Quality framework in education through application of interpretive structural modeling

An administrative staff perspective in the Indian context

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Abstract

Purpose – The Indian higher educational system is one of the largest in the world. Besides, the growth of students and universities, the range of disciplines and universities in professional and vocational education has greatly increased. With the sudden immense growth of the educational institutes all over the country, educational institutions must improve the quality of their services to compete and achieve a leading position. Orientation towards quality and competitiveness in higher education in India has thus started gaining the attention of the policy makers, educational planners, and administrators as also the various stakeholders of the educational system. With the internal and external stakeholders becoming more demanding in a gradually liberalizing Indian economy, the issues related to quality need to be addressed from varying perspectives on the very conceptualization, implementation, and assessment. Starting with a theoretical background, the purpose of this paper is to present the results of an empirical study conducted on the administrative staff, so as to obtain the internal customer's perspective on quality.

Design/methodology/approach – Based on the literature review followed by a pilot study and an earlier study based on the quality function deployment technique, certain elements critical to quality management in education are identified. Thereafter, the interpretive structural modeling (ISM) technique is applied.

Findings – The ISM technique helps prioritize the strategic issues in quality assessment qualitatively, so as to propose a hierarchical structure through prioritizing, sequencing, and categorizing of ideas. The elements are classified as drivers, enablers and dependents, and the hierarchically structured.

Practical implications – The adoption of such a framework in educational institutions would lead to the creation of an environment where the administrative staff would be satisfied and in turn, be able to deliver quality service to the other customers and stakeholders.

Originality/value – An implementation of the integrated framework of such critical components can help policy makers, educational planners, and administrators as also the various stakeholders of the educational system contribute towards growth, success and survival in the rapidly changing environment.

Keywords Quality management, Higher education, Educational administration, India

Paper type Research paper

I. Introduction

The Indian higher educational system has witnessed a phenomenal expansion both in terms of growth and diversity. While it is one of the largest in the world, it also offers

amongst it gamut a wide range of disciplines ranging from basic to applied knowledge in fields of both professional and vocational education. A recent trend that has developed is that education is becoming much more of a "product" with varying customers and stakeholders. With a steep rise in the number of educational institutions, primarily in the fields of engineering and management, there are a lot of alternatives as far as this "product" is concerned. The educational institutions face tremendous competition and are under immense pressure to become more responsive to customer needs and gain an upper edge.

What the varying customers and stakeholders demand today, is value for money. There are demands for improvement in academic activity, transparency in policies and procedures, focus on matters of funds and finance and an increased emphasis on efficient and effective management. With the government being the highest body that is accountable to its people and the society at large, there are increasing strains and pressures from the social and political system. Accreditation by regulatory agencies to monitor the standards of education set up by the government and the ratings and rankings by the media are popularly used measures that are indicative of the standard of the quality of such a "product," called education. Attempts by educational institutions to become more efficient, effective and customer-centric are underway. The educational system must improve the quality of their services, achieve competitive advantage and move on a path of academic excellence. A customer centric philosophy of management needs to be all encompassing throughout the organization with the ultimate objective being customer satisfaction.

Quality is budding as a theme that is fast spreading within the educational system in India. The operating forces and dynamics are creating new challenges, making the very conceptualization, assessment and measurement of quality management in education a priority issue for research and analysis. Higher education has varying stakeholders, with often complementary and contradictory expectations. This dictates the need for a very vital and judicious analysis on the subject of quality against a backdrop of the varying customer and stakeholder expectations, the accompanying problems, limitations, and conflicts. The identification of strategic components to assess quality, and their prioritization and modeling, thus becomes necessary.

The administrative staff is an important component in the input-process-output chain in the educational system and thus, their interests cannot be ignored. A satisfied internal customer would act as an efficient service provider. With the assumption that the satisfaction of the external customer would have to be preceded by the satisfaction of the internal customer, the paper presents the results of an empirical study conducted on the administrative staff, so as to obtain the internal customer's perspective on quality, through the application of interpretive structural modeling (ISM). Based on the literature review and an earlier study based on the quality function deployment (QFD) technique, certain elements, indicators and strategic issues in quality assessment were identified. The ISM was applied to prioritize these elements qualitatively, and thereby propose a hierarchical structure based on sequencing, and categorization.

II. Theoretical background
Quality management in education has been well researched and documented (Sallis, 1993; Harvey and Knight, 1996; Cheng and Tam, 1997; Owlia and Aspinwal, 1996a, b; Kanji *et al.*, 1999). As with any service, there is not much of a consensus as to what

constitutes quality in education, with the matter being debatable (Harvey and Green, 1993; Reeves and Bednar, 1994; Harvey, 1995; Harvey and Knight, 1996; Cheng and Tam, 1997). Most definitions of quality in education are customer focused, i.e. meeting or exceeding customer's expectations of education (Parasuraman *et al.*, 1985), with an emphasis on identification of relevant bases and measurement criteria to use in evaluating quality. A widely accepted view on quality is the degree to which stakeholders' needs and expectations are consistently satisfied. However, with the educational system having various customers and stakeholders, formulating a single, comprehensive definition that can integrate the interests of all the customers and stakeholders becomes challenging. With numerous customers and stakeholders, both internal and external to the system, with their own demands and expectations, the identification of design characteristics that would impact the processes part, integrate the interests of the various stakeholders and lead to customer satisfaction becomes precarious and complicated. There is difficulty of understanding and managing the dynamics of what would constitute a success model.

Studies on quality in education have examined institutional inputs, outputs and processes. An educational system is a constituent of subsystems and processes, comprising the inputs, processes and outputs that must work together to produce a synergistic effect. With the basic contention that an educational institution education should aim to satisfy the needs of various stakeholders, Sahney (2002) have tried to study the various stakeholders and arrive at an integrated model; in fact, they define quality in education as multi-faceted that includes within its realm the quality of inputs in the form of students, faculty, support staff, and infrastructure; the quality of processes in the form of the learning and teaching activity; and the quality of outputs in the form of the students that move out of the system.

Amongst the literature that exists, mention may be made of the process and satisfaction models proposed by Cheng and Tam (1997). The process model, studies quality in education as an internal process of a transformation that enables the administrative staff to perform the administrative tasks, the teachers to perform the teaching task and students to gain knowledge. The satisfaction model defines quality in education as satisfaction of the various customers and stakeholders. Against a backdrop of the systems view, with a focus on the process model and the satisfaction model, there is need to identify strategic components and design elements that can integrate the interests of the various stakeholders and lead to customer satisfaction.

Researchers all over the world, have primarily focused on the external customer, be it the student or the industry. Sahney (2002), have tried to arrive at a synthesized and integrated model of quality management in education by following a double pronged strategy:

(1) Study the various customer groups to examine simultaneously the perspectives of each group so as to be sensitive to the expectations of different groups of people involved.

(2) Apply multiple tools, techniques and methodologies, both qualitative and quantitative.

This paper restricts itself to the administrative staff to obtain an internal customers' perspective about the role of a quality system in higher education.

With both the process and satisfaction models as bases, an attempt has been made through this study to focus on the processes part to propose a quality framework. The customer orientation, calls for the need to identify the relevant bases and criteria in evaluating quality. Such a framework would affect the transformation system in the input-processes-output chain and lead to a better "product," in our context, education service and delivery.

III. Empirical study
Objectives of the study
Employee satisfaction is a major driver towards adoption of a customer orientation by any organization and the educational system is no exception. A satisfied internal customer would act as an efficient service provider to the external customer. Understanding and managing the dynamics of quality would include knowing what the customer wants, and, designing a system accordingly. The quality components are synonymous to and have been referred to as "design characteristics." The design characteristics refer to the design elements that make up a system and act upon or are acted upon by the transformation system in the input-processes-output chain. If an educational institution adopts and implements these components/elements and designs its system with these "design characteristics" as bases, the requirements of the customer groups, could be met and satisfaction gained from the educational system.

This study has been conducted with the objectives of:

- identifying the design characteristics of a system that would meet the requirements of the administrative staff as an internal customer of the educational system; and

- sequencing, categorizing and prioritizing these design characteristics and then structuring these into a comprehensive systemic model which when adopted would lead to quality from an internal customers' perspective.

Methodology of the study
(a) Scope of the study. The study was confined to the City of Delhi, India. On the basis of non-probabilistic and convenience sampling engineering and management institutions imparting graduate and post-graduate degrees/diplomas were chosen. Within such institutions, the respondents were selected by stratified random sampling.

(b) Variable conceptualization. Various theoretical and empirical studies of quality in education were reviewed and measures and indicators of educational performance were identified under two broad heads, namely, customer requirements and design characteristics. The pilot study was conducted to examine the validity and reliability of the scale facilitated the identification of quantitative and statistically proven items and attributes.

Qualitative validity was tested through the theoretical study as well as through expert comments. The tests for quantitative validity and reliability identified a total of 14 customer requirements, which got grouped under four factors/constructs, with the Cronbach's α values ranging from 0.5637 to 0.8344; similarly, 21 design characteristics were identified, with Cronbach's α values ranging from 0.6071 to 0.8167, indicating that the scale was internally consistent and reliable (Cronbach, 1951; Nunnally and Bernstein, 1994).

The focus of the study is on "design characteristics," which are essentials that an educational institution must possess in order to satisfy the needs and wants of the stakeholder and customer groups. The various design characteristics that emerged statistically proven are as follows: clearly defined and specific goals, effective and efficient leadership, clear and specific policies and procedures, strategic and operational planning, clear organizational structure and design, machinery for evaluation and control, budget priorities-proactive and objective driven, emphasis on continuous improvement, management-by-fact/information system, cross-functional collaboration, administrative competence-expertise and adequacy, administrative arrangement-adequate infrastructure and facilities, adaptive resource allocation (as in contingencies), reward policy/incentive schemes, emphasis on training and development, customer focus, participation and involvement, trustworthiness, well-defined channels of communication, teamwork, and respect for people.

(c) Techniques used for the study. With issues of assessment of quality management in education being a precarious task, multiple tools in research methodology were used to arrive at a consensus. The research instrument in the form of a questionnaire was developed comprising both customer requirements and design characteristics. A total of 37 questionnaires were found to be complete and valid for analysis.

As a part of an earlier study, the QFD technique was applied. The QFD is an integrative process that focuses on establishing relationships between the customer requirements with design characteristics, finally helping arrive at a set of design characteristics to best satisfy the customer requirements (Hauser and Clausing, 1988; Pitman *et al.*, 1995). The QFD helped identify the minimum set of design elements able to cover the customer requirements. Thereafter the ISM technique was applied on these design characteristics to establish linkages between them and identify them as driver, facilitator/enabler, and dependent variables.

(d) Variables used for the study. The design characteristics that were identified through the QFD, either as a result of the ranking or the correlation analysis are as follows:

Clear and specific policies and procedures, customer focus, administrative competence, administrative arrangement, management-by-fact, budget priorities, well-defined channels of communication, effective and efficient leadership, strategic and operational planning, machinery for evaluation and control, adaptive resource allocation, reward policy/incentives, emphasis on continuous improvement, emphasis on training and development, participation and involvement, trustworthiness, cross-functional collaboration and teamwork.

For the study, these design characteristics/quality components have been conceptualized from the works of the quality gurus. These elements synonymous to "design characteristics," have been conceptualized through literature review, pilot tested and then identified and ranked through the QFD technique. The various items along with their sources in literature are tabulated (Table I).

With the help of another questionnaire, the respondents were asked to identify interrelationships between these elements. Based on their responses, these elements were prioritized and categorized further to develop a hierarchical model illustrating dependency relationships.

S. no.	Items	Source
1	Adaptive resource allocation	Developed by self
2	Administrative arrangement – adequate infrastructure and facilities	Developed by self
3	Administrative competence – expertise and adequacy	Trethowan (1987), also adapted from Pratt and Stenning (1989)
4	Budget priorities – proactive and objective driven	Finch (1994)
5	Clear and specific policies and procedures	Tang and Zairi (1998)
6	Cross-functional collaboration	The Conference Board (1993, quoted in Boaden, 1997)
7	Effective and efficient instructional/ educational leadership	West-Burnham (1992), Nadeau (1993), Oakland (1993), Dahlgaard *et al.* (1995), Spanbauer (1995), Lozier and Teeter (1996), Frazier (1997) and Tang and Zairi (1998)
8	Emphasis on continuous improvement	The Conference Board (1993, quoted in Boaden, 1997), Kanji and Asher (1993), Lewis and Smith (1994), Dahlgaard *et al.* (1995), Harvey and Knight (1996), Frazier (1997) and Madhavan (1997)
9	Emphasis on training and development for all	The Conference Board (1993, quoted in Boaden, 1997), Spanbauer (1995), Lozier and Teeter (1996), Boaden (1997) and Owlia and Aspinwall (1997)
10	Customer focus/need-based approach	West-Burnham (1992), The Conference Board (1993, quoted in Boaden, 1997), Downey *et al.* (1994), Dahlgaard *et al.* (1995), Spanbauer (1995), Lozier and Teeter (1996), Owlia and Aspinwall (1996a, b, 1997), Boaden (1997) and Madhavan (1997)
11	Machinery for evaluation and control	Harvey *et al.* (1992), Nadeau (1993), Burkhalter (1996) and Horne and Pierce (1996)
12	Management-by-fact/information system/ database	The Conference Board (1993, quoted in Boaden, 1997), Lewis and Smith (1994), Dahlgaard *et al.* (1995), Spanbauer (1995), Frazier (1997) and Madhavan (1997)
13	Participation and involvement/meetings	Kanji and Asher (1993), The Conference Board (1993, quoted in Boaden, 1997), Dahlgaard *et al.* (1995), Boaden (1997), Frazier (1997), Owlia and Aspinwall (1997) and Madhavan (1997)
14	Reward policy/incentive schemes	The Conference Board (1993, quoted in Boaden, 1997), Raisbeck (1994) and Gurnani (1999)
15	Strategic and operational planning	Finch (1994), Frazier (1997), Owlia and Aspinwall (1997) and Tang and Zairi (1998)
16	Teamwork	West-Burnham (1992), Kanji and Asher (1993), The Conference Board (1993, quoted in Boaden, 1997), Spanbauer (1995), Burkhalter (1996), Boaden (1997) and Owlia and Aspinwall (1997)
17	Trustworthiness amongst all	Owlia and Aspinwall (1998)
18	Well-defined channels of communication	Murgatroyd and Morgan (1993), The Conference Board (1993, quoted in Boaden, 1997) and Oakland and Oakland (1998)

Table I.
Element with source from
literature

IV. Interpretive structural modeling

A Conceptual framework

ISM is a qualitative tool that was developed by Warfield to understand and comprehend the complex interrelationships between elements. Through a sequential and systematic methodology, it aims at developing an arrangement, wherein a set of elements related directly and indirectly are structured into a model, after analyzing the complex relationships amongst them. The model ultimately depicts order and direction on the complexity of relationships amongst the various elements, based on primacy, priority, and, cause and effect. It ultimately leads to a portrayal of the direct and indirect relationships among the various elements in a system, through a multi-level structural model (Warfield, 1976; Gorvett, 2006):

> [...] The method is interpretive in that the group's judgement decides whether and how the items are related; structural in that, on the basis of the relationships, an overall structure is extracted from the complex set of items, and; modeling in that specific relationships and overall structure are portrayed in a digraph (directed graph) model (Sharma *et al.*, 1994).

B The ISM technique

The process begins with the identification of elements that could be related to each other in a system. Direct and indirect relationships are then identified between these elements, which are then converted into a matrix that is finally structured into a model through a hierarchical configuration. Eventually what is arrived at is:

- a multi level structure of elements with a graphical representation of their networks and relationships based on primacy, priority, cause and effect; and

- the identification of these elements into drivers, facilitators and dependents based on the independent and dependent relationship.

Methodology and application of ISM to the study. The ISM technique follows a systematic methodology. The various steps involved in ISM technique when applied to the 18 design characteristics (henceforth called elements) identified are as follows:

(1) The 18 elements were listed down, and numbered/coded as Elements 1-18 (Table II).

(2) They were arranged in rows and columns; a matrix was developed for the elements, by relating each of the elements with the other element, one by one, pairwise, through rows and columns. The contextual relationships arranged in terms of "V" for "will help achieve," "A" for "will be achieved by," "X" for "help achieve each other," and "O" for "unrelated." The existence of a relationship between any two elements (i and j) and the associated direction of relationship was analyzed. Four symbols were used for the type of the relationship that may exist between two variables: V for the relation from i to j; A for the relation from j to i; X for relations in both directions, i.e. i to j and j to i; and, O if the two variables are not related.

(3) Based on this pair-wise relationship between elements of a system, a structural self-interaction matrix (SSIM) was developed (Table III).

(4) Reachability matrix was developed from the SSIM by expressing the information in each cell entry of the SSIM into 1s and 0s (Table IV). The table was checked for transitivity and modifications were made (Table V). If the (i,j)

Variables	Element codes
Efficient and efficient leadership	1
Clear and specific policies and procedures	2
Strategic and operational planning	3
Machinery for evaluation and control	4
Budget priorities	5
Emphasis on continuous improvement	6
Management by fact/information system	7
Cross-functional collaboration	8
Administrative competence-expertise and adequacy	9
Administrative arrangement	10
Adaptive resource allocation	11
Reward policy/incentives	12
Emphasis on training and development	13
Customer focus-need based	14
Participation and involvement	15
Trustworthiness amongst all	16
Well-defined channels of communication	17
Teamwork	18

Table II.
Variables and codes

Codes	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
1	X	X	V	X	X	X	V	X	X	V	X	X	X	V	X	V	X
2	X	X	O	X	X	V	V	V	X	X	X	X	X	X	X	V	
3	X	X	O	A	X	X	V	X	A	X	X	X	X	V	V		
4	X	X	V	A	X	V	V	X	V	X	V	X	X	V			
5	A	X	X	A	X	V	V	X	X	A	X	A	X				
6	A	X	V	X	X	V	X	X	V	A	X	X					
7	A	X	V	A	X	X	V	V	X	X	X						
8	X	X	X	X	X	X	V	X	x	X							
9	X	X	V	X	X	X	X	X	V								
10	X	A	O	A	A	V	O	A									
11	A	X	V	A	X	V	O										
12	V	A	V	V	A	X											
13	A	A	V	X	X												
14	X	X	X	X													
15	X	X	X														
16	X	X															
17	X																

Table III.
Structural self-interaction
matrix

entry in the SSIM is V, then the (i,j) entry in the reachabilty matrix is converted to 1 and the (j,i) entry to 0; if the (i,j) entry in the SSIM is A, then the (i, j) entry in the reachabilty matrix is converted to 0 and the (j,i) entry to 1; if the (i,j) entry in the SSIM is X, then the (i,j) entry in the reachabilty matrix is converted to 1 and the (j,i) entry to 1; if the (i,j) entry in the SSIM is O, then the (i,j) entry in the reachabilty matrix is converted to 0 and the (j,i) entry to 0.

(5) The reachability matrix was partitioned on the basis of the reachability and antecedent sets for each of the variables, and, through a series of iterations, these were grouped into various levels (Tables VI and VIII).

Elements	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
3	0	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1
4	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1
5	0	1	0	0	1	1	0	1	0	1	1	1	1	1	0	1	1	0
6	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0
8	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	1	1	1	0	1	0	1	1	0	1	0	0	1	0	0	0	0	1
11	1	0	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0
12	0	0	0	0	0	1	0	0	1	0	0	1	1	0	1	1	0	1
13	1	0	1	0	0	0	1	1	1	0	0	1	1	1	1	1	0	0
14	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
16	0	0	0	0	1	0	0	1	0	0	0	0	0	1	1	1	1	1
17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1

Table IV.
Reachability matrix (1)

Elements	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1
4	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	0	1	0	0	1	1	0	1	0	1	1	1	1	1	0	1	1	0
6	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	0
7	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0
8	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	1	0	1	0	1	0	1	1	0	1	0	0	1	0	0	0	0	1
11	1	0	1	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0
12	0	0	0	1	0	1	0	0	1	0	0	1	1	0	1	1	0	1
13	1	0	0	0	0	1	1	0	1	0	0	0	1	1	0	0	0	0
14	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1
15	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1
16	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	1	1
17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1

Table V.
Reachability matrix (2)

(6) The reachability matrix was then converted to a conical form, based on the 0 and 1 relationship (i.e. absence and presence of relationships) (Table VII). A directed graph, was drawn portraying direct and indirect relationships through arrows, and then converted into an ISM, by replacing elements/codes with the statement of the respective design characteristics (Figure 1).

(7) The various levels of design characteristics, were classified as "drivers" (the lowest two levels), "facilitators/enablers" (the middle two levels), and "dependents" (top level) (Table VIII and Figure 1):

Code (P_i)	Reachability set: $R(P_i)$	Antecedent set: $A(P_i)$	Intersection: $R(P_i) A(P_i)$	Levels
1	1-18	1,2,4,6-8,10,11,13-15,17,18	1,2,4, 6,7,8,10,11,13,14,15,17,18	II
2	1-18	1-3,5-9,14,15,17,18	1,2,3,5,6,7,8,9,14,15,17,18	V
3	2-14,17,18	1-3,6-11,14,15,17,18	2,3,6,7,8,9,11,14,17,18	III
4	1,4-18	1-4,6,7,9,11,12,14,15,17,18	1,4,6,7,9,11,12,14,15,17,18	IV
5	2,5,6,8,10-14,16,17	1-11,14-18	2,5,6,8,10,11,14,16,17	I
6	1-8,10-17	1-9,11-15,17,18	1,2,3,4,5,6,7,8,11,12,13, 14,15,17	II
7	1-14,16,17	1-4,6-10,13-15,17,18	1,2,3,4,6,7,8,9,10,13, 14, 17	II
8	1-3,5-18	1-11,14-18	1,2,3,5,6,7,8,9,10,11,14,15,16,17,18	I
9	2-18	1-4,7-9,11-15,17,18	2,3,4,7,8,9,11,12,13,14,15,17,18	II
10	1,3,5,7,8,10,13,18	1-11,14,15,17,18	1,3,5,7,8,10,18	III
11	1,3-6,8-11,13,14,16,17	1-9, 11,14, 15,17,18	1,3,4,5,6,8,9,11,14,17	IV
12	4, 6, 9,12,13,15,16,18	1-9,12,14,17	4,6,9,12	IV
13	1,6,7,9,13,14	1-13,15,17,18	1,6,7,9,13	II
14	1-12,14-18	1-9,11,13,14,15,17,18	1,2,3,4,5,6,7,8,9,11,14,15,17,18	II
15	1-11,13-18	1,2,4,6,8,9,12,14,15,17,18	1,2,4,6,8,9,14,15,17,18	IV
16	5,8,16-18	1,2,4-9,11,12,14-18	5,8,16,17,18	I
17	1-18	1-9,11,14-18	1,2,3,4,5,6,7,8,9,11,14,15,16,17,18	I
18	1-11,13-18	1-4, 8-10,12-18	1,2,3,4,8,9,10,13,14,15,16,17,18	I

Table VI.
Levels of elements: partitioning the reachability matrix based on five iterations

Elements	5	8	16	17	18	1	6	7	9	13	14	3	10	4	11	12	15	2
5	1	1	1	1	0	0	1	0	0	1	1	0	1	0	1	1	0	1
8	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1
16	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
17	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	1	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	1
7	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1
9	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1
13	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0
14	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1
3	1	1	0	1	1	0	1	1	1	1	1	1	1	1	1	0	0	1
10	1	1	0	0	1	1	0	1	0	1	0	1	1	0	0	0	0	0
4	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0
11	1	1	1	1	0	1	1	0	1	1	1	1	1	1	1	0	0	0
12	0	0	1	0	1	0	1	0	1	1	0	0	0	1	0	1	1	0
15	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table VII.
Canonical form of reachability matrix

- *Drivers: Levels V and IV.* Clear and specific policies and procedures, machinery for evaluation and control, adaptive resource allocation, reward policy/incentives, participation and involvement.
- *Facilatators/enablers: Level III.* Strategic and operational planning, administrative arrangement.
- *Dependents: Levels II and I.* Efficient and efficient leadership, emphasis on continuous improvement, management by fact/information system,
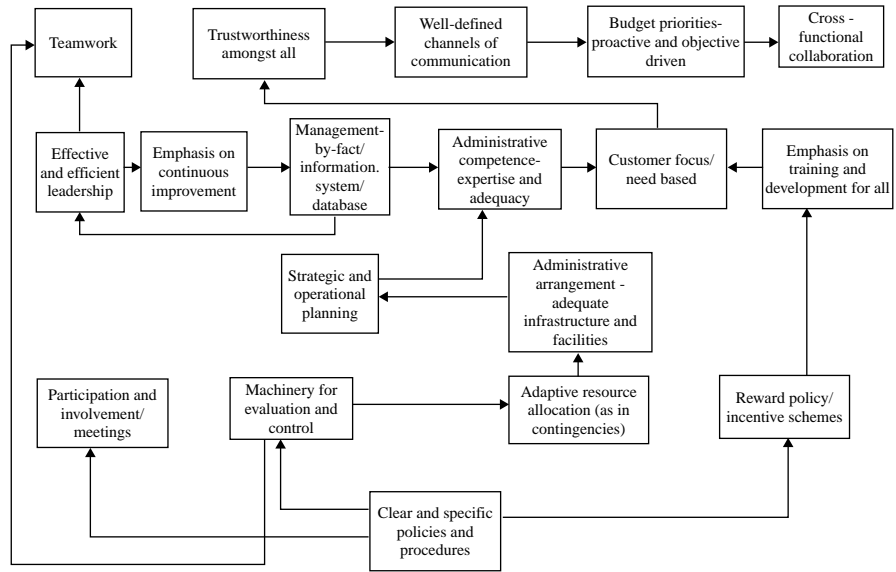
Figure 1.
Interpretive structural
modeling

Level	Code	Element/design characteristics	
I	5,8,16,17,18	Dependents	Budget priorities, cross-functional collaboration, trustworthiness amongst all, well-defined channels of communication, teamwork
II	1,6,7,9,13,14		Efficient and efficient leadership, emphasis on continuous improvement, management by fact, administrative competence, emphasis on training and development, customer focus
III	3,10	Facilatators	Strategic and operational planning, administrative arrangement
IV	4,11,12,15	Drivers	Machinery for evaluation and control, adaptive resource allocation, reward policy/incentives, participation and involvement
V	2		Clear and specific policies and procedures

Table VIII.
Levels with codes and
corresponding design
characteristics

administrative competence, emphasis on training and development, customer focus, budget priorities, cross-functional collaboration, trustworthiness, well-defined channels of communication, and teamwork.

V. Findings
The ISM helped identify and prioritize the critical design characteristics into drivers, facilitators/enablers, and dependents (Table I and Figure 1).

Drivers
- *Clear and specific policies and procedures.* Educational institutions must define widely their vision statement, and translate it into guiding principles for the

achievement of strategic and operational plans. This would be facilitated by clear
and specific policies and procedures.

- *Machinery for evaluation and control.* For an educational institution, evaluation
  and control are a twofold activity that involves the monitoring of progress of not
  only the employees (administrative and support staff and teachers), but also the
  students, through objective outcome-based assessment methods, feedback, and
  record keeping.
- *Adaptive resource allocation.* It refers to providing of resources in unforeseen
  cases.
- *Reward policy/incentives*. It is, either individual based or group based, lead to
  motivation and enthusiasm at work. An education institution must have a fair
  and transparent reward policy, based on distributive and procedural justice.
- *Participation and involvement.* An institution must adopt and implement a
  democratic and participative environment where the employees feel free to offer
  ideas and suggestions. Employee participation and involvement is the process of
  empowering the members of the organization to make decisions and to solve
  problems appropriate to their levels in the organization.

Facilatators/enablers

- *Strategic and operational planning.* Strategic planning articulates the
  institutional vision, weighs external opportunities and threats, gauges internal
  strengths and weaknesses and determines appropriate action. It results in
  operational planning. Operational plans are those that are required to channel
  institutional activities, within the boundaries of the vision. While strategic plans
  diagnose and assess needs and plan for their satisfaction, operational plans focus
  on the individual differences and adapt accordingly.
- *Administrative arrangement.* It refers to adequate infrastructure, computer
  hardware and software, other equipment and materials for the administrative
  set-up.

Dependents

(1) *Efficient and efficient leadership.* It is a pre-requisite for the successful
    functioning of any organization. An instructional/educational leadership is all
    pervasive and implies:

    - Keeping a balance between a "strong leadership role" and maximum
      autonomy for teachers.
    - Providing a structural institutional pattern in which teachers can perform
      effectively.
    - Being a firm disciplinarian and providing a role-model for teachers and
      students alike.
    - Performing all managerial functions, from planning to control.
    - Setting a strong administrative set up; providing resources and facilities.

(2) *Emphasis on continuous improvement.* Continuous improvement means
    improvements for greater customer satisfaction, through improvements in

technology and human resources. It involves all the units and requires the optimization of the entire system through interdependency among all the components. It is the learning of appropriate processes, tools and skills and practicing these newly developed skills on small achievable tasks and projects.

(3) *Management by fact/information system.* Management-by-fact, aims at data gathering, compilation and dissemination to enable access of information to all. Its relevance in educational institutions lies in obtaining facts and maintaining the latest information system database, to be used in the conduct of all administrative and academic functions and activities.

(4) *Administrative competence.* An educational institution has administrative competence, when it has the right number of people with effective communication skills, interpersonal skills, leadership abilities, planning and innovative abilities and decision-making abilities among other skills.

(5) *Emphasis on training and development.* Programmes for an in-service and an on-going process for the acquisition of knowledge and skills for administrative staff for development and upgradation of human, technical and conceptual skills and abilities should be emphasized upon by all educational institutes.

(6) *Customer focus.* The requirements, needs and expectations of customers, both internal and external must be met as far as possible, and the administrative staff, as an internal customer is no exception.

(7) *Budget priorities.* Based on incremental adjustments up and down from previous years, the budget should also be situational, as in contingencies and emergencies. An itemized yearly summary of the estimated or intended expenditures for infrastructure, salaries, etc. along with proposals for financing them, should be prepared and adopted.

(8) *Cross-functional collaboration.* It refers to collaboration through co-operation, participation and breakdown of barriers across departments, units and functional areas.

(9) *Trustworthiness.* It promotes participation, cooperation, and better coordination of activities amongst all.

(10) *Well-defined channels of communication.* Vertical, horizontal, and lateral communication, within and across departments and units and also with the external environment is important. Clear channels of communication must be established for educational institutions and attention should be paid not only to the quantity of information received but also to the extent to which useful information is shared.

(11) *Teamwork.* Like any other organization, teamwork is essential for educational institutions because lasting and significant changes will not occur unless instructors and other staff are directly and actively involved in planning and implementation of desired changes.

The sequencing, prioritizing, and grouping of the various elements structured into a comprehensive model which when implemented in an educational institution would lead to quality from internal customers' perspective, ensuring customer satisfaction,

retention, loyalty, and patronage. These components could act as guidelines of good policies and practices for the delivery of efficient service.

VI. Conclusions

There has been a paradigm shift in the manner in which customer interests in education are viewed today, with the ultimate objective of "delighting the customer." A satisfied internal customer would act as an efficient service provide to the external customer. Employee satisfaction is a major driver towards adoption of a customer centric philosophy by any organization, and thus measures should be adopted to promote employee satisfaction. With this assumption, the study was conducted with the objective of identifying the quality elements/components for an educational system as identified by the administrative/support staff as an internal customer of the educational system.

Based on a theoretical and conceptual framework, an empirical study was conducted on the administrative staff to get their perspective as to what would constitute quality. The literature review helped identify elements/components of quality. These items were tested for reliability and validity, so as to arrive at statistically proven items that could be identified as quality elements/components. The study was conducted on these elements, and the findings helped identify critical strategic parameters, and qualitative and quantitative reference points which when implemented would result in the satisfaction of the administrative staff, that would then be able to deliver quality service to the external customers and stakeholders. Such a framework would help educational institutions use an integrated approach to improve performance, administrative abilities and academic effectiveness.

References

Boaden, R.J. (1997), "What is total quality management . . . and does it matter?", *Total Quality Management*, Vol. 8 No. 4, pp. 153-71.

Burkhalter, B. (1996), "How can institutions of higher education achieve quality within the new economy", *Total Quality Management*, Vol. 7 No. 2.

Cheng, Y.C. and Tam, W.M. (1997), "Multi-models of quality in education", *Quality Assurance in Education*, Vol. 5 No. 1, pp. 22-31.

(The) Conference Board (1993), *Does Quality Work? A Review of Relevant Studies*, The Conference Board, New York, NY.

Cronbach, L.J. (1951), "Coefficient alpha and the internal structure of test", *Psychometrica*, Vol. 16 No. 3, pp. 297-300.

Dahlgaard, J.J., Kristensen, K. and Kanji, G.K. (1995), "TQM and education", *Total Quality Management*, Vol. 6 No. 5, pp. 445-55.

Downey, C.J., Frase, L.E. and Peters, J.J. (1994), *The Quality Education Challenge*, Corwin Press, Thousand Oaks, CA.

Finch, J. (1994), "Quality and its measurement: a business perspective", in Green, D. (Ed.), *What Is Quality in Higher Education?*, Open University Press, Buckingham.

Frazier, A. (1997), *A Roadmap for Quality Transformation in Education*, St Lucie Press, Delray Beach, FL.

Gorvett, R. (2006), "Interpretive structural modeling of interactive risks", paper presented at Call Paper Program, Enterprise Risk Management Symposium, Chicago, IL.

Gurnani, H. (1999), "Pitfalls in TQM implementation: the case of a Hong Kong company", *Total Quality Management*, Vol. 10 No. 2, pp. 209-28.

Harvey, L. (1995), *Quality Assurance Systems, Total Quality Management and the New Collegialism*, QHE, Birmingham.

Harvey, L. and Green, D. (1993), "Defining quality", *Assessment and Evaluation in Higher Education*, Vol. 18, pp. 9-34.

Harvey, L. and Knight, P.T. (1996), *Transforming Higher Education*, Open University Press, Buckingham.

Harvey, L., Burrows, A. and Green, D. (1992), *Criteria of Quality*, QHE, Birmingham.

Hauser, J.R. and Clausing, D. (1988), "The house of quality", *Harvard Business Review*, May-June, pp. 63-73.

Horne, H. and Pierce, A. (1996), *A Practical Guide to Staff Development and Appraisal in Schools*, Kogan Page, London.

Kanji, G.K. and Asher, M. (1993), "TQM process: a systematic approach", *Total Quality Management*, Vol. 4 (Supplement, special issue).

Kanji, G.K., Tambi, A.M.A. and Wallace, W. (1999), "A comparative study of quality practice in higher education institutions in the US and Malaysia", *Total Quality Management*, Vol. 10 No. 3, pp. 357-71.

Lewis, R.G. and Smith, D.H. (1994), *Total Quality in Higher Education*, St Lucie Press, Delray Beach, FL.

Lozier, G.G. and Teeter, D.J. (1996), "Quality improvement pursuits in American higher education", *Total Quality Management*, Vol. 7 No. 2.

Madhavan, M. (1997), "TQM in educational institutions", *The Indian Journal of Technical Education*, Vol. 20 No. 3.

Murgatroyd, S. and Morgan, C. (1993), *TQM and the School*, Open University Press, Buckingham.

Nadeau (1993), Quoted in Harvey, L. and Knight P.T. (1996), *Transforming Higher Education*, Open University Press, Buckingham.

Nunnally, J.C. and Bernstein, I.H. (1994), *Psychometric Theory*, 3rd ed., McGraw-Hill, New York, NY.

Oakland, J.S. (1993), *TQM, The Route to Improving Performance*, Butterworth-Heinemann, London.

Oakland, J.S. and Oakland, S. (1998), "The links between people management, customer satisfaction and business results", *Total Quality Management*, Vol. 9 No. 4 and 5.

Owlia, M.S. and Aspinwall, E.M. (1996a), "A framework for the dimensions of quality in higher education", *Quality Assurance in Education*, Vol. 4 No. 2, pp. 12-20.

Owlia, M.S. and Aspinwall, E.M. (1996b), "Quality in higher education – a survey", *Total Quality Management*, Vol. 7 No. 2, pp. 161-72.

Owlia, M.S. and Aspinwall, E.M. (1997), "TQM in higher education-a review", *International Journal of Quality & Reliability Management*, Vol. 14 No. 5, pp. 527-43.

Owlia, M.S. and Aspinwall, E.M. (1998), "A framework for measuring quality in engineering education", *Total Quality Management*, Vol. 9 No. 6, pp. 501-18.

Parasuraman, A., Zeithaml, V.A. and Berry, L.L. (1985), "A conceptual model of service quality and its implications for future research", *Journal of Marketing*, Vol. 49 No. 4, pp. 41-50.

Pitman, G., Motwani, J., Kumar, A. and Cheng, C.H. (1995), "QFD application in an educational setting: a pilot field study", *International Journal of Quality & Reliability Management*, Vol. 12 No. 6, pp. 63-72.

Pratt, K.J. and Stenning, R. (1989), *Managing Staff Appraisal in Schools: Training Manual*, Van Nostrand Reinhold, New York, NY.

Raisbeck, I. (1994), "Royal mail: developing a total quality organization", in Green, D. (Ed.), *What Is Quality in Higher Education?*, Open University Press, Buckingham.

Reeves, C.A. and Bednar, D.A. (1994), "Defining quality: alternatives and implications", *Academy of Management Review*, Vol. 19 No. 3, pp. 419-45.

Sahney, S. (2002), "Total quality management in higher education in India – a diagnostic study of select engineering and management institutions", unpublished paper, IIT, Department of Management Studies, New Delhi.

Sallis, E. (1993), *TQM in Education*, Kogan Page, London.

Sharma, H.D., Sushil, K.B. and Gupta, A.D. (1994), "A structural approach to analysis of causes of system waste in the Indian economy", *System's Research*, Vol. 11 No. 2, pp. 17-41.

Spanbauer, S.J. (1995), "Reactivating higher education with total quality management: using quality and productivity concepts, techniques and tools to improve higher education", *Total Quality Management*, Vol. 6 No. 5 and 6.

Tang, K.H. and Zairi, M. (1998), "Benchmarking quality implementation in a service context: a comparative analysis of financial services and institutions of higher education: part III", *Total Quality Management*, Vol. 9 No. 8, pp. 666-79.

Trethowan, D. (1987), *Appraisal and Target Setting – A Handbook for Teacher Development*, Harper and Row, London.

Warfield, J.N. (1976), *Societal Systems*, Wiley, New York, NY.

West-Burnham, J. (1992), *Managing Quality in Schools – A TQM Approach*, Longman Group, Harlow.

Further reading

Sahney, S., Banwet, D.K. and Karunes, S. (2004), "Identification of elements of total quality management for the educational system: a study of select engineering and management institutions in India", *Vision (MDI Journal)*, Vol. 8 No. 1, pp. 11-24.

Sahney, S., Banwet, D.K. and Karunes, S. (2007), "Developing a quality framework for educational institutions – an administrative staff perspective in the Indian context", *The Journal of Engineering Education*, Vol. XX No. 4, pp. 71-88 (9th special issue on *TQM* in Engineering Education, Vol. XXI No. 1).

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