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Quality Improvement in Open and Distance Education Institutes: Six Sigma Approach

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Abstract

The present society is being termed as the 'knowledge society'. As per the National Knowledge Commission report, the higher education system should be in tune with expansion, excellence and inclusion. From a meager 18 number of University in 1947, it has grown to the number of over 400 University/Deemed University at present. Though the expansion of Indian Higher education system has been spectacular since independence, the higher education system in India needs a massive expansion to around 1500 universities, which would enable our country to attain a gross enrolment ratio (GER) of at least 30 percent by 2020. The only way to increase the GER in the short-run is Distance Education. The Distance Education system can play a pivotal role in Indian higher education system. The young aspirants for higher education unable to find their place in the traditional system of education are switching over to the ODL system. Learning is most effective when it is a student's full-time-job, but in the case of the ODL system, most of the students are working or otherwise they are engaged. This is the main reason why the quality of programs in ODL must be maintained in order to at least produce justified learning outcomes. The distance education system can only fulfill these obligations through quality assurance in its academic content and delivery of services.

Quality is simply fitness for the purpose at minimum cost to the society i.e. it means customer's satisfaction with a product or its fitness for its particular purpose. Quality Assurance (QA) is a continuing process for maintaining and improving the quality. By the concept of Total Quality Management (TQM) we mean, quality is a culture and not a destination but a journey. Quality is a culture because its journey never ends. The more common approach found in the countries is a combination of quantitative and qualitative criteria that are developed by the QA agencies normally involving some measure of consultation with stakeholders. There are so many methods or mechanism for quality assurance practice or quality control in an organization whether it is a manufacturing sector or service sector. Six Sigma is one of the methodologies which is being used by top companies to maximize their profit by reducing their costs (defects or wastes) in the process.

Since the Distance Education Institutes (DEIs) possess the features of both manufacturing sector and service sector, the use of Six Sigma methodology will help the DEIs in imparting quality education with the quality of service to all its stakeholders.

In this paper, the contributor has tried to explain the importance of quality assurance practice in higher education institutions with special reference to the distance education institutes in India and applicability of Six Sigma methodology for assuring quality in such institutions.

Keywords

Six Sigma, Quality, Total quality management, Defects

Introduction

The present society is being termed as the 'knowledge society'. Every branch of knowledge is now being shaped in such a way that, it can be applied to improve the living condition of human beings. As per the National Knowledge Commission report, the higher education system should be in tune with expansion, excellence and inclusion. From a meager 18 number of University in 1947, it has grown to the number of over 400 University/Deemed University at present. Though the expansion of Indian Higher education system has been spectacular since independence, the higher education system in India needs a massive expansion to around 1500 universities, which would enable our country to attain a gross enrolment ratio (GER) of at least 30 percent by 2020. The only way to increase the GER is Distance Education. The opportunities for higher education in terms of the number of universities are simply not adequate in relation to our needs. Large segments of our population just do not have access to higher education. The Distance Education system can play a pivotal role in Indian higher education system to include the excluded left by the conventional system of education. The phenomenal growth of open and distance learning all over the world has drastically changed the educational scenario everywhere today. The distance education can accommodate a huge number of aspirants of higher education. The young aspirants who have no access to higher education are switching over in the ODL system. Besides, the old persons, housewives, working people are taking interest in this alternative method of education i.e. the open and distance learning system. This system is very flexible in nature. Open learning is a philosophical concept whereas distance learning is the methodology by which the gap between teacher and taught, teacher and University, University and taught can be minimized. So a distance exists in the Open and Distance learning system of education. In this context, the quality is the relevant subject. Learning is most effective when it is a student's full-time-job, but in the case of the ODL system, most of the students are working or otherwise they are engaged. This is the main reason why the quality of programs in ODL must be maintained in order to at least produce justified learning outcomes. On the other hand, distance education is prone to more rigorous public scrutiny than the conventional education, because of its wider jurisdiction and the heterogeneous student profile with a wider public presence and therefore greater social accountability. It can fulfill these obligations only through quality assurance in its academic content and delivery of services.

It may be noted that the quantitative expansion is not always an indicator of qualitative improvement. The advent of LPG (Liberalization, Privatization, and Globalization) regime and particularly after our acceptance of GATS (General Agreement on Trade and Services) in 1998, the education has been identified as the major service sector. The higher education is gradually becoming borderless and the Indian Education market has been thrown open for international competition after acceptance of GATS. As such many Foreign Universities are now entering the huge Indian Education Market. Our higher educational institutions including the distance education institutes are therefore facing stiff challenges against these foreign institutes as well as private universities demanding improvement in their quality. Of let, Indian higher education institutes are signing an agreement with foreign universities to undertake joint research, joint degree, student exchange program etc. This will ensure quality in distance education system. Quality is simply fitness for the purpose at minimum cost to the society i.e. it means customers satisfaction with a product or its fitness for its particular purpose. When a product or service surpasses our expectation, we say that its quality is good. Quality assurance is a continuing process for maintaining and improving the quality. By the concept of Total Quality

Management (TQM) we mean, quality is a culture and not a destination but a journey. Quality is a culture because its journey never ends.

The quality of a distance education institute depends on its a) course curriculum, b) teaching-learning process, c) human resources, d) quality of the products like students, research and services.

Though the education is taken as the service sector, the system of distance education may be considered as quasi-industrial in nature because of its mass production and distribution of course materials as well as the logistical aspects of administering and coordinating the activities of the dispersed population of students. According to Otto Peters (1973), distance education is an industrial form of teaching and learning system. Distance education is a method of imparting knowledge, skills, and attitudes rationalized by application of division of labor, organizational principles and extensive use of technical media especially for the purpose of producing high-quality course materials.

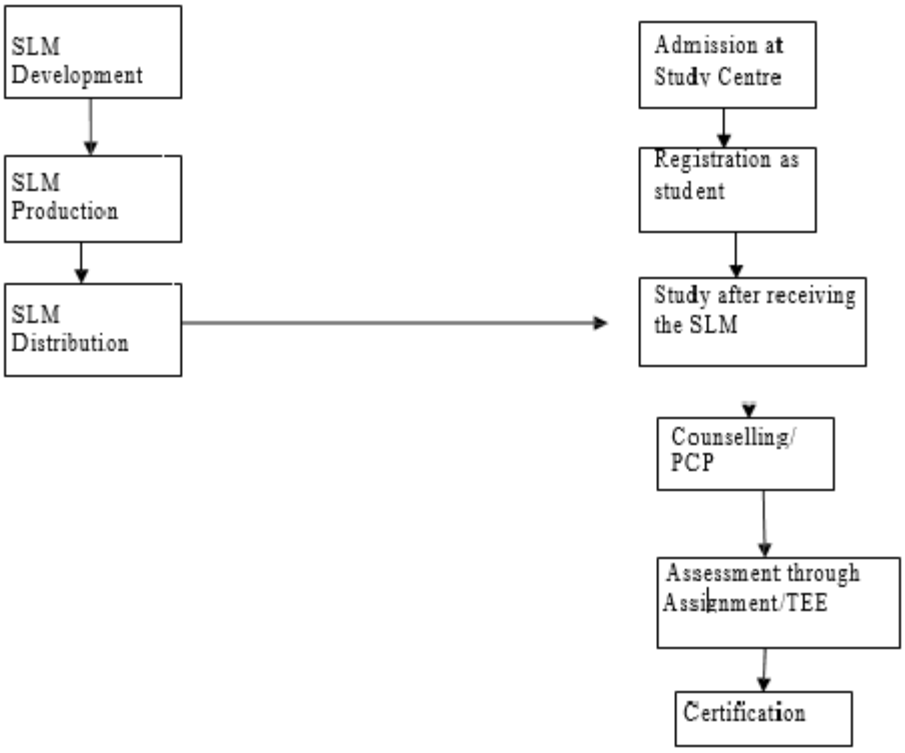
The quality in Distance Education is visible and invisible. The criteria for a quality product and quality service are distinct in their objectives because service is often invisible and cannot be stored. Since we are dealing with the ODL system, both the product and service are involved in this system of education. The product is visible, e.g. Self Learning Materials (SLM). Again the students can be taken as the product. The marketability of a product depends on quality. Therefore, maintenance of quality is a major requirement in the ODL system.

On the other hand, service means the student support service, which in turn is intangible. Student support service is necessary for distance learners. The more it is accessible to learners the greater is the degree of success of DE. The student support services are framed to meet the needs and expectations of students coming from a diverse background — educational, social, economic and occupational. The quality can be seen to meet the stakeholders' expectations. In the ODL system, the stakeholders can be the learners, counsellors, or the employers, e.g. a well-prepared course material and well-designed SLM may meet the learner's expectation whereas for an employer the emphasis may be on skills learnt which are to be used by the passed out learners (product) at the workplace.

The model identifies the principal activities involved in a distance education institute, as well as the interrelationships that exist between them. If we consider the left-hand side, we find that for the development and production of course materials the following experts are required to be engaged:

> i) Subject specialist, ii) Media experts, iii) Copy editors, iv) Language experts, v) Graphic designers, vi) Proof readers, vii) Printers, viii) Logistic expert/Storekeeper.

Management of logistics plays a key role in distance education. Timely dispatch of study materials and home assignment should be ensured because the students depend largely on course materials. Home Assignments are one of the major inputs through which distance education institutes generally communicate with the students. The tutor's comments on assignments give the students the necessary feedback. If the teachers do not give suggestions for improvement while correcting the answer script of the assignments, the students feel that the exercise of the home assignment is futile. Again in case, the responses sent by the students are not returned within a reasonable period of time, the students lose interest and consequently they stop submitting them. The face to face personal contact programme is very limited and takes place at some selected study centres at the different time. Since the Personal Contact Programmes are limited in number, the students should be



A systems model of distance education
Source: SLM (PGDDE-ES311, IGNOU), Adapted

encouraged to attend the counseling sessions. The role of a teacher cannot be ignored in this regard. It is his responsibility to retain the students in the classroom.

The last stage is the certification. The certification is the important component of any education program, to judge the quality of the product. However, a quality component in an educational institute rests on the end result, the product that an institute markets under their certification. The element of certification is more challenging for DE institutes which have their own curriculum as these have to concentrate on its certification of their beneficiaries who step out in the society with the tag of a new system which is still foreign to many.

There are two components of examination under the distance education system viz. i) continuous evaluation and ii) Term-end examination. A student has to submit a prescribed number (one or two) of assignments by a due date to the Study Centre. It is obligatory on the part of candidates to respond to the assignments before appearing in the Term-End-Examinations. The counsellors attached to the Study Centre to which the student is enrolled usually check these assignments. The Home Assignments carry a weightage of 20–30% for the final score as internal assessment. As regards the second component, the Term-End-Examinations, the Grade/Score is awarded to a student on the basis of student's performance in the examinations.

Another key factor of good distance teaching is a well-developed system of feedback. A system of feedback enables students who have problems with course materials, it also enables the distance education institutes to assess how far they have been successful in what they were trying to achieve. Feedback is necessary both for students

and the teachers who cannot otherwise see how effective their teaching has been. Feedback is the way of building dialogue between student and teacher in a distance teaching environment.

Concerning quality work in business and industry, there has been an increasing emphasis on requiring that those responsible for the processes also should take responsibility for quality control and quality development. The more common approach found in the countries is a combination of quantitative and qualitative criteria that are developed by the QA agencies normally involving some measure of consultation with relevant stakeholders. Quality refers to the final product, quality assurance refers to the process. There are so many methods or mechanism for quality assurance practice or quality control in an organization whether it is a manufacturing sector or service sector. **Six Sigma** is one of the methodologies which is being used by top companies to maximize their profit by reducing their costs (defects or wastes) in the process.

There is no doubt that at present many companies in the manufacturing sector adopt Six Sigma methodology for the quality control. Since all work is a process, all processes have variability and all processes create data that explains the variability. Therefore this methodology can also be applied in the service sector to improve the quality of services they provide.

As discussed earlier, the Distance Education Institutes (DEIs) possess the features of both the manufacturing sector and service sector. The use of Six Sigma methodology will help the DEIs in imparting quality education with the quality of service to all its stakeholders.

Generally speaking, it is a number that quantifies the shape of the distribution of a population of values, whereas the small value of sigma is synonymous with low variability and high quality.

What is Six Sigma (6σ)

With a 6σ quality control system, 99.99966% of all the parts company products will fall within the tolerances it sets forth. This equates to roughly 3.4 defective products for every million produced. Six Sigma is one idea that is adopted by a company to become world class. It is aimed at reducing the defect levels in products to a level of less than 3.4 defects per million opportunities.

Six Sigma stands for Six Standard Deviations (Sigma is the Greek letter used to represent standard deviation in statistics) from mean. 6σ methodology provides the techniques and tools to improve the capability and reduce the defects in any process. Six Sigma is a statistical concept that measures a process in terms of defects. It is a well-structured, data-driven methodology for eliminating defects, waste, or quality control problems of all kinds in manufacturing, service delivery, management, and other business activities. It indicates the defects in the output of the process and helps us to understand how far the process deviates from perfection. It assists companies in focusing on the development and delivery of product and services that are close to perfect. The core concept behind Six Sigma is that it is possible to calculate the number of flaws or defects in a given process, it is possible to thoroughly know the manner in which to remove them and attain the level of '**zero defect**' as far as practicable. This is a time-tested tool for quality and process improvement methodology.

It was first implemented by Motorola in 1985 as a means to improve the quality of their products and services. In the first nine years of its use, Motorola managed to save an expenditure over $2 billion. It is widely known (in the field of quality management) that Motorola inaugurated Six Sigma in the mid-eighties. At that time, Six

Sigma was employed to make a dramatic gain in customer satisfaction (by way of quality improvement). Almost by nature, the initiative was based on the idea of defect reduction.

Benefits of Six Sigma Quality Control

The objective of 6 Sigma is to reduce variation in the product/services such that the specification limits are at least six standard deviations away from the mean. This system offers a wide range of both short-term and long-term benefits. The short-term benefits relate to the increased efficiency and the improved quality of products and services whereas the long-term benefits relate to the substantial increase in customer satisfaction levels, which in turn helps in developing customer loyalty, vital for the long-term success of any business enterprise.

Other benefits relate to the substantial increase in employee motivation levels brought about by the drastic reduction in employee workload. All these benefits are quite important because ultimately they help the organization in achieving the desired goals and objectives.

Six Sigma Methodology

The first and foremost concern of top executive leaders of the company is the acceptance of Six Sigma methodology. This is done to ensure that the process is not just a technical method undertaken by engineers; rather it involves changing the way the entire company views the needs of their customers and the level of quality they are capable of producing. Six Sigma improves the process performance, decreases variation and maintains consistent quality of the process output. This leads to defect reduction and improvement in profits, product quality and customer satisfaction.

Six Sigma strives for perfection. It allows for only 3.4 defects per million opportunities for each product or service. It relies heavily on statistical techniques to reduce defects and measure quality. To achieve this Six Sigma uses a methodology known as DMAIC. DMAIC stands for Define opportunities, Measure performance, Analyze opportunities, Improve performance, and Control performance. Using Six Sigma's **define-measure-analyze-improve-control** method, a service providing company can implement quality:

- **Define -** Six Sigma is aimed at reducing defects. An opportunity is the lowest defect noticeable by a customer, the first step is to find out what a defect would be.
- **Measure -** The next step is to collect data to find out why, how, and how often this defect occurs. This might include a process flow map of where employees start and finish their job.
- **Analyze** - After the data is measured, the company's Six Sigma team will analyze the reason behind the defect or deficiency.
- **Improve** -Once the defect is identified, the team implements the new method/ techniques.
- **Control** - The Company teaches new employees the new technique or method so that he does not repeat the older one which causes defects. Over time, there's a significant improvement in customer satisfaction and increased business.

Calculation of Yield

Some of the important elements of Six Sigma tool:

i) **Unit:** A unit is any item that is produced or processed which is liable for the measurement or evaluation against predetermined criteria or standards.

ii) **Opportunity:** An opportunity is any area within a product or service where a defect could be produced or where you fail to achieve the target.

An opportunity is anything that you inspect, measure or test on a unit that provides a chance of allowing a defect.

iii) **Yield:** Yield is the percentage of a process that is free of defects.

iv) **DPMO:** Defects per Million Opportunities (DPMO) is the average number of defects per unit observed during an average production run divided by the number of opportunities to make a defect on the product under study to one million.

The yield is calculated by subtracting the total number of defects from the total number of opportunities, dividing by the total number of opportunities, and multiplying by 100.

Yield value = (Total number of opportunities – Total Defects)/Total number of opportunities × 100

Yield to Sigma Conversion Table

Yield (%)	Defects Per Million Opportunities (DPMO)	Sigma
99.9997	3.4	6.00
99.9970	30	5.51
99.9770	230	5.00
99.8650	1350	4.50
99.3790	6210	4.00
97.7300	22700	3.50
93.3200	66800	3.00
84.2000	158000	2.50
69.2000	308000	2.00

Applying 6σ in Distance Education Institutes

We have seen that various factors are involved in the process of satisfaction of all the stakeholders of distance education. In between entry point and exit point, there are so many factors in distance education system. We may start with the development and production of study materials and end with the certification.

There is a possibility for the commission of errors or deficiency in product and services in the distance education. We may give an example of the preparation of course material.

Suppose printing of study material is a process. One study material contains 500 pages. Each page contains 30 lines and number of words in each line is 15.

Total words in the SLM = (30 × 15) × 500 = 225,000 words,
Opportunities = 225,000 words;
Defect per page 20 words (assumed), Total defect = 20 × 500=10,000 words in the SLM.
Defects per million Opportunities (DPMO)=10,000/2,25,000×10,00,000=4,44,444
Yield value=(2,25,000–10,000)/2,25,000×100=95.55%
OR
Total words in the SLM = (30 × 15) × 500 = 2,25,000 words,
Opportunities = 2,25,000 words;
Defect per page 5 words (assumed), Total defect = 5 × 500 = 2,500 in the SLM.
Defects per million Opportunities (DPMO) =2,500/2,25,000 × 10,00,000 = 11,111
Yield value = (2,25,000 – 2,500)/2,25,000 × 100 = 98.89% = 3.75**σ** approx.
From the above example it is evident that even if there is an error of 2500 words in a 2,25,000 words of SLM, there is a scope of improvement.

Conclusion

In an educational institute especially in DEIs, the quality assurance is easier said than done. In the institutional set-up unless everybody thinks it as their responsibility to assure quality it is not

possible to assure it or maintain it. Planning, development, implementation and evaluation of a learning package must be effected in a professional manner focusing on the following areas where 6sigma tool can play an important role to measure the quality of the contents.

i) Curriculum design and course development
ii) Delivery mechanism
iii) Student Support Services
iv) Innovative Practices
v) Evaluation of every activity at regular interval

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