undergraduate level program. 1,41,037 students are enrolled in Ph.D. that is less than 0.4% of the total student enrolment. On the other hand, second to Under Graduate, 11.2% students are enrolled in post-graduation which is approximately 40.0 lakh students. The student enrolment from UG to PG is thus decreasing steeply. Thus to improve and manage the quality of education, institutes need to work on different factors which needed to be updated and implemented in the quality measurement system (Sunder & Sunder,2016).
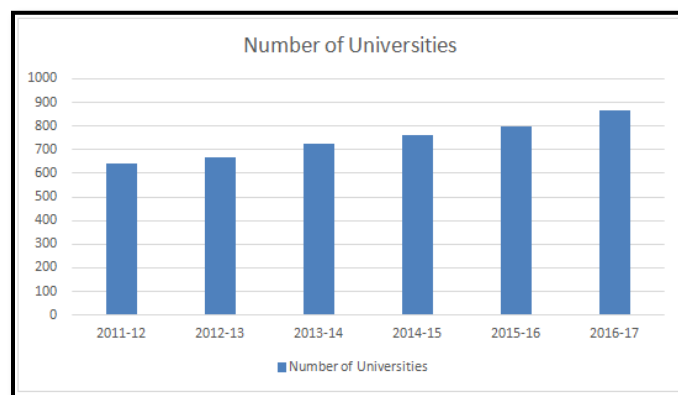
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MODEL TO MEASURE SERVICE QUALITY IN HIGHER EDUCATION:

Many studies have utilised the SERVQUAL by Parasuraman et al. (1985) which is one of the most widely used instrument to measure quality in Higher Education .The dimensions of service quality is different in different service sectors. Intangibility and lack of physical evidence of service makes the perception of service a complex thing to study in higher education (Mahapatra & Khan,2007).The SERVQUAL model has also been criticized as it had issued relating to validation, application and dimensionality (Cronin & Taylor, 1992; Cook, 1997; Clewes, 2003; Galeeva, 2016). Ladhari (2009).

SIX SIGMA IN EDUCATION:

The Greek symbol σ (sigma) is a statistical term denoting "standard deviation" (S.D). S.D denotes how far the data points are from the mean, typically, and it may be computed with a formula. The phrase six sigma refers to several things: One, six sigma is a performance level - for a six sigma process, 6 standard deviations each may be fitted between the mean and the upper and lower specification limits. Six Sigma is used for improvement in the performance of a work process which is repetitive in nature. Education is also a continuous work process, including repetitive processes like Recruiting, Admission, Registration, Lectures, Examinations and finally Graduation. Factors influencing successful six sigma projects include management involvement and organizational commitment, project management and control skills, cultural change, and continuous training. Quality in higher education is treated from different perspectives in various articles and literature. According to Paval and Saebu (2014), characteristics of six sigma are compatible with ISO 9000, a quality management system and integrating six sigma in any higher education institute will be successful.

Application of DMAIC methodology (Design, Measure, Analyze, Improve & Control) is used in quality management. Attempts to establish a relationship between DMAIC methodology and its scope in the academic environment involving undergraduate engineering programs have been studied (Shoeibi & Zahmatdoost,2015).

SIX SIGMA DEFINE PHASE:

The first step is to identify the various stakeholders. In the current study, we have identified the students as the primary stake holders for the quality assessment. For improving the performance, the students who attend the lectures in the classes can identify the problems with the content and classroom delivery.

SIX SIGMA MEASURE PHASE:

A measure is a quantified value. The qualitative and quantitative data was collected from the primary stake holders and the direct recipient of the service i.e. the students. The data was collected in the form of questionnaire. The objective of the study was clearly mentioned in the questionnaire. Data was collected from students of basically commerce and management stream i.e. B Com, M.Com, B.B.A and M.B.A. The questionnaire was divided into three parts

Part 1: Comprised of the respondents demographic and academic background.

Part 2: The respondents were asked to rate their level of agreement to each statements asked related to teaching material quality and classroom delivery.

Once the list of question was set, a pilot study of 40 students was conducted. After the survey, the questionnaire was submitted to academicians and language experts for feedback. Consequently, changes

were done accordingly and at the end a total of 30 statements were drafted and that were grouped into 3 clusters Viz Cluster A : Self Motivation. Cluster B : Academic content quality . Cluster C : Classroom Delivery. A total of 220 students from public and private Higher Education Institutes responded to the survey. The responses help to identify the degradation variables associated with the performances of the students.

FIGURE 1: FLOW DIAGRAM OF METHODOLOGY ADOPTED
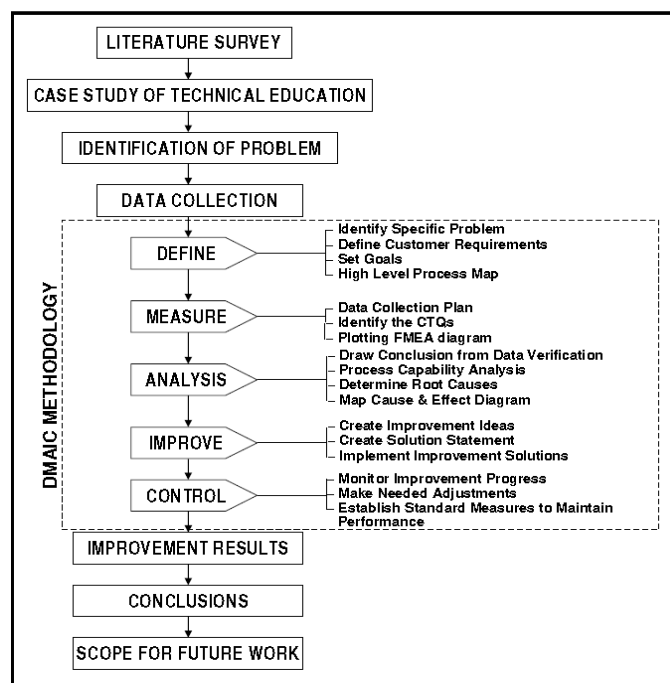
SIX SIGMA ANALYSE PHASE:

To implement factor analysis to a sample, we have Kaiser Meyer Olkin (KMO) measure. The KMO statistic range is from 0 to 1, and it the value is over 0.6, the sample is fit for the factor analysis technique (Huck,2012; Pallant, 2011). In our Study, the KMO measure has a value of 0.88.

TABLE 1: KMO AND BARTLETT'S TEST

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.883
Bartlett's Test of Sphericity	Approx. Chi-Square	1194.429
	Df	105
	Sig.	.000

Another test is Bartlett`s Test of Sphericity. It compares the correlation matrix with the identity matrix. It checks if there is a redundancy between variables that can be grouped with some factors.　　(Table 1.)

The variable`s commonality indicating the amount of variance in each variable was also assessed to ensre acceptable levels of explaination. The result ststed that all the commonalities are more than 0.5 except one . (Table 2)

Principal component analysis with varimax rotation is used for factor analysis in this study (Table 3) The factors with an eigen value of 1 or more are considered. (Scree

Plot)

The factors identified as a part of factor analysis can be described as follows:

Factor 1 : Therotical-Knowledge : How well the students have understood the topic.

Factor 2 : Library-Facility : Students using library out of curiosity to gain more knowledge.

Factor 3 : IT-For-Learning : Students using technology for understanding & expressing their topic.

Factor 4 : Faculty-Interaction : Students interacting with the faculties for their improvement.

As seen in table 3, these four factors explain 63% of the total variation.

SIX SIGMA IMPOVE AND CONTROL PHASE:

In this phase, the reasons for student`s failure and lack of interest in the subject must be identified. Continuous evaluation , monitoring and counselling of the students wil help them overcomr their confusions and improve the quality of education. Identifying and understanding key factors, obstacles and shortcomings of an organisation make them better in taking constructive straategic decisions.

Colleges should think like corporates, re-engineer, innovate and diversify their structure continuously to provide optimum service. Service satisfaction evaluation should also be doe on continuous basis.

LIMITATIONS AND FUTURE RESEARCH:

Successful implimentation of Six Sigma methods have seen an exploding growth in the past years. We in this paper have tried to inplement the DMAIC approach to the higher education. This study has focused on only one of the stake holders of quality i.e. Students to measure the quality in higher education institutes. Further studies may include other stake holders like parents, teachers, administrators, government, etc.

Also the data collected was crosss-sectional, i..e.it was collected durinf one period of time,whereas the data can be collected at different point of time for further studies, to compare any changes in the satisfaction levels.

CONCLUSION:

Six sigma plays a very important role in improving the efficiency and effectiveness of the institutes. In this paper we had studied DMACI approaches and different tools and techniques which can be used in improving the quality of education at different levels. Also we have identified some factors which can be used in measuring the effectiveness of class room teaching and the content. Higher education institutes in India should also start implementing six sigma methodologies for maintaining high academic standards and improving it continuously. As academicians, we should try to understand six sigma better so that no over hype s created or we are too quick to dismiss it.
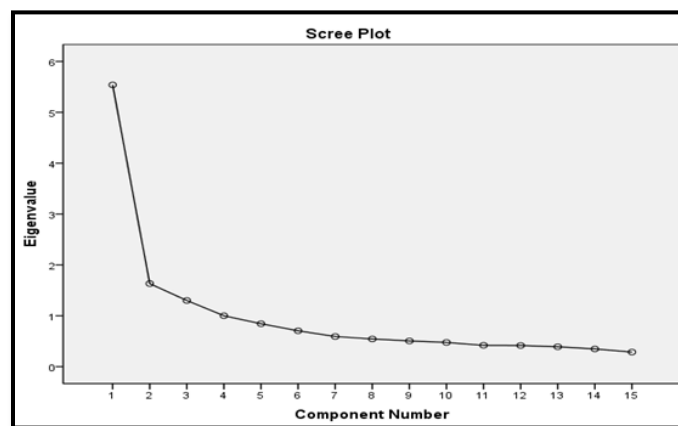

Scree Plot

TABLE 2: COMMUNALITIES

	Initial	Extraction
In your experience at your institution during the current year, about how often have you done each of the following? Made a classroom Presentation?	1.000	.660
Worked with classmates outside of class to prepare class assignments.	1.000	.557
Used an electronic medium (list-serv, chat group, Internet, etc.) to discuss or complete an assignment.	1.000	.624
Worked with faculty members on activities other than coursework (committees, orientation, student life activities, events etc.)	1.000	.571
Discussed ideas from your reading or classes with faculty members outside of class	1.000	.709
Talked about career plans with a faculty member or advisor	1.000	.676
Used the library as a quiet place to read or study materials you brought with you.	1.000	.659
Read assigned materials other than textbooks in the library (reserve readings, etc.).	1.000	.627
Used library to read a basic reference or document that other authors referred to.	1.000	.733
Made a judgment about the quality of information obtained from the library	1.000	.725
In your experience with the teaching material, how much have the following helped you? Gaining knowledge of facts, terms, classifications, works, major figures, etc	1.000	.619
Gaining an understanding of theories, fundamental concepts, or other important ideas.	1.000	.581
Learning techniques and methods for gaining new knowledge in this subject.	1.000	.659
Developing skill in expressing ideas orally.	1.000	.622

Developing skill in expression through art, music, media, writing, design, or performance.	1.000	.451

TABLE 3: PRINCIPAL COMPONENT ANALYSIS. ROTATION METHOD: VARIMAX WITH KAISER NORMALIZATION.

	Component			
	1	2	3	4
Learning techniques and methods for gaining new knowledge in this subject.	.778			
Developing skill in expressing ideas orally.	.734			
Gaining an understanding of theories, fundamental concepts, or other important ideas.	.717			
In your experience with the teaching material, how much have the following helped you? Gaining knowledge of facts, terms, classifications, works, major figures, etc	.709			
Developing skill in expression through art, music, media, writing, design, or performance.	.637			
Made a judgment about the quality of information obtained from the library		.814		
Used library to read a basic reference or document that other authors referred to.		.794		
Used the library as a quiet place to read or study materials you brought with you.		.769		
Read assigned materials other than textbooks in the library (reserve readings, etc.).		.726		
In your experience at your institution during the current year, about how often have you done each of the following? Made a classroom Presentation?			.763	
Used an electronic medium (list-serv, chat group, Internet, etc.) to discuss or complete an assignment.			.723	
Worked with classmates outside of class to prepare class assignments.			.676	
Talked about career plans with a faculty member or advisor				.772
Discussed ideas from your reading or classes with faculty members outside of class				.718
Worked with faculty members on activities other than coursework (committees, orientation, student life activities, events etc.				.563

TABLE 4: TOTAL VARIANCE EXPLAINED

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.539	36.927	36.927	2.913	19.417	19.417
2	1.633	10.888	47.815	2.749	18.325	37.742
3	1.300	8.667	56.482	2.028	13.518	51.260
4	1.001	6.674	63.157	1.784	11.896	63.157
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