Findings and Discussion

“Innovation comes from the producer
-- not from the customer”

William Edwards Deming

6.1 The rationale for using student ratings

Clearly there is no doubt on how important students are for an institution. They ARE.... and hence the university IS! Students spend a major and the most significant part of their education years in universities, molding themselves for a path that they wish to take on. Like any business unit, a university too aims to provide for its students the best of learning experiences. These experiences further transform into word of mouth (optimistically good will) before the students leave the portals of the institution. “The younger generation, on an average is ‘performance’ conscious and does like to evaluate institutions based on ‘effective educational practices,’ ‘environment & culture,’ ‘industry & job market’s assessment of an institution,’ ‘affordability,’ and faculty performance”, Dr. R N Shukul. (Educator, TV & Film professional in Direction & Cinematography) (Shukul, 2012)

Student satisfaction surveys are often lauded as providing the real lowdown on how students feel about their university experience, by measuring final year students’ satisfaction with their university experience. The feedback policy requires that student surveys must be included as one source of information (UoM, 1997). So does this mean that an academic institution should treat its students like customers and thereby they are always right? “No!”, says Stephany Schings (Communications Specialist). In her study (Schings, 2012), the author is of the opinion that Satisfaction, but not customer perceptions, predicted educational involvement—meaning those students who were most satisfied with their education showed the most involvement whereas those students who viewed themselves as customers were not necessarily more involved in their education than other students. “If students see the world as the service-dominant logic, then they would look at education as my professor is here to give me an opportunity to make an effort where I
can help myself learn," says R. Zachary Finney (Professor of Marketing at the Mitchell College of Business at the University of South Alabama). Among the recommendations given to the University of Alabama under this study the authors suggest that “universities may find it useful to inform their student ‘customers’ that they must co-produce their desired educational outcomes. Universities could emphasize students’ accountability for helping create knowledge and meeting learning expectations.”

A study on student-faculty engagement (Umbach & Wawryzynski, 2005), concludes that students tend to demonstrate higher level of engagement and learning at institutions where the institution engages students in experiences and thereby their points of view. It is apparent that student’s perception plays an important role in not just faculty’s credibility but the institutions credibility, as well. The lack of credibility, as some researchers point out, is linked to perceived learning (Russ, Simonds, & Hunt, 2002); in today's highly competitive and cut throat business, most colleges are struggling with increased competition, decreasing share of pie, and uncertain economic circumstances – given the scenario, student satisfaction assumes a greater importance. A lack of perceived learning is likely to reduce a student’s satisfaction, leading to dwindling enrollment numbers. (Livermore, Scafe, & Weichowski, 2010). So, it will be right to assign greater importance to Student Perceptions despite the credibility issue.

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Given the profit making model for any socio-economic activity, perceptions will always be important until and unless institutions decide to re-brand or re-position themselves!

(Shukul, 2012)

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Given the profit making model for any socio-economic activity, perceptions will always be important until and unless institutions decide to re-brand or re-position themselves!
6.2 Variables used in the study

Academic institutions and Accreditation agencies across the world use customized sets of parameters for evaluating and assessing academic quality. The QS stars, a system used by The QS Intelligence Unit (A division of QS Quacquarelli Symonds Ltd http://www.qs.com/) evaluate universities on a range of performance indicators that include research quality, graduate employability, careers service support, teaching quality, infrastructure such as sports facilities and medical care, student societies and accommodation, IT and libraries, international appeal, innovation and knowledge transfer, and community involvement. Dr. Oehler (Oehler, 2007) suggests inclusion of Student academic progress, Faculty & Staff development, Scholarship & Research Productivity, Student Satisfaction & Involvement, Alumni and Parent satisfaction, Internal offices process accuracy, timeliness and friendliness, fund balances, endowment and expenditures as some of the parameters for quality improvement analysis in academic institutions. A report by the OECD (Chalmers, 2008) reiterates the findings of Burke and Minassians (Burke, 2001) that Higher education institutions have progressively implemented more systematic, formalized quality assurance processes, recognizing this as a way to achieve greater efficiency and accountability within their organization. The search for key indicators of quality in this study concurred with that used by accreditation
agencies and evaluators of quality in academic institutions.

A survey of this sort helped validate the current perceptions of the stakeholders and helped map the same with those being used by the accreditation agencies in general.

6.3 Findings of the study

Findings of this study are consolidated from two specific points of view:

a. What does the sigma level signify with respect to the stated priorities of the critical to quality factors?

b. When treated as significant variables of influence, what do the parameter estimates suggest in the multilevel model generated?

6.3.1 The Decision Matrix

The σ-levels of each factor that was suggested critical to quality was then compared to the priority index given to the same. A mapping of the same is done using the stated priority v/s operating sigma level matrix.

![Figure 6.1: Perceived v/s Sigma Level Matrix (Lieberman)](image)

- **Primary and Selling factors**: These are vital to the institution as they are most expected by the stakeholders! That these variables/processes are operating at a relatively high sigma level reinforces the voice of the
'customer'. These variables will contribute to the USP of the institution. It in a way also indicates that the institution/university is moving in the right direction in terms of its focus to deliver what is expected of it! The institution should ensure that these variables continue to operate at the required level of quality thereby remaining in the same quadrant, to hence maintain the required standard of Academic Quality.

- **Opportunity areas**: The Thesaurus defines *opportunity* as an exploitable set of circumstances with uncertain outcomes, requiring commitment of resources and involving exposure to risk. In this context of study, Opportunity areas for an academic institution is defined as those processes which are operating at a comparatively high level of sigma but have been stated low on priority by the stakeholders. Variables in this quadrant should be developed for the institution to gain a competitive edge in the market. If enhanced upon, these processes/variables can be turned into value-adds so as to leverage the existing level of quality of the institution.

- **Potential differentiators**: A reason why another institution may gain an advantage is indicated by these variables that play differentiators! Variables/processes in this area of the decision matrix are high on priority but low on performance. Evidently, this is the pain area that will require the focus of the decision makers within the institution. In an industry such as the Academia, stakeholders are microscopic in their decision making processes. These variables if not adhered to may be the cause of refutation. A call to drive these variables into Quadrant 1 must be taken, delaying which; the same variables will prove detrimental to the institution’s position in the market!

- **Secondary Opportunities**: Though not rated high or extremely important by the stakeholders, the variables in this quadrant are an inherent part of the academic setup. These processes/variables will contribute to the next set of opportunities that the institution can cash in on. That these variables are not being operated at a significantly higher sigma level can be attributed to the fact that they don’t appear to be the first choice for academic quality, though that is not justifiable. Considering the dynamism at which the market is driven, it won’t be long before, these variables move into higher levels of importance!

*Arbitrarily, a sigma level less than 2 (more than 30% lack academics) is considered low in performance, while a 30% or more (response in favor of the variable) is considered high on priority. This cut off however is subject to the choice of the decision makers within the institution studied upon.*
**Figure 6.2: Priority v/s Sigma Level - Pooled Data**

**Figure 6.3: Priority v/s Sigma Levels - MUDC**
For MUDC, its Faculty, Infrastructure (both departmental and overall), perceived global recognition and the value for money are the strong-holds! Prioritized high for academic quality, the institution has established with a relatively high sigma level on the quality aspect of these processes. The institutions opportunity to augment its quality comes in the form of Library, Evaluation and Support services. Though not as important as those mentioned formerly, these are variables that can be projected for the cause. A reason why research opportunities may have recorded higher number of lackademics is due to the fact that the respondents of this study are students pursuing their undergraduate studies with a relatively lower affinity towards research (Eagan, Sharkness, Hurtado, Mosquedo, & Chang, 2010) and thereby being ignorant or disregarding any effort in this regard, if there has been any. (WVcure)

Two critical areas that need attention at MUDC are Industry Interface and Placement.

Discussion in this regard brought out the following for a rather low rating for placement. Owing to the effects due to the economic recession the Gulf market has been particularly restrictive in terms of placement. The overall placement% has
been just about 20% for the academic year 2011-2012. Alternatively workshops, guest-lectures and industry interface activities have recorded instances between 4 and 17 among departments. A conclusion about the quality of these interface activities cannot be taken directly as what is being reflected here are the student-ratings for the same, indicative of their perception of the variable. What probably can be commented about is the appeal effect of such activities among the students. For example, a lecture by a guest of extremely high intellect may have reflected well in terms of industry connections for the institution, but may not have served a similar purpose from the student’s comprehension point of view. Poorly planned guest talks may result in students not benefitting from the real function of such activities. (Butler & Wielligh Von, 2012)

Five of the eleven prioritized variables fall in the Primary- quadrant for BVBVC. Student responses suggest that Faculty, Infrastructure (both institutional and departmental), value for money, global recognition and placement are selling points for the institution. Stated high in priority and operating at (an arbitrarily) high sigma level, these variables are the central and essential for the institutions quality. As suggested earlier, variables in this quadrant must be maintained for effective quality. The opportunity areas for BVBVC are in its Support systems, Library and Evaluation methods. Though they have not been stated high in priority the fact that they do not record high lackacademics is indicative of the fact that these variables will prove stepping stones towards excellence for the institution. Research opportunities fall exactly at the cut off mark suggesting that this variable can be easily converted into an opportunity with a little more attention in this regard.

Industry interface needs to be given attention at BVBVC as this is a highly prioritized variable and is not operating at a required sigma level.

Students’ perception regarding their interests and comprehension must be completely borne in mind while organizing these activities. Industry interface is not merely a guest lecture or a visit to industry site (aka study tour) but rather activities that will provide an effective real life experience for students in the concerned subject (Butler & Wielligh Von, 2012). Attention in this regard is crucial for the institution.
6.4 The empirical multilevel model

Models that were generated using absolute values showed the effect of cluster variables (Equations 32, 36 & 38). A random intercept model best fit the data for both absolute and weighted values. In these models two predictor variables Faculty and Research turned out to be the two most influential variables affecting the Quality index when considered as equivalent in importance (un-weighted) with regard to other variables. Alternatively with weighted responses (equations 35, 37 & 39), the variables operating at department levels did not show any significant/large effect on the response variable. The discussion that follows is based on the generic model developed using the pooled data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Std. Err.</th>
<th>df</th>
<th>t</th>
<th>Sig</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>5.41490</td>
<td>1.0111431</td>
<td>9.377</td>
<td>2.909</td>
<td>.015</td>
<td>1.342141 - 9.487897</td>
</tr>
<tr>
<td>X1_Dpt_Research</td>
<td>.661920</td>
<td>.106735</td>
<td>871.148</td>
<td>6.199</td>
<td>.000</td>
<td>.452322 - .871538</td>
</tr>
<tr>
<td>X2_Dpt_Placement</td>
<td>4.06337</td>
<td>.104247</td>
<td>666.099</td>
<td>3.089</td>
<td>.000</td>
<td>.200661 - .610913</td>
</tr>
<tr>
<td>X3_Dpt_Industry</td>
<td>4.95341</td>
<td>.105074</td>
<td>889.899</td>
<td>4.714</td>
<td>.000</td>
<td>.298120 - .701533</td>
</tr>
<tr>
<td>X4_Dpt_Faculty</td>
<td>.955107</td>
<td>.110388</td>
<td>904.169</td>
<td>8.615</td>
<td>.000</td>
<td>.737516 - 1.172698</td>
</tr>
<tr>
<td>X5_Dpt_Infrastructure</td>
<td>5.52360</td>
<td>.104957</td>
<td>894.562</td>
<td>5.072</td>
<td>.000</td>
<td>.320314 - .738233</td>
</tr>
<tr>
<td>X6_Overallpass</td>
<td>.067973</td>
<td>.207361</td>
<td>8.466</td>
<td>3.270</td>
<td>.011</td>
<td>.020490 - .115448</td>
</tr>
</tbody>
</table>

* a. Dependent Variable: Total_uriv_score.

6.4.1 Faculty: With a priority of 72 % (Table 3, Chapter 4) of the respondents suggesting that this is the most essential factor, the model restates the importance of Faculty in enumerating the quality index of an institution. The parameter estimate for Faculty rating was estimated at 0.955(0.11); the 95% confidence interval being (0.737, 1.17) indicating a significant improvement of near unit value in the response variable for a unit change in the faculty rating. Clearly the significance of high rating for Faculty for a high rating of Institutional quality is reiterated. The reasons for this are exhaustive. In his article on the importance of faculty role in university governance, Roger Benjamin states that faculty involvement is imperative to produce results of quality. The author goes on to state why this factor is critical adding the following points in the functionality of the faculty

- Deciding what curriculum is taught
- Choosing the pedagogy used
- Determining what departments and fields within them exist and their size and emphasis
- Deciding individually what research is stressed
- Defining and implementing the criteria and evaluation for determining the quality of faculty
- Defining functionally the standards of admissions and graduation for students” (Benjamin, 2004)

A study on the engagement and role of faculty in student learning showed that students are deeply affected by the behavior and attitudes of faculty signifying faculty members may play the single-most important role in student learning. (Wawrzynski & Umbach, 2005). This thereby directly influences the perception of academic quality by the students. Among the important aspects that contribute to student retention in an academic program, quality of faculty-student relationships and faculty concern for teaching is crucial (Baird, 1990) (Benjamin, 2004). Good teacher lead to good teaching methods. Teachers and professors can empower both academic and personal development of the student community (Theophilides, Terenzini, & Lorang, 1984). With the onus of playing the role of an advisor, instructor, curriculum planner researcher and mentor (Brown & Krager, 1985), Faculty becomes the nucleus of any academic set with respect to student interaction. Student perception about faculty then gets transformed into that of the university/institution to a large extent.

6.4.2 Research: The multilevel model generated for both the institutions showed rating on research as the next most important aspect for University quality index. The parameter estimate for this factor in the model is 0.662 (0.11) with a 95% CI of (0.452, 0.872) Research in this context refers to the opportunities for students to pursue research within the department. A reason why this variable superseded the other influencing variable in its effect is possibly due to one, there is noticeable difference in ratings owing to the provision of research opportunities and two other variables are significantly less influential as they may be of near equal effect on the quality rating of the respective institutions.

Cited by 26% of the survey individuals as among the top five parameters that represent quality of an academic institution, this Research (as a facility both tangible and intangible) is instrumental for enhancing the scientific productivity in learning! Gerhard Gasper former president of Stanford University states the university as an institution where the intensity of research is part and parcel of the traditional university functions of teaching and learning (Gasper, 1998). In an environment that is motivated through research for learning the focus will clearly be on the curricula-design leading the students to take a pivotal role in creating the link between research and learning (Leuddeke, 2008). Faculty connects students to
research. Evidently all of the laboratories, reading materials and equipments cannot compensate for the guidance that a research-oriented faculty can deliver. Effective research facilities in an institution has a threefold advantage, students benefit in terms of their learning from research-oriented faculty, the faculty integrate their areas of interest to their professional responsibilities of learning and the university gathers advantage with the holistic academic development (Prince, Felder, & Brent, 2007), hence the perception of quality.

6.4.3 Placement: The multilevel model a parameter estimate of 0.405 (0.104) based on absolute values in a 95% CI of (0.2, 0.61). 55% of the respondents who participated in the survey in a search for variables critical to Academic quality have quoted Placement (and Internships) as vital. An imperative matter of inquiry when admissions are sought into universities is about the placement opportunities that are provided by the institution. As described in para 4.4.3 of Chapter 4 of this report, a placement cell is a integral part of every academic institution. The fundamental purpose of university education is to enhance the skill sets of its students (Treuer, Sturre, Keele, & McLeod, 2011). Based on the reviews done for their studies Treuer et.al have described various dimensions to work-integrated learning viz-a-viz internships, work-placements, fieldwork, industry-based learning, sandwich years, job shadowing, apprenticeship, cooperative education, practicum, or clinical placements. The functional unit called the placement cell invites various organizations for campus recruitments; improve work-readiness of students to suit various needs of the industry and keep the institution abreast of the (dynamic) changes (in terms of job opportunities) in the industry. To put is plainly, the cell provides all possible assistance to its graduates to find employment; Employment (self or otherwise) leads to self-reliance and education enhances the chances of being better employed, the impact of the same growing beyond cents and dollars. (Smith, 2011). When students are open to the elements of work culture and practices through interactions with the industry, the quality of learning is elevated.

6.4.4 Departmental Infrastructure: The tagline of Manipal University Dubai Campus says “Take a walk through our campus”! Quoted second to Faculty in the list of top five factors significant of Academic quality, 62% of the respondents quoted Infrastructure as most important! Departmental requirements in terms of infrastructure are varied. Laboratories for experiment-oriented studies, Workshop facilities for mechanical studies, Audio and TV studios for Media studies, Design studios, and Information Technology labs are synonymous to this variable. The parameter estimate based on the absolute ratings for this parameter is 0.532(0.104); 95% CI (0.33, 074). Infrastructure is the primary and the foremost tangible aspect of an academic institution. The early (and positive) impressions about the Quality of an academic institution are generated by well facilitated
infrastructure and its accessibility. Competitiveness’ is reinforced by excellent infrastructure (WEF, 2012). Good infrastructure provides the ambience and the environment that motivates students adding the much required edge to quality learning!

6.4.5 Industry Interface: “The intersecting needs of both academia and the industry has led to a strengthening of academia-industry partnerships”, (Rizvi & Aggarwal, 2005). Guest Lectures, Executive education, training by corporate, Industry inputs in curriculum design, on-site visits and thereby leading to internships and placements. Industry Interface is an integral component of the academia today and the same was opined by 41% of the respondents during the search for CTQ’s. The parameter estimate for this variable is 0.495 (0.11) in a 95% CI of (0.29 – 0.701).

Revisiting the parameter estimates, it can be noted that two variables appear crucial and significantly stronger in determining the value of the response variable both in the case of absolute values and weighted values models, viz-a-viz, Faculty and Research! Higher ratings for these variables will contribute significantly towards the improvement of the Quality index value. This however must not be misconstrued as a reason to sideline other variables. Each of the variables included in the model is due to their priority toward academic quality. Even though the parameter estimates may be really low (ex: Placement % for BVBVC- Equation 38), the null hypothesis for a zero value of the estimate stands rejected. Besides, from the business relevance point of view, these variables with low parametric estimates will need to be considered as they are decisive factors to the quality of an institution. Comparing the same to their respective sigma levels may have the following implications.

<table>
<thead>
<tr>
<th>Nature of variable</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>High effect on the quality index and operating at a high sigma level</td>
<td>These variables are the ones that are probably best identified in terms of their importance. They have to be maintained as crucial to quality: The rule here would be &quot;Retain the operational standards&quot;</td>
</tr>
<tr>
<td>High effect on the quality index and operating at a low sigma level.</td>
<td>The variables in this quadrant mean a 'red alert'. Highly significant in their effect on the quality index, these variables may contribute to a low index if the ratings are low as indicated by the low sigma level of operations. &quot;Need instant attention&quot;</td>
</tr>
<tr>
<td>Low effect on</td>
<td>This is a safe zone for variables of low impact, as they</td>
</tr>
</tbody>
</table>

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| quality index and operating at a high sigma level | are operating at a high sigma level which is probably indicative of the fact that even in the event of a raised impact, these variables do not stand to cause any damage. "Value adds"

| Low effect on quality index and operating at a low sigma level | Alternative to that of priority, if a variable that shows low impact on the quality index then a low sigma level for such a variable should ideally not be of a cause of panic. In a certain sense these variables can be placed secondary to the ones playing more effective roles. "Improve them for value adds"

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### 6.5 Mapping observed process characteristics for a holistic view.

Figures 29, 30 & 31 clearly place the CTQ's in place for furthering actions on the variables. The multilevel models evidently show the statistical impact of each variable on the response variable. Since the explanatory variables are all measured in the same units of measurement, the parameter estimates themselves will be an indicator of their effect on the response variable (the quality index). Alternatively if different units of measurements are used to measure the predictor variables then, if a choice for the most crucial variable is to be made then a better pick can be made based on the standardized coefficients of the model. Basically standardized coefficients are beta weights or slopes derived by translating the raw data in z-scores and then computing the slope of the line. Independence of scale of unit's makes comparisons by this standard is a merit. This study has measured all the student level variables with the same units of measurement, viz-a-viz student ratings hence the parameter estimates may be directly used for furthering the diagnosis in this direction.

Comparing the coefficients, to the priority of the variable as stated by the stakeholders and the operating sigma level of the process (variable) a three dimensional holistic view can be generated as follows:
FIGURE 6.5: CATEGORIZING VARIABLES ACCORDING TO PRIORITY, EFFECT AND OPERATING SIGMA LEVEL

An arbitrary choice of a cutoff value is used in this study.

- If more than 30% of the respondents have prioritized the variable then it is rated High on Priority.
- An operating sigma level of greater than 2 is considered High
A parameter estimate of more than 0.5 is considered to be of High effect on Quality Index.

The following table shows all High indicators in red.

### Table 6.2: Table Showing Priority, Sigma Level and MLM Parameter Estimates

<table>
<thead>
<tr>
<th>Processes</th>
<th>Priority</th>
<th>Pooled</th>
<th>MUDC</th>
<th>BVBVC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Sigma level</td>
<td>MLM parameter</td>
<td>Sigma level</td>
</tr>
<tr>
<td>Faculty</td>
<td>72</td>
<td>2.8</td>
<td>0.96</td>
<td>3.03</td>
</tr>
<tr>
<td>Research opportunities</td>
<td>26</td>
<td>1.87</td>
<td>0.66</td>
<td>1.79</td>
</tr>
<tr>
<td>Industry Interface</td>
<td>39</td>
<td>1.9</td>
<td>0.495</td>
<td>1.85</td>
</tr>
<tr>
<td>Placement</td>
<td>55</td>
<td>1.93</td>
<td>0.41</td>
<td>1.7</td>
</tr>
<tr>
<td>Departmental Infrastructure</td>
<td>62</td>
<td>2.44</td>
<td>0.53</td>
<td>2.61</td>
</tr>
</tbody>
</table>

**Figure 6.6: Venn Diagram Showing Diagnostics Based on Pooled and Institutional Data**
6.6 A critical note on inputs, processes and outputs of the academia

Unlike the manufacturing firm, inputs to a service setup are not all concrete and/or tangible. Specifically in an academic setup, as is the case with the service industry, the nature of inputs is not specific. Barring a certain base line that defines the eligibility of a student to enroll for a certain course, the input process does not guarantee uniformity across the entire group/lot! This specification holds good for the other inputs into the academic services such as that of Faculty competency, Administrative services, General Facilities, Reading and Learning materials, etc.

Secondly, the processes that operate in an academic set-up are specific to a set of guidelines but that can not assure a lackademic-free end product. The heterogeneous dimension of academic services makes its appeal different at different instances. For example, two students taught by the same teacher and two teachers teaching the same concept will result in four different conceptions of the service rendered. Clearly, by nature, services are not unique, unlike manufactured goods that are standardized and robustly specified. As mentioned earlier (in 2.2.3), the difficulty of separation of production from consumption is another aspect that governs processes in the academia.

The third aspect is the output. Debatable and subject to perceptions, judgments and satisfaction of the end-beneficiary, services in academics can have different connotations once delivered. As an example, a lecture when delivered, may have varying appeal across the classroom; at a secondary level, a course administered may be utilized differently by different students at the next level thereby suggestive of varying degree of utility; graduates of the same course may be employed and perceived differently by their employers. Then again, the validity of satisfaction and perishability of the usefulness of a rendered service is subject to time. Unlike a manufactured product, which is expected to last longer, the utility of a service rendered is volatile. For instance a degree earned say five years back may not hold as good currently owing to the market changes. A student who was satisfied with the degree then, ceases to be so any longer!
In summary, conformity (positive and satisfied) in an academic scenario is a blend of Student aptitude, Faculty competence, Curriculum comparability, Utility of facilites, *Carpe diem* outlook, Usefulness of learning, Employability in the current markets, Continuous progression and Perceived achievement to name a few!

### 6.7 Limitations of the study

This study is a very modest step toward what I perceive as blend of six sigma and statistical modeling to examine and showcase the root causes for lack of quality in an academic institution. The first among the inherent limitations is the longevity of the variables identified as critical to quality. The CTQ factors identified in this study are subject to the time frame within which the study has been conducted. As they appear, the variables considered are fundamental, however the entry of more variables cannot be ruled out owing to the changing dynamics of the Academia as a service provider and the industry requirements.
Although a search for CTQ’s were made from a holistic point of view, a second limitation I see is that that the Quality index was conducted based on opinions from a single sector viz-a-viz students, meaning a single point of view. Contributions to the model could be made from internal sources (Faculty, Administrative staff, and other internal service providers) and external sources (employers, alumni, industry etc). This could have leveraged the validity of the index.

A third limitation is in the limited definition of the predictor variables. Defining the variable in a rather broad sense has undermined the importance of factors that may be crucial for the variable itself. For example, Faculty was treated as a single variable and respondents were asked to rate the faculty on a scale of 1 to 5. However this one word is cannot be taken as indicative of all factors related to Faculty! For instance, teaching methods / pedagogy could be treated as a separate process, while the interaction between faculty and teaching methods could be studied upon. Similarly Library in itself has a broad connotation. For students at the Dubai campus, internet access to the e-library and online browsing facility were important criteria, while students at the Hyderabad campus were keen on book-borrowing and copier facilities. Not studying such variables that are inherent and vital within a process has overshadowed the accuracy of the findings. Clearly each variable may be further divided into sub-variables so as to have an improved measure of the same.

Fourth, the model is purely based on the responses by the students of the academic year during which the study was conducted and cannot be generalized as that of batches that have studied before or are yet to come.

A fifth limitation is with respect to the administration of the survey instrument to students. If not administered properly, responses may be perpetuated by the ‘customer-is-king’ feeling thereby sabotaging the whole motive of having used them as units of observation. Actions following such responses, (thereby findings) will result in a group of students who may not want to work hard and a drop in the value of education. Needless to say there will be loss of credibility to the whole exercise!

A sixth limitation or rather a drawback is the limited use of multilevel modelling in the study. Multilevel modelling is the apt choice for the method of modelling. However this study does not delve (enough) into the nuances of the method such as the estimation methods have not been completely envisaged, interaction effects between variables have not been examined, the estimates for level-1 and level-2 residual variances have not been construed upon. Alternatively in the
absence of a significant intra-class correlation a naïve regression model would suffice.

☐ The seventh and a major limitation that encompasses the whole study is that of the partial implementation of the Six-Sigma strategy! With the lack of a controlled 6σ hierarchical structure of work process and the personnel thereof, this study does not adhere to this being considered a total 6σ project in a certain sense.

☐ Owing to the apprehensions and resistance on the part of invited institutions to participate in a quality assessment project such as this, the study could not be furthered but on the basis of the two obliging institutions.

6.8 Scope of the study and future research
Academic institutions are under continuous review for what they tender in terms of quality. University learning comprises of gaining a range of expertise across breadths of facilities made available in the same. Global competition and the ever dynamic market have increased the importance of higher education and synonymously the quality of the same. One of the aims of this study was to create an inventory, through a primary research, the variables critical to academic quality and to map the same based on their priority effect to their operating sigma levels. Responses based on survey in an initial survey conducted brought out some of the prominent variables most important to the quality of an academic institution. This list should be of optimum use to researchers who would want to pursue their investigations based on perceived priority of variables specific to Academic Quality. Faculties, Infrastructure, Placements, Fee structure, Industry Interface were observed to be some of the most importantly sought parameters. Dialogues with several individuals also pointed out to the Faculty being the most sought variable. Discussion with respondents also revealed the fact that fee structure and placements become important in the present day scenario of the post-recession market. Although variables such as college discipline and evaluation methods have taken a back seat, it was observed through talks that these were not completely negligible. The scope of these variables as parameters to quality may be vital, essential or desirable. A study on the changing dynamisms of the market and the relevance of a variable in the current times will be another area of study that can be pursued. This study has used variables that are more generic in nature and are likely to be retained in the first quadrant of priority at all times. Empirical evidence of prioritized variables and student ratings makes the modeling technique used more robust in terms of utility. It is imperative for institutions to conduct reality checks.
frequently to so they don’t miss a (inherent) lowered run of the index. Coherently such process inspection activities will also be a reassurance to the institution about its own assert on quality.

This study is an empirically justified study on the perceived notions of Academic quality with a mapping on the status quo of operating processes within institutions based on data driven results.

The strategy proposed in this study, as stated earlier is a modest step towards what can be furthered on a large scale. As is evident, this study was conducted single handedly at the interest of the researcher herself. If initiated by the top management, six sigma projects in academic institutions can deliver commendable results in terms of raising the bars of excellence and thereby giving the institution the much needed drive towards distinction. This study can be furthered in the following ways (though the suggestions made are not exhaustive).

- To decide the decision variables and processes, the feedback from alumni and stakeholders at the industry can form a continuous data base. The rationale being that currency and relevancy of an existing practice/process at the institutions are best tested by them.

- Owing to the governing limitations, a two level multilevel model was used in this study. This can be extended to higher 3-level (or more) models based on following suggestions also increasing the utility of multilevel modelling as against the limited use in this study.
  - Universities - Affiliated Institutions- Departments- Students
  - Geographical locations - Institutions - Departments- Students
  - States- Universities - Affiliated colleges- Departments-Students etc.

- The variables (processes in the generic sense) observed in this study are limited to just 11. There are two ways of advancing the study from here; either these processes may be further subdivided into sub-processes that are inherent within them (as mentioned in the limitation) delving deeper into the causes and/or more processes be included in the study making it more extensive and exhaustive

- A full-fledged six-sigma project cannot be ruled as the far end objective if not the next!