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Summary & Conclusion

“What we call the beginning is often the end. And to make an end is to make a beginning. The end is where we start from.”
T. S. Eliot

7.1 Intent of the study

Studies and research regarding Quality of academia and the institutions consequently has seen an exponential growth in the last three decades. Evaluation of academic quality is a blend of practices namely accreditation, evaluation and academic audits. Perceptions of quality, the causal relationships between the variables indicative of learning experiences of the student, contribution of knowledge to the society and community in general (to name a few) are contributors to quality of education and hence the academic institutions. This study was intended

I. To gain an understanding of how Six sigma strategy can be integrated into the quality analysis of the Academia.

II. To identify a set of key indicators (and their metrics) to define Quality in Academia.

III. To generate a Quality index or the Efficiency factor that can be formulated based on a mathematical model using the key indicators.

The line of direction in which the study was conducted is based on the principles of six sigma philosophy. The first objective encompasses the study methodology. A partial implementation of the Define, Measure, Analyze, Improve and Control strategy was used in this study while aligning the same to the conventional method of research! Six-sigma is not a stand-alone activity. In lieu of its reason of existence a six-sigma project requires the involvement of members from the top level management, subject matter experts, Master Black belts, Black belts, Green belts and the improvement team for a successful implementation, to begin with. This study works within the realms of restrict (as the project is more an individual’s initiation) and implements to a certain extent the guidelines of the six sigma project.
7.2 Literature review - A concise report

The reviews of literature was conducted in three courses

- Perception and published definitions of Academic Quality
- The theory and scope of Six-sigma
- The Multilevel model and its application

7.2.1 Academic quality and its definitions

Readings in the areas of Academic quality helped amass a plethora of published discussions regarding definitions of academic quality by various authors, researchers and stakeholders of the academia. The plurality of the terms used to describe Academic quality span expectations of the end users. Some of them (also synonymous to quality in general) are excellence, quality of output, certifying quality standards, relevant curricula, constant development, special, academic freedom and autonomy, effectiveness in teaching, transformative learning and value for money, to list a few. Definitions ranged from scholarly excellence to utility of learning, from acquiring skills relevant to the market requirements to adaptability of the learner, from a holistic growth to a propensity for research, to sum them up. The models used to describe quality includes the Knight and Harvey's (1996) Transformative model, Haworth's Engagement Model (1997), Bowden's Learning Model (1998), Tierney's Responsive University Model (1998).

Among the practices that have been introduced to the world of academics to measure quality, accreditation agencies take the lead as evaluators. Universities and academies of Higher education worldwide practice quality assurance and measurement as dictated by governing agencies and regulating bodies AQUA (Australia), NAAC (India), HEQC (South Africa), (UAE), CHEA (US), ENQA(Europe) to name a few are the active accreditation agencies of external mechanism of quality evaluation across the globe. Academic quality practitioners and researchers have also adjudged Self-evaluation as a simultaneous (internal) practice of quality evaluation. Self-evaluation investigates on the lines of accountability, obligation, self-preservation and effectiveness. Student surveys form an integral part of self-evaluation exercises. Students are the heart of any institution and needless to say they are the primary ambassadors of opinion in terms of learning experiences within a campus. Student satisfaction surveys provide vital (though not complete) information to the decision makers. If administered effectively such surveys are of immense value.
7.2.2 The 6-sigma strategy

As a customer-driven data oriented process, the six sigma strategy is an organized and systematic method for process improvement. It is a fact-based, data-driven philosophy of improvement that values defect prevention over defect detection. With a primary objective of cost cutting through reduction of quality failures this strategy aims to a cascading effect on customer satisfaction. Immensely successful in the manufacturing industry the last two decades also saw the inception of this strategy into the service industry as well. Limitations of intangibility, inseparability of production and consumption, heterogeneity and perish-ability govern the definition of perceptions of quality in services. Overcoming some or all of them, researchers and advocates of $6\sigma$ have successfully integrated the philosophy with accomplished results in the fields of health, job satisfaction, customer satisfaction, work improvement, banking services etc. A complete implementation of $6\sigma$ in the education sector has not been reported or published so far. Reviews by authors and researchers on the initiatives in this regard speak of the requirement of a more comprehensive framework for such an implementation in the academia. The primary reason quoted here is the confusion about the definition of a 'defect' in academics. Academia is a multifaceted service provider. A nonconformity in this regard will have two aspects to it, firstly the source of non-conformity secondly the intensity of its impact on the end user. Another angle to this is the definition of the end user! Who decides the conformity or the lack of it - Students, Employers, Facilitators, Sponsors', Peers? This study used the definitions of quality conformity and thereby the variables critical to academic quality based on the opinions and perceptions of all the groups mentioned.

7.2.3 The multilevel model

A third dimension to the literature review was to understand the application of multilevel models in management research. On account of the hierarchical structure, inherent of data in an academic setting, it was essential to use multilevel modeling (MLM) for data analysis. Multiple linear regression techniques help explain the variation of outcome variable in terms of a set of independent variables owing to causation. If the assumption of no correlation between two pairs of observations is flaunted, this method stands invalid. MLM generalizes ordinary regression modeling to distinguish multiple levels of information into the model. The readings in this direction also helped elucidate a few application oriented studies done with multilevel models. The method allows the user to determine the relative impact of each level of the hierarchy on the response and to identify the factors at each level that are associated with that level's impact! The study encompasses a complete
description of the multilevel modeling technique (in an academic set up) in Chapter 2.

7.3 The DMAIC strategy - A partial implementation

Following this are the first four phases of the DMAIC cycle to further the research. In doing so a partial and modest implementation of the 6sigma strategy was accomplished.

7.3.1 Define - Identifying the determinants of quality in the present scenario

Evaluation methods are preceded by identification of variables that are representative of the characteristic under study. In this study too, the definitions of Variables critical to Academic quality was re-searched. Meetings with members of the academia, discussions both formal and informal with individuals from a varied areas of work force including Directors, Managers, Executives, Team leaders, Business persons, Designers, Professionals (Engineers, Lawyers, Medicos, Architects) and Students to name a few were approached for their perceptions on the meaning of academic quality and for the variables in their opinion are critical quality. A survey of 398 individuals (79.6% response rate) helped amass an inventory of 60 variables, some with overlapping meanings. A fish bone diagram illustrating process map was the deliverable at this stage (Figure-13). Faculty was cited as the most important and vital variable to academic quality re-iterating the findings of researchers in this direction. Efficient faculty nurtures effective thinking and thereby valuable research and effectual learning. Pertinent infrastructure and resources combined with a environment that is conducive for learning was cited as the next most important parameter. Placement (and employment services by the university) indicating the usefulness of the study and also the primary motive for education was also among the top five parameters listed by most respondents. Value for money and a flexible fee structure, Industry interface, Research facilities and Brand value of the University were some of the opined indicators of Academic Quality by this survey.

7.3.2 Measure - Instrument development and gauging the current state of affairs

Variables from the define stage were combined owing to the meaning of the variables, filtered based on the priority as stated by the respondents. A second level survey was implemented in using a self-administered questionnaire designed for
multi-level data collection. All senior students of two obliging institutions formed the sampling frame. Student ratings were used as measures to identify operating sigma level of each process. In this context a new term 'lackademic' was framed to suit non-conformity or a low rating for a certain process. The number of lackademics for each process was counted and then used to compute the LMPO (lackademics per million opportunities). The LMPO (representative of the sigma levels) for each process ranged from 1.7 to 2.8 for Institution 1 and 1.9 to 2.87 for Institution 2.

7.3.3 Analyze & Improve - Investigating for variable effects and mapping the findings

Findings in the analysis stage were consolidated from two specific points of view

✓ What does the sigma level signify with respect to the stated priorities of the critical to quality factors?
✓ When treated as significant variables of influence, what do the parameter estimates suggest in the multilevel model generated.

A mapping of stated importance v/s sigma-level of the process helped distinguish the CTQ variables into Primary and Selling factors, Opportunity Areas, Potential Differentiators and Secondary opportunities. Figures 29, 30, 31 & 33 describe the status quo for the two institutions and that based on the pooled data, thereby allowing the decision makers to proceed with their course of actions in this regard.

Analysis using the multilevel model for each institution showed Research and Faculty as the most influential on the Quality index for both the institutions. While Industry and Infrastructure showed rather equal effects, the significance of Placement was different for the two institutions owing to the nature of this process in the two institutions.

7.4 Summary

The conclusion of this study may be summarized as follows:

1. Optimistically the six sigma strategy can be implemented in an academic set up in a rather basic sense as is done in this study, with minimal involvement of the hierarchical structure. $6\sigma$ cannot be treated as yet another stand-alone activity. It requires adherence to a whole philosophy rather than just the usage of a few tools and techniques of quality improvement. Application of six-sigma in
services is heavily subject to a deep understanding of the nature of services and the nature of how people judge quality in. It must be acknowledged that an effective six-sigma project is that which is initiated by the management as a step toward excellence. The claim that the six-sigma strategy can be integrated into the quality analysis process of the academia can be agreed upon but with the conditions that Quality excellence projects such as these required trained personnel to conduct the diagnostics, subject matter experts to investigate into and contribute to the pain areas in the processes and continuous support from the top management in terms of resources for an effective inquiry and implementation. A simple study as this is but a modest step to what can otherwise be an effective six-sigma project if conducted in an environment conducive for the same.

2. A search for metrics for the quality parameters started with the already existing definitions of quality and academic quality, followed by the validation of the currency of those definitions and then metrics that may be used to measure the variables hence filtered for the study. Since this study was based on student feedback the variables observed at the student level were measured by ratings given by the students. The key indicators of quality used in this study are Faculty, Research Opportunities, Placement facilities, Infrastructure, Industry Interface, Support services, Global Recognition, Evaluation, Library, Fee structure (Value for money). Ratings (by students) of these variables served as the observations and count of the lackademics were used to identify the sigma level of each process.

3. The multilevel model that was generated helped identify the most influential and contributing variables to the Quality Index of the institution. Faculty and Research Opportunities were significantly (and statistically) dominant in terms of the effect. Higher ratings to these variables contribute significantly to the quality index value. The other variables too contribute, though not as much as the previously defined ones. Alternatively it is important to note that, ratings are subject to change according to the experiences and perceptions of the students. Hence these variables cannot be generalized for all institutions. This study is primarily to highlight such variables for each institution that is conducting a quality analysis. Clearly the set of most-effective variables will be a customized set for an institution.

4. Mapping of the sigma levels v/s the stated priority of the decision variables helped give an insight into how should these variables be treated for the future. Categorized as Primary and Selling factors to maintain, Opportunity areas, Secondary opportunity areas and Potential Differentiators, these categorized variables lead to the recommendations for change or continuation. Knowing the pain area gives the lead to a successful six sigma project. The superior motive of
any quality analysis program is to enhance performance and consequently to improve the position in the market thereby leading to profits. If conducted in a manner that is required of a six sigma project, such a enquiry will be of immense information and use to the stakeholders and the decision makers of the academia.

This study justifies the otherwise perceived notions about quality of academia, promotes the use of strategy for six-sigma for quality assessment of processes in an academic institution and also places a modeling technique in place so as to quantify the effect of influencing variables on the quality index.

7.5 Closing comments

"Quality assessment in the higher education sector is deemed to be useful to stimulate, attain and increase systems’ and institutions’ effectiveness, efficiency, cost savings, quality and transparency towards users/clients / stakeholders interested and involved in it", Prof Vairal. (Vairal, 2007) (© Ch 14, The Authors Volume compilation © 2007 Portland Press Ltd)

Being involved in quality movements, incorporating quality assurance structures and being assessed for an academic institution means to find the possibility to attract funds, students and researchers, to gain social prestige and legitimization, and being able to compete effectively for them in the international and national higher education marketplace. With the availability of the right direction and if implemented the six sigma strategy is an effective tool. With an additional support of statistical modeling, the variables critical to quality can be quantified in terms of their effect on the quality index and thereby indicative of need for change or otherwise! Quality studies in an academic institution aims to provide vital information to its stakeholders as a proof of the institution’s progress and growth or the lack of it! An analysis of this sort is also in introspection by the institution as a check on its utility. Having said that, it is important to bear in mind that the academia should not be completely drawn into the consumerist attitude of the market. While usefulness governs all kinds of learning, a university must not deviate from its mission of disciplining the mind of its students.