

ABSTRACT

The emergence of global competitive market has posed many challenges to the manufacturing fraternity. Of the many strategies that are sought after to face this situation, quality comes at the forefront. Innovative concepts and approaches to attain higher degree of quality has become popular in manufacturing arena over the past few years. The manufacturers in their anxiety to attain quality enhancement began to invest considerably on quality management (QM) practices which are being today addressed under different terms such as Total Quality Management (TQM), Total Quality Control (TQC), Company Wide Quality Control (CWQC), etc. However, in spite of such investments and evolution of theoretical information, no significant results in the form of continuous quality improvement have been observed in manufacturing firms. This situation has arisen due to the huge gap existing between theory and practice of QM causing insufficient and improper penetration of continuous quality improvement strategies in manufacturing firms. This has called for review of traditional QM concepts prevailing in the manufacturing arena and bring out a practically feasible, reformed and focussed approach for achieving excellence in quality enhancement.

This thesis explains the doctoral work which was started with the objective of finding avenues to bridge the gap between theory and practice for attaining quality enhancement. The beginning of the doctoral work was marked by a historical review on the status of quality which covered right from the ancient days' single manufacturing systems to the present day industrial scenario. The outcome of the review points out the emergence of many approaches on quality improvement strategies proposed by a number of experts in the modern industrial atmosphere. A thorough analysis on the outcome of review was carried out which revealed that, relying upon the continuous quality improvement strategies practiced ideally by the ancient single manufacturer could be the feasible solution for attaining quality enhancement in all facets of today's complex manufacturing systems. Hence, considering ancient single manufacturing system as the guiding model, reformed, modified and improved approaches on quality enhancement have been proposed which have been collectively called as 'Strategic Quality Management' (SQM). After the identification of all vital continuous quality improvement strategies in the manufactur-

ing systems, a well structured investigation methodology that facilitates in bridging the gap between theory and practice on quality enhancement has been designed. Adopting this methodology, investigations on all vital quality strategies have been conducted. The carefully collected results and inferences which have been subjected to the viewpoints of both manufacturers and customers have been used to evolve a SQM system model that aims to focus on quality enhancement.

Meanwhile, an important observation being overcome in modern industrial arena is the increased level of automation in manufacturing systems that has resulted as the consequence of the tremendous developments that have taken place in the field of information technology, the benefits of which have been realised by the absence of human deficiencies like inconsistent and incorrect decision making, forgetfulness, fatigue etc. Although many fields have already nourished the benefits of easily available and accessible latest software and hardware, only subtle attempts have been made in the industrial world to adopt them for implementing quality enhancement efforts. At this context, it was decided to emphasise the feasibility of exploiting artificial intelligence techniques for implementing SQM practices in manufacturing firms. To open avenues in this direction, an expert system for quality circle programmes as a means to execute one of the vital quality strategy namely "harnessing human knowledge for quality development", has been developed.

In a nutshell, this doctoral work covered the core aspects of continuous quality improvement strategies which are being missed in the present day manufacturing firms while effecting quality enhancement programmes. The thesis in its conclusion, narrates the experiences overcome during this doctoral work and provides the scope for further future work in this direction.