



A PROPOSED CONCEPTUAL TQM MODEL FOR IMPLEMENTATION TO ENHANCE BUSINESS EXCELLENCE FOR NORTH KARNATAKA MANUFACTURING SMES

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ABSTRACT

The purpose of this paper is to present a proposed conceptual total quality management (TQM) model for implementation to enhance business excellence for north Karnataka manufacturing small medium-sized enterprises (SMEs). The development of this model is based on the TQM literature review, the structured interviews, and general characteristics of 295 Manufacturing SMEs in the northern Karnataka firms. This model provides the users with a number of practices, drawn mainly from the northern Karnataka firm's experiences in general and their failures and problems in particular. The present study attempts to fill the gap by identifying the critical factors of managing the manufacturing SMEs quality, and proposes a holistic conceptual framework for the implementation of TQM in the manufacturing industry. The benefits of this model helps its users in evaluating the strengths and weaknesses of their TQM implementation, targeting their improvement areas, setting up an action plan for improvements, and tailoring a special part to the needs of their firms. The conceptual model for TQM implementation dedicated to the manufacturing SMEs and guides them through from the start to end of the TQM implementation process.

Key words- Total Quality Management (TQM), Manufacturing small and Medium- Sized Enterprises (SMEs), North Karnataka (NK), Business excellence, critical factors



1.0 INTRODUCTION

Total Quality Management (TQM), an evolutionary concept, has evolved with human civilization. In recent years TQM has received attention worldwide. TQM has evolved because of continuous change in global economic structure and hence changes in expectations of customers. The recent trend can be attributed to the recognition of importance of quality in global competition. TQM is viewed as an organization wide philosophy requiring all employees at every level of an organization to focus his or her efforts to help improve each business activity of the organization [21]. Since TQM underlines the involvement of whole organization, it is affected by the whole organization. Whether it is people who are working in and for the organization, the activities going in the organization or the infrastructure facilities, everything affects TQM environment. Viewing from customer's side it is the quality of product; value for the money spent and post sales facilities. Commitment and involvement are the key issues for employer and employee. Conducive work environment demands attitudinal changes. Similarly synchronization of activities among departments is desirable.

Self-assessment is a comprehensive, systematic and regular review of an organization's activities and results referenced against the EFQM excellence model. The self-assessment process allows the organization to discern clearly its strengths and areas in which improvements can be made and culminates in planned improvement actions that are then monitored for progress. In the USA, self assessments are carried out against the Malcolm Baldrige National Quality Award (MBNQA) model, Europe uses the European Quality Award (EQA) model and Japan uses the Deming Prize (DP). A comparative study was accomplished by [1] on four major quality awards: the Deming Prize, the European Quality Award (EQA), the Malcolm Baldrige National Quality Award (MBNQA), and the Australian Quality Award (AQA). They describe three factors that encouraged many western countries to introduce quality awards. These factors are: quality is a significant contributor to competitive superiority; benchmarking and self-assessment are essential techniques to improve performance; and the success of the Deming prize in Japan.

This paper presents the development of implementation model TQM in SMMEs of north Karnataka region. The development of this model was based on the TQM literature review, the structured interviews, and general characteristics of SMMEs in the northern Karnataka firms. This model provides the users with a number of practices, drawn mainly from the firms' experiences in general and their failures and problems in particular. The model can assist its users in evaluating the strengths and weaknesses of their TQM implementation, targeting their improvement areas, setting up an action plan for improvements, and tailoring a special part to the needs of their firms.

2.0 DEFINITIONS OF TQM

Defining of what TQM really is does seem to be a tough job by itself. For instance, [23] says TQM is "an approach to improving the effectiveness and flexibility of business as a whole". It is an essential way of organizing and involving the whole organization, every department every activity every single person at every level. [14] defined TQM as a total system approach, and an integral part of high level strategy which works horizontally across functions and departments, involving all employees, top to bottom, and extends backwards and forwards to include the supply chain and the customer chain. [6], considers the



importance of TQM for a number of reasons, viz., TQM is increasingly taught as an academic subject; there is broad based developing body of research on TQM; TQM and quality management are often confused; and evidence reading the 'success' of TQM is mixed. [10] [11] defined it as a management approach that encourages everyone in the organization to focus exclusively upon serving the customer. [8] Defined quality management as approach to management comprising mutually supported principles, where each of them is supported by a set of practices and techniques. ISO 9000:2000 defined TQM as coordinated activities aimed at the control and direction of the organization towards quality [15]. It is visible from the various definitions that there is no unique definition of the TQM but there is a common thread of customer satisfaction and continuous improvement in all most all definitions of TQM.

3.0 CRITICAL SUCCESS FACTORS (CSFs) OF TQM

The critical factors of TQM are almost invariant across countries. The leaders, policy makers and strategists, human resource managers, process managers, information managers, marketing and supply chain managers focus on certain factors of TQM, of course, with suitable adaptations, as critical factors that contribute to the success of TQM. The critical factors of TQM identified are Leadership & Top Management Commitment (LTMC), Vision and Plan Statement(VPS), Supplier Quality Management (SQM), System Process Quality Improvement (SPQI), Total employee involvement (TEI), Education and Training(ET), Performance appraisal, Recognition(PAR), Customer Focus Satisfaction and(CFS), Evaluation (En), Work Environment and Culture (WEC), Continuous Improvement (CI), and Communication(Co), with a perspective on how to use critical factors as the foundation for driving transformational orientation in order to create a sustainable performance of business excellence. Although, TQM is a well-established field of study for business excellence the success rate of TQM implementation is not very high. The major reason for TQM failure is owing to the tendency to look at TQM as tool and not as a system.

Critical success factors are indicators of what must be achieved if an institution is not only to satisfy its customers but also move ahead on the paths of its vision statements. The past decade has seen many firms focusing on Total Quality Management (TQM) as a means of improving profits, market share and competitiveness. Although TQM is a proven approach for success in manufacturing, services and the public sector, several organizations failed in their campaigns because of many reasons like lack of top management commitment, ignoring customers etc. It is necessary to understand what are the reliable and valid critical success factors of TQM, and how these factors influence operational and business performances and excellence. The most commonly used critical TQM factors cited in the literature are top management commitment and support, customer focus, supplier's quality management, design quality management, quality data reporting, usage of quality control tools, training, work environment and culture, employee involvement, employee empowerment, quality related training, product quality, and supplier's performance. Each of these critical factors has more than one dimension.

3.1 Independent variables

Several attempts have been made to review, study, identify, justify and evaluate the critical factors that constitute TQM strategy. As reported in the TQM literature, several review papers have been published by researchers such as [28], [13], [3], [25], [2], [5], [31], [9], [16], [18], [26], [30], [20], [22], [27], [24], [17], [1]and the most recent review of TQM literature is by [4].



3.2 Dependent variables (business excellence)

The literature review indicated that different researchers adopted different variables for measuring overall business excellence. To date, no uniform measures have existed. Therefore, the constructs of overall business performance had to first be identified so that this research could be conducted. Researchers have identified different variables used for measuring organizational business excellence shown in Table 1.

Table1: Performance measure proposed by literature

Author(s)	Measure	Variables
Brah et al. (2002) [7]	Quality Performance	Product/service quality, Employee and service quality Process quality, Supplier performance
Lakhal et al. (2006) [19]	Organizational Performance	Financial performance, Operational performance Product quality
Tari et al. (2007) [32]	Quality outcome	Customer result, People result, Quality performance
Feng et al. (2008) [12]	Organizational Performance	Operational performance, Business performance
Su et al. (2008) [29]	Organizational Performance	Quality performance, Business performance R&D performance

4.0 METHODOLOGY

The objective of this study is to development of a conceptual total quality management (TQM) model for introduction and implementation of TQM and also to investigate the relationship between TQM and Business Excellence (B E) in small and medium sized manufacturing enterprises (SMMEs) in the north Karnataka region. To that end, a survey questionnaire was developed. A total of twelve constructs were proposed, which were felt to be important for TQM implementation. For scoring purposes, a five-point Likert scale was employed with a score of 1= strongly disagree; 2=Disagree; 3= Neutral; 4= Agree; 5= strongly agree, for practice (The level of perceived importance to the factory) and 1= Not important at all; 2=Not important; 3= Neutral important; 4=Important; 5= very important for Importance (The level of perceived importance to the factory). Having validated the questionnaire through expert validation and pilot testing, a sample of 950 companies of small and medium enterprises in north Karnataka region, were randomly selected from the Directory of the north Karnataka small scale industries association (NKSSI) and the data base of the Karnataka Small and Medium Industry Development Corporation (KSMIDEC). The full survey, through the mailed questionnaire, and personally visited the some companies was carried out. Although the response rate was initially not encouraging, various techniques were used to improve the response rate including providing a stamped self-addressed envelope, and personalization (a hand-written note) on the covering letter in the follow-up stage. As a result responses of 315 being returned. 10 of the 315 returned responses were incomplete, resulting in only 295 (48 medium and 247 small) responses considered for final study, i.e. 31.05% valid response rate which the authors felt to be reasonable for this kind of study. The responses were analyzed using the SPSS Version 11.5 statistical package



5.0 SURVEY RESULTS

5.1 General profile of the company

Table 1 shows that the respondents of small and medium sized companies. Respondents from small-sized companies, defined in this study the investment in plant and machinery is more than twenty five lakhs rupees but does not exceed rupees 5 cores. This is followed by medium-sized companies the investment in plant and machinery is more than rupees 5 cores but not exceeding Rs.10 cores.

Table: 1 Classification of respondents by type of company

Type of Company	Respondents	
	Number	Percent
Small	247	83.7
Medium	48	16.3
Combined	295	100.0

Source: Research Survey Data

Table 1 indicates the classification of respondents by type of companies. It is evident from the finding that higher percentage (83.7%) of small type of companies established as compared to 16.3% groups of industries focused as medium manufacturing enterprises.

Table.2 indicates the classification of respondents by type of group of industries. It is evident from finding that straightly higher percentage (76.6%) of non ISO groups of industries focused as compared to ISO (23.4%).

Table: 2 Classification of respondents by type of groups

Groups	Respondents	
	Number	Percent
ISO	69	23.4
Non ISO	226	76.6
Combined	295	100.0

Source: Research Survey Data

6.0 RELIABILITY ANALYSIS

Using the SPSS reliability analysis procedure, an internal consistency analysis was performed separately for the items of each critical factor. Cronbach's alpha is commonly used for this purpose. Values of Cronbach's alpha range between 0 and 1.0. Higher values indicating higher reliability. The value of each variable, as measured by each statement on the scale of 1 to 5, is computed using the reliability analysis procedure shown in Table 3. The alpha values range from 0.8259 to 0.9148, which indicates an internal consistency with the alpha value of more than 0.70, so no items were dropped from each variable. These results are therefore acceptable and are a reliable.

Table: 3 internal consistency analyses

Quality management practice	No. of items	Alpha value	Item for deletion	Alpha if item deleted
LTMC	7	.8818	none	.8833
VPS	7	.8511	none	.8532
SQM	6	.9023	none	.9019
SPQI	6	.9064	none	.9065



TEI	7	.8506	none	.8546
ET	7	.8653	none	.8606
PAR	7	.8639	none	.8608
CFS	7	.9188	none	.9193
En	9	.9019	none	.9017
WEC	9	.9270	none	.9262
CI	7	.9090	none	.9089
Co	5	.8421	none	.8437
Total	84	0.885	none	0.885

Source: Research Survey Data

7.0 A THEORETICAL TQM IMPLEMENTATION MODEL

From extensive review of total quality management literature, the external and internal environment affecting an organization's quality performance and the twelve critical success factors of TQM are identified. Based on the critical success factors of TQM, a theoretical TQM model is developed. This model describes the primary quality management methods which may be used to assess an organization's present strengths and weaknesses with regard to its use of quality management methods.

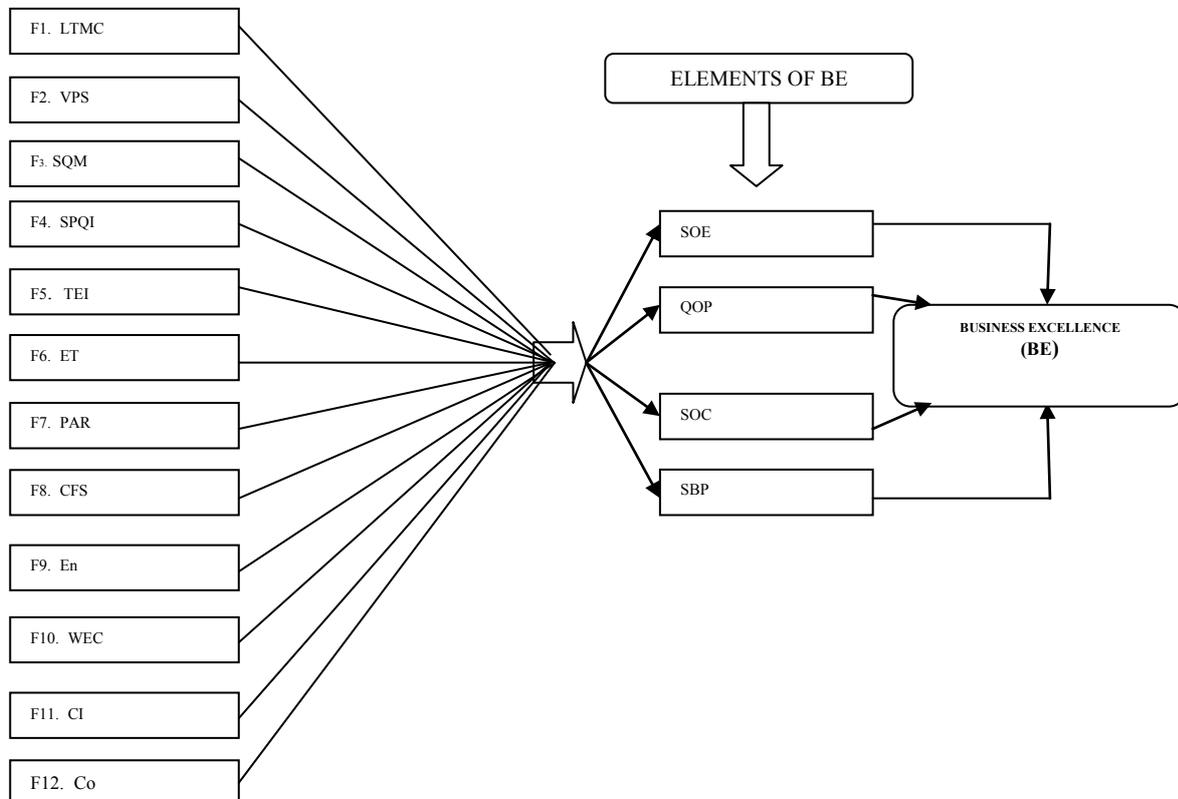


Fig.1: Theoretical TQM implementation model on TQM extension practices and BE

Using this model as a basis for this research, a proposed TQM implementation model in small and medium sized manufacturing enterprises is shown in Fig.1. The degree of implementation of quality principles (84 variables) has been measured using a five-point



scale. The level of implementation of twelve TQM factors will then be determined by calculating the averages of the scores of the corresponding variables.

8.0 DEVELOPMENT OF THE CONCEPTUAL TQM MODEL FOR IMPLEMENTATION

Of all the critical success factors considered, leadership and top management commitment is of critical importance. The present work, based on the foregoing thorough review of the prescriptive, conceptual, practitioner and empirical literature on TQM spanning over many research articles, identifies twelve critical factors of quality management as critical for the institution of a TQM environment in manufacturing organizations. The following critical success factors (CSFs) are identified from the literature survey and through discussions with the CEO and managers of small and medium manufacturing enterprises of northern Karnataka and experts from management and engineering institutions.

- Leadership & Top Management Commitment (LTMC).
- Vision and Plan Statement (VPS).
- Supplier Quality Management (SQM).
- System Process Quality Improvement (SPQI).
- Total Employee Involvement (TEI).
- Education and Training (ET).
- Performance Appraisal, Recognition (PAR).
- Customer Focus and Satisfaction (CFS).
- Evaluation (En).
- Work Environment and Culture (WEC).
- Continuous Improvement (CI).
- Communication (Co).

Thus, the proposed TQM model consists of twelve critical factors (independent) of TQM that are identified, help to understand on how to use critical factors as the foundation for driving transformational orientation in order to create a sustainable performance of business excellence. Following are the four elements (dependent) of business excellence.

- Satisfaction of Employee (SOE).
- Quality of Product (QOP).
- Satisfaction of Customer (SOC).
- Strategic Business Performance (SBP).

Independent critical factors can be broadly grouped under four categories as follows.

Step 01: Drive to preparation and awareness

- Leadership & top management commitment.
- Vision and plan statement
- Total employee involvement
- Continuous improvement

Step 2: Focus to asses & develop

- Customer focus and satisfaction

Step 3: Standardize, improve and review

- Education and training
- Work environment and culture
- Supplier quality management
- Communication



Step 4: Prepare to implement

- Performance appraisal and reorganization
- System process quality management
- Evaluation and measurement analysis

The conceptual TQM model helps to understand the overall business excellence in terms of Satisfaction of Employee (SOE), Quality of Product (QOP), Satisfaction of Customer (SOC), and Strategic Business Performance (SBP). North Karnataka SMMEs can optimize the use of this model by blending it with and applying it to their own situations, because SMMEs are different in terms of their people, goals, structure, products, services, and processes, allowing their own methods to better suit their situations and consequently develop their own ways to business excellence. Thus this model shows that the application of critical factors of TQM practices in combination can lead to improvements in overall business excellence.

The conceptual TQM model is divided into four main steps, all of which need to be addressed once the motivation for TQM has been identified from top management commitment. The motivation will set the overall strategic direction of TQM and influence the relevant importance of each part of the TQM model. Of the four steps of the TQM model the first one: 'drive to preparation and awareness', includes leadership & top management commitment, vision and plan statement, total employee involvement, continuous improvement; the second one: 'focus to assess and development', include customer focus & satisfaction; the third one: 'standardize, improve and review' includes education and training, work environment and culture, communication, supplier quality management; and the fourth: "prepare to implement", includes performance appraisal & recognition, system process quality improvement, evaluation & measurement analysis. These independent critical factors are, in essence, are tools of the intellect that have been forged in the administrative theory, tempered in manufacturing quality management. 'Business excellence' and 'Changing the culture' are the elements which must be considered at all stages, not only in the initial organizing activities, but also primarily results from the other initiatives described, interacts with them throughout the process, and will evolve with the organization's operating experience of TQM. People, both as individuals and working in teams, are core to TQM and without their skills and endeavors continuous improvement will simply not occur.

A diagrammatic representation of the TQM model is given in fig. 2. The performance of the system (output or business excellence) should be constantly measured using metrics, and should be evaluated and analyzed with respect to benchmarks that are set up, and a feedback is given to the system for taking corrective steps. The comments (feedback) from the customer, regarding the delivered products, along with their suggestions and new requirements, are again fed into the system for its enrichment. All the factors that are discussed above are vital components for quality improvement, and are derived from the literature and through interaction and discussions with the managers.

9.0 TQM IMPLEMENTATION METHODOLOGY

There are four major steps that TQM typically implemented. TQM is a process that never ends and establishing organization wide TQM generally takes three or more years. The various steps involved in attaining total quality management in small and medium sized manufacturing enterprises are explained as below.

9.1 Step 01: Drive to Preparation and Awareness

It is concerned with gaining thorough knowledge of what can and what should be expected from introduction of TQM and its implementation.



At this stage, particular attention is required first at management's commitment for quality in all aspects through a vision and plan statement which describes how a company wants to be seen in its chosen business, by total employee involvement and continuous improvement and by creating working environment for quality management.

9.2 Step 2: Focus To Asses & Develop

A successful organization recognizes the need to put the customer first in every decision made. The key to quality management is maintaining a close relationship with the customer, in order to determine fully the customer's needs, as well as to receive feedback on the extent to which those needs are being met. Thus, it is very important to find customer satisfaction and customer perception of quality. The insights gained can clearly help the organization to improve quality.

9.3 Step 3: Standardize, Improve and Review

In this stage step up the planned implementation programme, step by step quality is people & if any institution is really people oriented, it needs plenty of words to describe the way the people ought to treat one another. Communication is an expression of trust and confidence in people and induces cooperation involving people assisting the trust and confidence in people and induces cooperation involving people assisting the each other not because they perceive their long term goals to be identical but because they seem to realize that their own welfare lies in not harming each other's interest.

Communicating the company's total quality management performance to vendors involve some basic principles that are used to communicate the programme intentionally, i.e. Vendors must be led to appreciate the benefits to be gained by using TQM. For this purpose companies can publish alternative brochures and even conduct vendors clean it for encouraging their supplies to join with them in specific quality improvement and quality management programmes. All these programmes are based on the principles & benefit from good purchaser vendor relationship.

For improving production and quality in any organization key techniques are based on quantities data. There are many quantities techniques for the process control and improvement but these are generally referred as seven basic tools. Some of these techniques are data related to input, process and output are obtained in respect of certain parameters for quantities analysis facilities decision making in improvements in the process for better production quality, efficiency and cost effectiveness.

9.4 Step 4: Prepare To Implement

Rewards are the form of employee's involvement in which the organization identifies and recognizes the employees who have made positive contribution in the success of the organization. The reward should be commensurate to the situation and level of achievement, i.e. the higher the achievement, the higher the reward. Recognition and rewards can be in many forms but it is always better to develop new ideas to suit the local situation for recognition. In many of the responding companies, rewards range from simple handshake or pat on the back to banquets in honor of the individual or team. The rewards are appropriately presented so that fellow employees know about it.

Thus integrating the efforts at various levels and using the above factors of TQM implementation as the foundation and pillars of an implementation strategy an organization can plan a transition to total quality management culture. By using the above model, it is hoped that north Karnataka companies shall be able to implement TQM in a systematic manner.

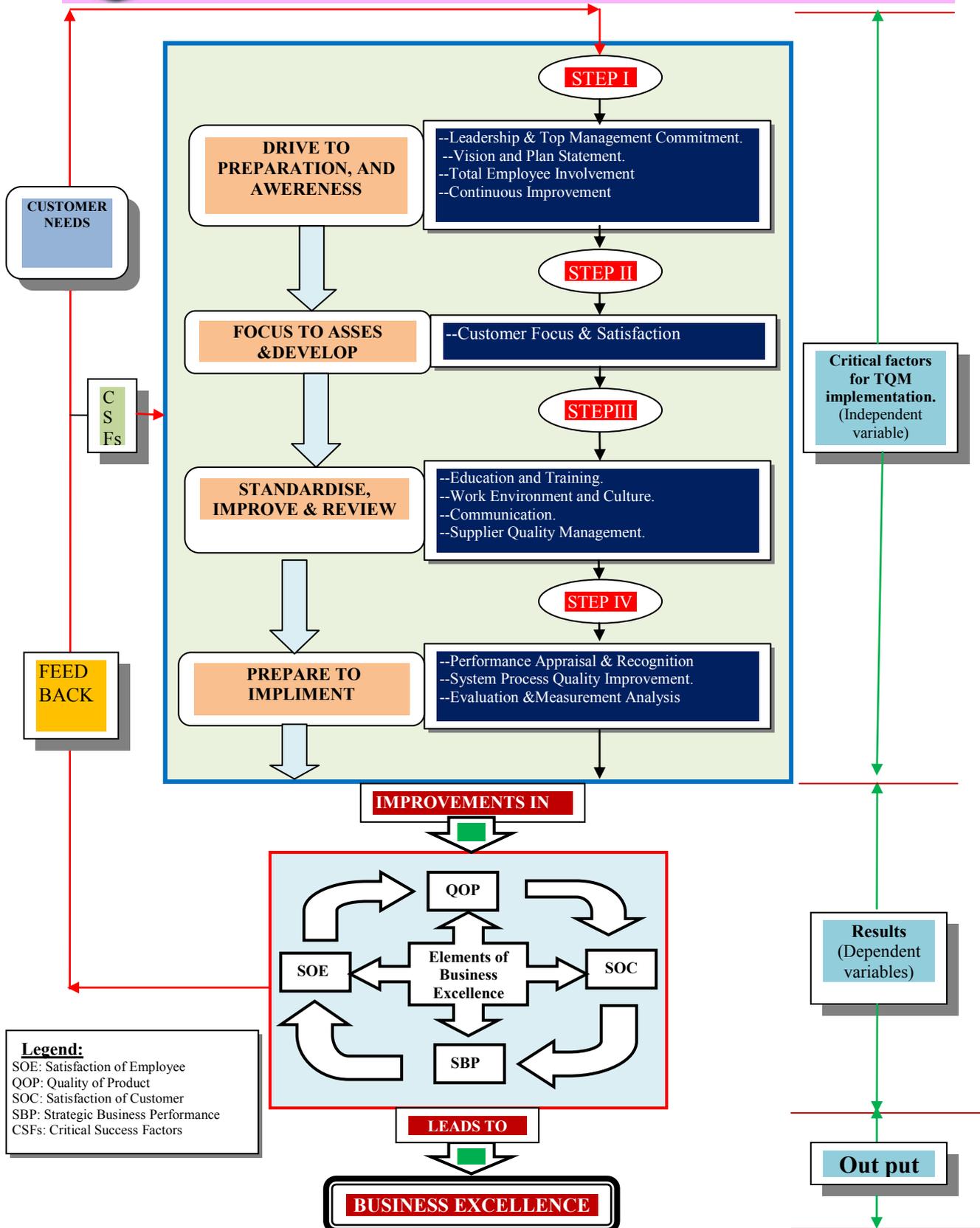


Fig. 2: A conceptual TQM implementation model for implementation in the small and medium sized manufacturing enterprises (SMMEs)



9.5 Elements of Business Excellence

Total quality management (TQM) has been proposed to improve business excellence and received considerable attention in recent researches. Business excellence (B E) is a systematic approach to achieving and sustaining business improvement and organizational growth. The business excellence way of working is based on total quality management principles, particularly the focus on balancing stakeholder's interests, collaboration and continuous improvement.

This study empirically examines the extent to which TQM and business excellence are correlated and how TQM impacts various levels of business excellence. In this study, a conceptual TQM model is developed according to a literature review. This conceptual TQM model demonstrates the relationship between critical factors of TQM and business excellence through examining the direct and indirect effects of twelve critical factors TQM on four different levels of business excellence. The proposed conceptual TQM model and hypotheses were tested by using data collected from information-related small and medium sized manufacturing enterprise (SMMEs) in the north Karnataka.

9.5.1 Satisfaction of Employee (SOE)

Satisfaction of employee is the terminology used to describe whether employees are happy and contented and fulfilling their desires and needs at work. Employee satisfaction is also a measure for how happy the workers are with their job and working environment. Keeping the morale high among workers can be of tremendous benefit to any company, as happy workers will be more likely to produce more, take fewer days off, and stay loyal to the company. There are many factors in improving or maintaining high employee satisfaction, which the wise employers would do well to implement. Job security, Equity, fairness, and equal opportunities, recognition and reward schemes, leadership style and ability, relationships with coworkers, promotion opportunities, and other factors may improve employee satisfaction.

9.5.2 Quality of Product (QOP)

According to Garvin (1987), product quality consists of eight dimensions: performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. Performance refers to operating characteristic of a product. Feature refers to additional characteristics that supplement a product's basic function. Reliability reflects the probability of a product being available for use or failing within a specified period of time. Next, conformance refers to the degree to which product design and operating characteristic meet the predetermined standard. Durability can be defined as the amount of use one gets from a product before it deteriorates. While serviceability reflects speed, courtesy, competence and ease of repair. Aesthetics refer to personal judgment of appearance of products, their sound, taste or smell. Lastly, perceived quality is about the reputation of the provider.

9.5.3 Satisfaction of Customer (SOC)

It is important to focus on the customer, both internal and external i.e., the employees and the users of the end product. A successful organization recognizes the need to put the customer first in every decision made. Customer satisfaction can be measured by comparing product quality and service quality with those in the other firms in the same industrial sector. Use of customer satisfaction information can provide a focus and direction for continuous improvement throughout the entire firm. Such information can be used to improve TQM



implementation efforts, seek opportunities to improve product and service quality, and study the time dimension of TQM implementation. The ultimate measure of company performance is customer satisfaction. Thus, it is very important to find customer satisfaction and customer perception of quality. The insights gained can clearly help the organization improve quality.

9.5.4 Strategic Business Performance (SBP)

Total Quality Management (TQM) tries to meet customer expectations. TQM is a strategic way for revamping the operations of organization for the above goal. It means that TQM is not an addition to anything else. In short, TQM is an organizational strategy formulated at the top management level and then implemented throughout the organization. The overall success of TQM depends upon different major steps such as achieving total quality in Human Resource Management, total Quality in Business Strategy, TQ Business Process Management etc. Annual sales growth, Profits, market share is typical measures of strategic business performance.

10.0 ESTABLISHMENT OF RELATIONSHIP BETWEEN INDEPENDENT VARIABLES WITH DEPENDENT VARIABLES FOR BUSINESS EXCELLENCE.

Literatures on total quality management practices and organizational business excellence are abundant. Organizations are motivated to embrace quality management practices with the principle objective to achieve improved organizational business excellence. Generally, these studies are mainly focused on large organizations and the majority of the studies are on organizations in developed economy. There is less number of studies of quality management practices on small and medium enterprises. The objective of this theoretical TQM implementation model is to show the critical success factors that influence organizational business excellence for small and medium enterprises when they are adopting standard based TQM as a system of their quality management practice. The primary thrust in this proposed study is to enable the findings of this research to be utilized as guidance to organizations and consultants to establish and prioritize the critical success, factors that should be addressed in order to achieve improved organizational business excellence. Identifying and prioritizing to address the critical success factors as the determinant of organizational performance would enable small and medium enterprises to improve in quality management practices.

The proposed TQM implementation model for the research is illustrated in the model shown in Figure 7.2. Organizational business excellence will be the Dependent Variable (DV) and the critical success factors for standard based management are the Independent Variable (IV).

10.1 Independent variable (Critical Success Factors)

The conceptual TQM model for this study addressed the critical success factors on organizational business excellence for small and medium enterprises that adopt quality management practices using standard based management systems. The critical success factors for quality management developed by a number of authors had been be utilized for this study.

10.2 Dependent Variables (organizational business excellence)

Organizational business excellence (Neely, Gregory & Platts, 1995) can be defined as the process of quantifying the efficiency and effectiveness of action, and 'performance measure' as a metric used to quantify that action. In Total Quality Management and quality importance of performance indicators has been highlighted as important criterion in



achieving quality excellence. Quality measures are seen to represent the most positive step in broadening the basis of business excellence measurement (Bogan & English, 1994).

11.0 THE IMPORTANCE OF THE STUDY

Small and Medium Enterprises often are constrained by their resources such as financial, manpower and time to embark on quality management practices. Adoption of TQM system is perceived as an economical option to embrace quality management practices in the organization. Knowledge and understandings of the critical success factors of TQM system on organizational business excellence for small and medium manufacturing enterprises will facilitate to influence or establish the determinants for the success of small and medium enterprises in their organizational quality practices in their pursuit for organizational competitiveness, and consequently, organizational business excellence. These determinants will be utilized as prescriptive measures for the small and medium enterprises in their strategic decision makings in order to achieve positive organizational excellence. It is anticipated that, small and medium enterprises that focused on these critical success factors would be able to economically concentrate to enhance these factors in order to economically achieve their quality management exercise.

The relationship between twelve independent variables with dependent variables (business excellence) comprising of four components. The final findings indicate that there exists positive higher significant relationship between independent variables with business excellence for both small and medium companies and ISO and non ISO certified companies.

11.1 Perceived relationship between independent and dependent variables (Small and Medium)

The findings indicate that there exists positive higher significant relationship between independent variables with business excellence for both small and medium manufacturing enterprises.

Table 4: Relationship between independent and dependent variables (Small and Medium sized manufacturing enterprises)

Sl. No	Aspect	Relationship with Business Excellence (r)	
		Small (n=247)	Medium (n=48)
1	LTMC	0.790	0.822
2	VPS	0.741	0.860
3	SQM	0.852	0.807
4	SPQI	0.795	0.786
5	TEI	0.757	0.853
6	ET	0.869	0.888
7	PAR	0.807	0.837
8	CFS	0.727	0.732
9	En	0.895	0.930
10	WEC	0.789	0.650
11	CI	0.778	0.759
12	Co	0.532	0.594

Source: Research Survey Data **r = Correlations co-efficient**



It is evident from the chart (establishing) under which establishes the relationship between all twelve independent variables with dependent variables (business excellence) comprising of four components. The final findings indicate that there exists positive higher significant relationship between independent variables with business excellence for both small and medium companies (Table 4).

11.2 Practice relationship between independent and dependent variables (Small and Medium)

Table 5: Relationship between independent and dependent variables (Small and Medium sized manufacturing enterprises)

Sl. No	Aspect	Relationship with Business Excellence (r)		Remarks
		Small (n=247)	Medium (n=48)	
				Com (n=295)
1	LTMC	0.879	0.923	0.796
2	VPS	0.891	0.953	0.764
3	SQM	0.921	0.893	0.843
4	SPQI	0.867	0.845	0.790
5	TEI	0.894	0.939	0.775
6	ET	0.954	0.949	0.872
7	PAR	0.937	0.965	0.810
8	CFS	0.912	0.935	0.727
9	En	0.955	0.948	0.901
10	WEC	0.934	0.935	0.761
11	CI	0.929	0.940	0.773
12	Co	0.886	0.901	0.541

Source: Research Survey Data **r = Correlations co-efficient**

It is evident from the chart (establishing) under which establish the relationship between all twelve independent variables with dependent variables (business excellence) comprising of four components. The final findings indicate that there exists positive higher significant relationship between independent variables with business excellence for both small and medium companies (Table 5).

11.3 Relationship between critical success factors (independent) and dependent variables (ISO and Non ISO)-Perceived

It is evident from the chart (establishing) under which establish the relationship between all twelve independent variables with dependent variables (business excellence) comprising of four components. The final findings indicate that there exists positive higher significant relationship between independent variables with business excellence for both ISO and non ISO companies (Table 6).

Table 6: Relationship between critical success factors (independent) and dependent variables (ISO and Non ISO)

Sl. No	Aspect	Relationship with Business Excellence (r)	
		ISO (n=69)	Non ISO (n=226)
1	LTMC	0.817	0.838
2	VPS	0.505	0.852



3	SQM	0.793	0.852
4	SPQI	0.761	0.818
5	TEI	0.772	0.768
6	ET	0.957	0.820
7	PAR	0.908	0.768
8	CFS	0.409	0.837
9	En	0.878	0.916
10	WEC	0.796	0.794
11	CI	0.981	0.651
12	Co	0.910	0.321

11.4 Relationship between critical success factors (independent) and dependent variables (ISO and Non ISO)-Practice

Table 7: Relationship between critical success factors (independent) and dependent variables (ISO and Non ISO)

Sl. No	Aspect	Relationship with Business Excellence(r)	
		ISO (n=69)	Non ISO (n=226)
1	LTMC	0.817	0.838
2	VPS	0.505	0.852
3	SQM	0.793	0.852
4	SPQI	0.761	0.818
5	TEI	0.772	0.768
6	ET	0.957	0.820
7	PAR	0.908	0.768
8	CFS	0.409	0.837
9	En	0.878	0.916
10	WEC	0.796	0.794
11	CI	0.981	0.651
12	Co	0.910	0.321

It is evident from the chart (establishing) under which establish the relationship between all twelve independent variables with dependent variables (business excellence) comprising of four components. The final findings indicate that there exists positive higher significant relationship between independent variables with business excellence for both ISO and non ISO companies (Table 7).

12.0 VALIDATION OF PROPOSED TQM IMPLEMENTATION MODEL THROUGH REGRESSION USING ESTIMATION PROCEDURES

This is the final section of the research study that designed to validate and evaluate the proposed conceptual TQM implementation model based CSFs of TQM. The manager of the company gave the perceptions, comments, criticisms, and suggestions to the conceptual TQM model. The comment made by the company about the conceptual TQM implementation model was regarding the overall acceptability of the conceptual TQM model. The company agreed that the role of top management commitment is an important role to play in implementing the TQM program. Top management commitment alone, without vision and plan statements, employee involvement in process, continuous improvement, customer focus



and satisfaction, education and training, work environment and culture, supplier quality management and other CSFs will not bring the program into success of business excellence.

In statistical theory it is always ascertained with 10% of the main sample accounted for the validation of the research tool. Hence small and medium companies sample subjected has been considered. Thirty (n=30) companies were selected and subjected for validation. Further the model was formulated considering all the factors. The assessment of factors collected from the selected thirty companies and received back with responses. The model so constructed with the appropriate validation can be made use in the entire relevant field which found to be more appropriate and suitable. The model is also further helpful in the predictions aspects. The validation of the proposed TQM implementation model was undertaken through a case study involving thirty SMMEs with the objective of establishing relationship between independent variables and dependent variables.

The predicted business excellence (BE) value comprising twelve critical factors worked using simple regression co-efficient. This estimated value is has been compared with business excellence for sample size n=295+30=325. To ascertain the goodness of fit or on par results between absorbed business excellence and predicted business excellence values the χ^2 test is employed.

The computed χ^2 value found to be 3.74 is with lesser compared to χ^2 table value (3.86). Hence it can be concluded that the absorbed business excellence in relation to predicted business excellence found to be **non significant**. However it can be concluded that the validity component found to be stronger in establishing the difference between absorbed BE and predicted BE as **non significant**. The overall predicted BE worked to be 3.43(X) subjected for 95% confidence interval to estimate the population parameters (μ) ranges between 3.10 to 3.86. The range of value of the confidence interval depicts the narrow difference with responses to predicted business excellence value. With the procedure followed above with actual and predicted value of BE resulting with strong validation with respect to the component BE excellence under study. Hence, this conceptual TQM model can be utilized to the North Karnataka region as the sample selected is appropriate and Representing the same region.

13.0 VALIDATION METHODOLOGY

T-tests are statistical tests that are used to determine whether there are significant differences between two groups with respect to a given endpoint. Most calculators and spreadsheets have functions that will calculate the t-value for once enter the data. However, t-values are relatively easy to calculate, especially if the sample numbers are small. Once calculate a t-value it can determine whether there are statistically significant differences.

Calculate the mean for each of the samples. To do this, add all the values in each sample and divide by the number of values present

Explicit expressions that can be used to carry out various *t*-tests are given below. In each case, the formula for a test statistic that either exactly follows or closely approximates a [t-distribution](#) under the null hypothesis is given. Also, the appropriate [degrees of freedom](#) are given in each case. Each of these statistics can be used to carry out either a [one-tailed test](#) or a [two-tailed test](#). Once a *t* value is determined, a [p-value](#) can be found using a table of values from [t-distribution](#). If the calculated p-value is below the threshold chosen for [statistical significance](#) (usually the 0.10, the 0.05, or 0.01 level), then the null hypothesis is rejected in favor of the alternative hypothesis.

$$t = \frac{(\text{Avg. of business excellence}) - (\text{presumed avg. predicted business excellence.})}{(\text{S D of sample}) / (\text{sq. root of sample size})}$$



$$t = \frac{\bar{X}_D - \mu_0}{s_D / \sqrt{n}}$$

For above equation, the differences between all pairs must be calculated. The pairs are either one person's pre-test and post-test scores or between pairs of persons matched into meaningful groups (for instance drawn from the same family or age group: see table). The average (X_D) and standard deviation (SD) of those differences are used in the equation. The constant μ_0 is non-zero if you want to test whether the average of the difference is significantly different from μ_0 . The degree of freedom used is $n - 1$.

13.1 Calculating the T-test for Comparing Two Means

The t-test is often used to calculate the significance of observed differences between the means of two samples. The t-test is generally used with scalar variables, such as length and width, and so on. The null hypothesis is that there are no significant differences between the means.

1) First, calculate the variance in each of your samples:

Calculate the sample variance, which is an indicator of how much variability there is in responses, for each of the samples. To calculate the variance, subtract the mean from the first value, then square it and divide by the number of samples in the set minus one. Continue to do this for the second value, and then the third, continuing until you have a value for each sample, then add them all together. In math terms, the variance

(s^2) = the sum of $(x - \bar{x})^2 / (n-1)$.

(χ^2 cal. value) = the sum of $BE - x$ (mean of predicted BE) / (n-1).

Sample variance: $s^2 = \frac{\sum(x - \bar{x})^2}{n - 1}$

Sample mean: $\bar{x} = \sum x / n$

Sample size: n = number of observations in sample

N = number of observations in all samples being compared

2) Second, calculate the t-value

Calculate the t-value by taking the absolute value of the mean of sample one minus the mean of sample two. Divide this value by the following: the square root of the variance of sample one divided by the variance of sample one added to the variance of sample two divided by the variance of sample two. This will give you a single t-value with which you can determine significance by looking on a t-table.

$$t = \frac{|\bar{x}_1 - \bar{x}_2|}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Formula for the t-test

3) Third, calculate the degrees of freedom

Calculate the degrees of freedom by adding the samples of both means (n) which leads to the overall sample size (N), and subtract 1.

$$N = n_1 + n_2 \quad \text{and} \quad df = N - 1$$

4) Compare your t-value with the critical t-value



Compare the t-value and calculated with the t-value associated with the appropriate degrees of freedom. If the t-value is greater than the t-value reported in the table, this indicates that the two samples are significantly different from one another.

For a given df, if your t-value is larger than the value in the table, the null hypothesis of no difference between the means should be rejected. Again, biologists use a p-value of 0.05 or less as an indicator of significance.

5) Report the results of the t-test

The calculated t-value is less than t-tabulated value (1.96), the finding reveals the both the estimated methods under the package found to be similar and identical.

Predicted business excellence (mean) **less than compared** with 95% Confidence Interval (C I) found to be (3.10) less than that (3.42) less than that (3.86).

Calculated χ^2 value is less than tabulated χ^2 value is **Non Significant**.

Hence Validated

14.0 RESULTS AND DISCUSSION

From the analysis in the previous sections it is evident that the following inferences can be drawn.

A conceptual implementation model for TQM implementation in the north Karnataka context has been derived based on the discussion of the findings of the investigations of the practices of north Karnataka organizations and knowledge of the literature. The conceptual implementation model illustrates the relative criticality of the critical quality factors and their interrelationships, and the conceptual implementation model is constructed using inputs from the north Karnataka organizations, in order to offer north Karnataka management relevant guidelines for decision making for TQM implementation.

This research study makes several contributions. The study proved the positive relationship between TQM practice and all the various measures of manufacturing objective attainment, as well as organizational business excellence improvement, revealing the strong linkage of TQM and manufacturing objective as well as organizational business excellence.

Most of the critical quality factors identified and used in the construction of this conceptual implementation model are used in other current conceptual model of implementation provided by researchers, experts and consultants, and national quality awards.

The proposed TQM model is comprehensive model comprising twelve critical factors and aspects of TQM, and four elements of business excellence.

This chapter empirically examines the extent to which TQM and business excellence are correlated and how TQM impacts various levels of business excellence. The relationship between twelve independent variables with dependent variables (business excellence) comprising four components indicate that there exists positive higher significant relationship for both small and medium companies and ISO and non ISO certified companies.

To ascertain the goodness of fit or on par results between absorbed business excellence and predicted business excellence values the χ^2 test is employed. The computed χ^2 value found to be 3.74, which is lesser compared to χ^2 table value (3.86). Hence it can be concluded that the absorbed business excellence in relation to predicted business excellence found to be non significant.

The actual and predicted value of BE resulting with strong validation with respect to the component BE under study. Hence, this conceptual TQM model can be utilized to the North Karnataka region as the sample selected is appropriate.



15.0 CONCLUSIONS

This research paper presented a model for implementing TQM in small and medium sized manufacturing enterprise to achieve business excellence. The model is an integration of the twelve critical factors and four elements of business excellence, which cover all the groups for total quality management implementation. The analysis has established a high positive relationship between independent variables and dependent variables of business excellence for both small and medium enterprises and ISO and non ISO certified companies.

The validation of the model using regression analysis and ANOVA technique has clearly established the difference between absorbed business excellences (BE) and predicted BE as non-significant thereby confirming the valid for application in this region. However, the holistic approach adopted in this model makes it suitable application in any part of the country.

The final part of the TQM implementation model is the outcomes. It is hoped that at the end of the implementation of the TQM implementation model, organization can satisfy its customer and achieve continuous improvement in order to achieve business excellence to be competitive in the world competition. TQM implementation model system also focuses in helping a company grow and on focusing efforts on continually increasing profits.

To conclude, the proposed TQM implementation model can assist its users in evaluating the strengths and weaknesses of their TQM implementation, targeting their improvement areas, setting up an action plan for improvements, and tailoring a special part to the needs of their firms.

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