

**Designing a Model for Total Quality Management in Engineering
Education in Selected Institutes of Punjab and Chandigarh**

Thesis

Submitted in fulfilment of the requirements of the degree of

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by

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DECLARATION BY THE STUDENT

I hereby certify that the work which is being presented in this thesis entitled **“Designing a Model for Total Quality Management in Engineering Education in Selected Institutes of Punjab and Chandigarh”** is for fulfilment of the requirement for the award of Degree of **Doctor of Philosophy (Business Management)** submitted to the **Chitkara Business School, Chitkara University, Punjab** is an authentic record of my own work carried out under the supervision of Dr. Shuchi Dawra and Dr. Satish Kapoor.

The work has not formed the basis for the award of any other degree or diploma, in this or any other Institution or University. In keeping with the ethical practice in reporting scientific information, due acknowledgements have been made wherever the findings of others have been cited.

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CERTIFICATE BY THE SUPERVISOR(S)

This is to certify that the thesis entitled “**Designing a Model for Total Quality Management in Engineering Education in Selected Institutes of Punjab and Chandigarh**” submitted by **Shri Kasturi Lal Sapra, Registration No. CUPB/01/PhD/11/06** to the Chitkara University, Punjab in fulfilment for the award of the degree of **Doctor of Philosophy (Business Management)** is a *bona fide* record of research work carried out by him under our supervision. The contents of this thesis, in full or in parts, have not been submitted to any other Institution or University for the award of any degree or diploma.

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ABSTRACT

At the time of Independence, India had only 36 Engineering colleges with an annual intake of about 3600 students. As per the AICTE dashboard, in 2018-19, the number of Technical Institutions has risen to 6275 with an annual intake of 27,12,311.

A large number of Institutes of National importance like Indian Institutes of Technology (IITs), Indian Institutes of Science (IISc and IISERs) and National Institutes of Technology (NITs) have been set up and, at the same time, the annual intake in all the Institutes has been increased manifold. The fastest growth, both in terms of number of Institutes and the annual intake, however, has taken place during the period starting with late 1990s and ending with early 2000s. Most of the new Institutes set up during this period were in the private sector and even a considerable number of private Universities have also been established.

However, while an enormous increase in the number of Institutes and the annual intake has taken place, there is a wide variance in the quality of education offered by various institutes. Literature states that the current model of education is content heavy, involves a lot of information and testing with little emphasis on experiential learning, real world exposure to industries, problem solving and creative intelligence. Variance in quality is observed in the course work, evaluation mechanisms, infrastructure, industry exposure, quality of faculty: all of these lead to poor learning outcomes. The poor learning outcomes lead to lack of requisite skills and unpreparedness for real world jobs.

Starting with Japan and having spread all over the world, the approach of Total Quality Management (TQM) has helped achieve stupendous improvements not only in manufacturing but in service Industry as well.

With the above background, this study on 'Designing a Model for Total Quality Management in Engineering Education in selected Institutes of Punjab and Chandigarh' was taken up.

The most important element of TQM is stakeholder satisfaction. The prime stakeholder in Engineering Education is the student. In addition, faculty, parents of students, Top Management and Industry (and other prospective employers) are other major stakeholders. The satisfaction of all these stakeholders depends upon the quality of education. In addition to a stakeholder approach, the other major components of TQM that are relevant to the study are continuous improvement, having a quality manage-

ment system, benchmarking, transparent communication and the commitment of the top management.

This study considers the perspective of the five major categories of stakeholders (students, faculty, parents, top management and industry representatives) and considers the TQM approach to engineering education. This makes this study unique because it considers all categories of stakeholders, and also considers the various types of engineering education, viz. degree and diploma education, spread across government institutions, private institutions and the Top 100 institutions as per the NIRF ranking.

The research questions are the following-

- 1) What is the existing system of Engineering Education (EE) in India with reference to Punjab and Chandigarh?
- 2) How does the existing system fare in terms of skills, employability, industry relevance, specifically in Punjab and Chandigarh?
- 3) How can the present institutions include components of TQM Objective to improve the quality of education?
- 4) What should be developed as a model for providing Quality Technical Education in Punjab and Chandigarh?.

These research questions address the following objectives-

- Objective 1: To what extent do the present institutions located in Punjab and Chandigarh reflect components of TQM? (classified as O1)
- Objective2: To evaluate the existing system in terms of skills, employability, industry relevance, specifically in Punjab and Chandigarh. (classified as O2)
- Objective 3: To design a model for providing Quality Technical Education in Punjab and Chandigarh. (classified as O3)

The study is exploratory in nature. The sampling design is non-probabilistic, stratified sampling for data collection from students and faculty. In the case of parents, top management and industry representatives, convenience / purposive sampling was used.

The target population was taken from Chandigarh and Punjab based engineering institutions. Degree institutions and diploma institutions were both studied. The degree institutions were categorized under three categories: Top 100 institutions as per NIRF

ranking, Government institutions and Private institutions. Diploma institutions were categorized as Government institutions and Private institutions.

Responses from a large number of stakeholders from 14 engineering education institutions covering all the above categories were obtained.

609 students, 164 faculty, 52 parents responded to questionnaires. Additionally, inputs were obtained from 70 industry representatives and 14 top management representatives through semi structured interviews and discussions.

The approach followed for data analysis was Partial Least Square-Structural Equation Modelling (PLS-SEM). Through this approach, a model has evolved based upon the perspective of students and the perspective of faculty. In these models, the relationship of the four independent variables (TQM elements) with the dependent variables has been studied, showing the quantum of effect of the former over the latter. In as far as the perspectives of the remaining three categories of customers (or stakeholders) are concerned, qualitative research was resorted to, eliciting their views through a combination of questionnaires, semi-structured interviews and personal discussions and interaction.

Data analysis

For students, the independent TQM variables have an impact on the dependent variables, which are grouped under the major heads of Placement and Alumni connect, Infrastructure, Faculty Quality, Corporate and Industrial connect.

As per the models obtained, in case of students all the independent variables, i.e. the TQM elements, are impacting the different variables, albeit to varying degrees. In the case of faculty model, other than benchmarking, the remaining TQM elements are affecting the dependent variables, although to different degrees.

The response of parents in each category points to a positive view on quality. However, there are noticeable differences between the perception as demonstrated by responses of parents of students studying in Government colleges, Private colleges and the Top 100 institutes.

The top management has placements as a key priority for students. This is more pronounced for the private institutions. They are also concerned about the communication capabilities of students. The Top management of the Top 100 and certain private

institutions are concerned about the ranking of their institutes and look at that as a key factor in progress.

As per responses from industry experts, there is a large gap between the skills required for the industry and the skills imparted during engineering education. The students are not considered industry-ready and have to be imparted further training before they become suitable for the job. Greater and more frequent interaction between industry and academia is required, with more emphasis on practical and real life requirements.

This study is the first of its kind for the Punjab and Chandigarh region in that it incorporates the perspective of all stakeholders, viz students, faculty, parents, top management and industry representatives. This has given very valuable insights into the total quality management approach to engineering education and can be built upon further and extended to the rest of the country, other categories total stakeholder involvement element, and from it, other aspects that determine the quality of technical and engineering education.

Important keywords: - Engineering Education, Quality, Total Quality Management, Stakeholder Satisfaction.

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ABBREVIATIONS

ABET	Accreditation Board for Engineering and Technology
AICTE	All India Council of Technical Education
ASQ	American Society for Quality
AVE	Average Variance Extracted
BRIC	Brazil, Russia, India, China
CII	Confederation of Indian Industry
EI	Engineering Educational Institutions
EFQM	European Foundation for Quality Management
FICCI	Federation of Indian Chambers of Commerce and Industry
HEI	Higher Education Institutions
IIT	Indian Institute of Technology
ISM	Interpretive Structural Modelling
ISO	International Organization for Standardization
ISTE	Indian Society for Technical Education
IT	Information Technology
MHRD	Ministry of Human Resources and Development
MOORA	Multi objective optimization on the basis of simple ratio analysis
NAAC	National Assessment and Accreditation Council
NASSCOM	National Association of Software and Services Companies
NIRF	National Institutional Ranking Framework
NIT	National Institute of Technology

NKC	National Knowledge Commission
NMIMS	Narsee Monjee Institute of Management Studies
PG	Post Graduate
PLS SEM	Partial Least Square- Structural Equation modelling
QAA	Quality Assurance Agency (for Higher Education in the UK)
SAE	Society of Automobile Engineers
SQM	Service Quality Management
TQM	Total Quality Management
UG	Under Graduate
UGC	University Grants Commission
UNDP	United Nations Development Program
