Relevance of Total Quality Management (TQM) or Business Excellence Strategy Implementation for Enterprise Resource Planning (ERP) – A Conceptual Study

"Practice-Oriented Paper - Research Paper"
IQ Concepts, Tools, Metrics, Measures, Models, and Methodologies

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Abstract

Organizations worldwide have been exploring ways to improve business practices to gain competitive edge. One of the most important technological innovations of the last decade has been the emergence of ERP solutions. But implementation of ERP is not just a technological challenge. It's a socio-technological endeavor, which mandates modifying existing applications and redesigning critical business processes to facilitate ERP implementation. Hence, there are organizational and cultural issues, which determine the success of ERP implementation. The main objective of implementing an ERP system is to integrate the organizations business processes and operations for improved business results. But not all organizations have been successful in the ERP implementation. The aim of this paper is to understand the importance of Total Quality Management (TQM) philosophy or Business Excellence Models-Strategy Implementation for ERP Implementation within organizations. There is very little research done where the concept of TQM as a philosophy or Business Excellence strategy implementation, which integrates the concept of ERP implementation. This paper is an attempt to integrate the concept of ERP implementation within a broader perspective of TQM as a part of corporate strategy in an organization. Business Excellence strategy implementation, encompassing the concept of ERP implementation is also discussed. The paper builds upon the foundation on the major research done in the area of TQM or Business Excellence. The concerns and issues for TQM and ERP implementation are discussed. A small case study, of the first company in India to get the coveted Deming Prize based on the integrated Japanese Model for Business Excellence, Sundaram Clayton, is discussed in the paper. The paper attempts to give a holistic perspective of ERP implementation as a part of TQM or Business Excellence Strategy Implementation.

Keywords: Total Quality Management (TQM), Business Excellence Models, Strategy implementation, Enterprise Resource Planning (ERP), Sundaram Clayton

1.0 Introduction

In today's global competition and economic liberalization, quality has become one of the important factors for achieving competitive advantage. A good quality product or service enables an organization to

add and retain customers. Poor quality leads to discontented customers, so the costs of poor quality are not just those of immediate waste or rectification but also the loss of future sales. Technological innovations have diffused geographical boundaries resulting in more informed customers. The business environment has become increasingly complex and the marketplace has changed from local to global. Constant pressure is applied on the management to improve competitiveness by lowering operating cost and improving logistic. Customers are becoming increasingly aware of rising standards, having access to wide range of products and services to choose from. There is an ever-increasing demand for quality product and/or services and this global revolution had forced organizations to invest substantial resources in adopting and implementing total quality management strategies.

1.1 Understanding Total Quality Management (TQM)

Total Quality Management has many definitions. Gurus of the total quality management discipline like Deming, Juran, Crosby, Ishikawa and Feigenbaum defined the concept in different ways but still the essence and spirit remained the same. According to Deming, quality is a continuous quality improvement process towards predictable degree of uniformity and dependability. Deming also identified 14 principles of quality management to improve productivity and performance of the organization. Juran defined quality as "fitness for use." According to him, every person in the organization must be involved in the effort to make products or services that are fit for use. Crosby defines quality as conformance to requirements. His focus has been on zero defects and doing it right the first time. Ishikawa also emphasized importance of total quality control to improve organizational performance. According to him quality does not only mean the quality of product, but also of after sales service, quality of management, the company itself and the human life. Feigenbaum defined total quality as a continuous work processes, starting with customer requirements and ending with customer's satisfaction [8].

Definitions of quality have changed with the passage of time with changing customer's needs and requirements. But the essence has more or less been to develop an approach to problem solving, conformation to standards for customer satisfaction. With management functions getting complex, approaches to managing quality in functional areas are becoming difficult. Organizations, which have successfully use TQM principles, have customer and quality embedded in their corporate strategy.

Any organization is a system of interrelated units. For TQM to succeed, all of the components within the organization must be collectively involved. Initially, organizations implemented TQM in the hope that improvement in the shop-floor activities would solve all existing productivity and quality problems. Later, they have realized that TQM is much more than just shop-floor improvements. The definitions of quality incorporate factors like top management commitment, leadership, team work, training and development, rewards and recognition, involvement and empowerment of employees etc. These critical factors are the foundation for transformational orientation to create a sustainable improvement culture for competitive advantage on a continuous basis.

According to Selladurai Raj, TQM interventions or activities must be guided by four change principles, namely work processes, variability, analysis, and continuous improvement. Product design and production processes must be improved; variance must be controlled to ensure high quality; data must be systematically collected and analyzed in a problem-solving cycle; and commitment made to continuous learning by the employees about their work [25].

1.2 Understanding Enterprise Resource Planning (ERP)

Organizations have been using technology to serve customers in a better way. Enterprise Resource Planning (ERP) is one such concept, which encompasses social and technological readiness of the

organization. It is a business solutions aimed at building strong organizational capabilities for improved performance, better decision-making and competitive advantage.

An enterprise system, by its very nature, imposes its own logic on a company's strategy, organization, and culture. Despite the benefits that can be achieved from a successful ERP system implementation, there is already evidence of failure in projects related with ERP implementation [7]. These failures often result from the senior management's lack of understanding of degree of changes involved in the implementation. Implementing an ERP system is a challenging endeavor; the implementation is both complicated and difficult as the product spans functional silos and involves many internal and external entities [2]. Many organizations adopting ERP have serious conflict with their business strategies due to the enormous amount of time, money and effort needed to implement it. It is seen that implementation of ERP often results in delays and cost overruns, if the scope of the implementation is not clearly defined.

There are various factors like business process reengineering (BPR), top management support, stakeholder involvement, open communication etc. for establishing a total quality management (TQM) culture which play important roles in ERP implementation [16]. In the next part of the paper the focus is to identify successful integration sequences of TQM with ERP. This includes an explanation of the relevance of TQM in ERP systems and the role of TQM in problem solving techniques and continuous improvement opportunities for all ERP systems. Also discussed is the effective use of TQM for maximum return on investment from expensive investments.

2.0 Relevance of adopting TQM philosophies in successful ERP implementation – Formation of Integrated Quality Loop

2.1 The TQM Philosophy & Business Excellence- Issues and Concerns

Over the past few decades, although ERP initiatives and quality management programs have evolved independently from one another, both are considered as resources that require senior leadership commitment, high levels of investment and organizational effort, that help organizations to gain competitive advantage. It is very much important to look at how ERP integrates with the concept of TQM in any organization and has to be part of the corporate strategy for an organization for gaining a competitive advantage in the long run.

The quality movement has gone through many transformations. In the past, controlling quality meant that the product had to be inspected after it was produced to check whether it met all the specifications or not. The transformation from inspection mode to prevention mode is considered to be a very important step in building quality from the very beginning or start of the manufacturing process. The quality movement saw focus on building quality in every task that is performed in an organization. Therefore, we see a dramatic shift in the quality management focus from just a concentration on manufacturing, to a company wide activities and, more specifically, to the needs of the internal and external customers as explained earlier in the paper.

Various researches as cited in the following paragraph of the paper have shown the benefits of implementing quality initiatives. This has helped identify a set of critical factors for successful quality management implementation, as a way to improve customer satisfaction and performance. Critical success factors (CSFs) consist of activities, which must be completed to achieve the organizational vision and objectives. Furthermore, different instruments have been developed by researchers and institutions like Malcolm Baldridge National Quality Award (MBNQA), Tata Business Excellence Model (TBEM)

among the Tata Group companies in India, based on the American Model for Business Excellence (MBNQA), the European Foundation for Quality Management (EFQM), the Japanese Model, the Deming Prize by Japanese Union of Scientist and Engineers (JUSE) and the Confederation of Indian Industry and Exim Bank (CII- Exim) Business Excellence Award in India, based on EFQM. These most popular models are manifestations of principles of TQM implementation in the entire organisation.
Although there is some agreement over which factors constitute TQM, different studies still produced different sets of TQM factors, which may have arisen from certain differences in the definitional or methodological approaches taken by various researchers. Some researchers attempted to overcome these disparities in the set of TQM factors by using the criteria of quality awards such as the Malcolm Baldrige National Quality Award (MBNQA) and the European Foundation for Quality Management (EFQM) as their preferred TQM factors in their studies. However, the fact that various studies yielded different factors may also be due to the differences between countries' business environments in which the surveyed firms operate, which in turn are affected by various factors including culture, religion, education levels, information technology, government regulations, the extent of industrialization, and so on. These factors bring into question the universal applicability of certain TQM factors, which have been implemented successfully by companies in certain countries. Another reason for the differences in the TQM factors extracted in various studies may be due to the types of industries surveyed, company size, and so on, that may imply that there is a need for a contingency approach to TQM [23].

Literature reveals that if organisations focus on the management of these critical factors, improvements in quality performance and its reflection in financial results is bound to happen. Wali, Deshmukh and Gupta [32] have made an attempt to synthesize various critical factors given by authors in the form of a table. Although the factors and the approach may vary from author to author, eventually it leads to the same goal i.e. continuous improvement. This is shown in **Table 1**.

Some of the critical factors that have been discussed by researchers are top management leadership for quality, supply quality management, process management, employee training, and employee involvement [32]. TQM implementation involves a blend of hard and soft quality factors. Soft quality factors are intangible and difficult to measure, and are primarily related to leadership and employee involvement. Hard quality factors, on the other hand, refer to systems, tools and tecniques, such as those impact internal efficiency (eg. quality management systems, cost of quality and statistical process control) and external effectiveness (eg. benchmarking and customer satisfaction surveys) [21].

Lu and Sohal [17], based on their study on Australian organisations lists factors that are likely to contribute to the success of TQM implementation. Identification of the strategic direction of the business (i.e. senior management having a clear and uniform understanding of the mission, vision and policies of the organisation) is most important. Determination of customer expectations and measurement of perception (i.e. identification of customer expectations and communicating the same throughout the organisation) is a must. A well defined strategy for TQM implementation (time-frame, resources, training and supportive organisational structure) is also important. Most of the TQM structure consist a steering committee, followed by one or more layers of improvement teams. The steering committee has the responsibility to plan the implementation and monitor the progress. Improvement teams carry out the improvements and report results. It is seen that some organisations invite participation from lower levels of management and shop floor to increase employee involvement. Each improvement team has a sponsor, usually a senior manager. This linkage assures senior management commitment and ownership to the improvement teams. These organisations had their focus on “Train the trainer concept” which required particpants to train their own staff eventually. Installation of quality assurance system (ISO 9000, other standards) and use of external systems played important role in TQM implementation.

Sila & Ebrahimpouri have analysed and compared 76 empirically validated TQM factors and their impact on various performance measures across countries. The findings showed that top management

commitment and leadership, customer focus, information and analysis, training, supplier management, strategic planning, employee involvement, human resource management, process management, teamwork, product and service design, process control, benchmarking, continuous improvement, employee empowerment, quality assurance, social responsibility, and employee satisfaction were the most commonly extracted factors across these 76 studies [27]. These factors are shown in **Table 2**

Authors⟶ / Factors ↓	Juran 1974	Ishikawa 1976	Crosby 1979	Feigen-baum 1983	Deming 1986	Garvin 1987	Saraph *et al.* 1989	Lu & Sohal 1993	Porter & Parker 1993	Motwani *et al.* 1994	Powel 1995	Black & Porter 1995	Total
Employee Relation/ Empowerment	×	×	×	×	×	×	×	×	×	×	×	×	12
Top Management Leadership	×		×	×	×		×	×	×	×	×	×	10
Quality Polices/Process Management	×		×	×	×	×	×	×	×	×	×		10
Quality Measurement System/Quality Data	×	×	×		×	×	×	×		×	×	×	10
Training	×	×	×	×	×		×	×	×	×	×		10
Quality Technology/ Process Design (SQC)	×	×	×		×	×			×	×	×		8
Supplier Quality Management	×				×	×	×			×	×	×	7
QualityPlanning/ Product Design (Service)	×		×	×		×	×			×		×	7
Role of Quality Department	×	×	×		×		×			×	×		7
Team Work Structures								×	×		×	×	4
Customer Satisfaction Orientation								×			×	×	3
Strategic Quality Management								×	×			×	3
Communication of Information									×		×	×	3
Benchmarking								×			×		2
Zero Defect			×										1
External Interface Management/ Environment									×				1

Table 1: List of CSFs as recommended by various authors
Source: Wali, Deshmukh and Gupta, 2003

TQM factor	No. of studies in which the factor was extracted	No. of country categories in which the factor is present
Top management commitment and leadership	67	23
Customer focus	53	21
Information and analysis	53	17
Training	50	19
Supplier management	47	17
Strategic planning	38	16
Employee involvement	32	18
Human resource management	26	16
Process management	26	13
Teamwork	22	9
Product and service design	21	11
Process control	21	8
Benchmarking	16	12
Continuous improvement	16	10
Employee empowerment	16	6
Quality assurance	15	12
Social responsibility	10	9
Employee satisfaction	9	6

Table 2: Most commonly extracted factors across the 76 studies and the 23 countries
Source: Sila and Ebrahimpour, 2003

Kanji & Wong have looked into the relationships between TQM and Supply Chain Management (SCM) [14]. Most of the models in use for Business Excellence as mentioned in this paper are indicative models. Kanji's Business Excellence Model is an improvement model which synthesizes the concepts of TQM implementation and looks at factor relationships, factor indices and business excellence indices. This allows organizations to compare themselves with competing organisations. Kanji has given a holistic way of looking at performance measurement system, which can be used to drive success by focusing organization's efforts on the forces of excellence [15].

Figure 1: The Malcolm Baldrige National Quality Award (MBNQA) (American Model)
Source: Total Quality: Management, Organization and Strategy (1999) by Evans & Dean

By applying the Business Excellence Model, called the Tata Business Excellence Model (TBEM) based on the American Model for Business Excellence Model, MBNQA, and forming it as a part of Corporate Strategy from 1989 onwards, as explained in the context of one of the first steel companies, Tata Steel of Asia, having started in India, in 1907 has become the lowest cost producer of steel in the world in 2001, and is now counted among the top steel companies in the world. This company in the Steel Industry is the only company in the world, which has never made any loss since its inception [10]. Through three Indian case studies, where the Japanese Model for Business Excellence, the Deming Prize and the Application of TBEM, based on the American Model for Business Excellence, MBNQA, Jha [11] has shown how the companies can gain competitive advantage, using the philosophy of TQM in Indian Companies. Jha [13] has argued through the proposition as given in the Criteria for Business Excellence, whether it is the American Model for Business Excellence (MBNQA) or Business Excellence Model based on the European Model based on European Foundation for Quality Management (EFQM) has interlinked the concept of Technology Management ingrained in the Criteria for Business Excellence in the major process of Strategic Planning (MBNQA) and Policy Management (EFQM - [31]). The basic framework of MBNQA is given in **Figure 1.** The basic concerns & issues for the Deming Prize is given in **Table 3** as given below:

1. Policy	6. Standardization

2. Organization and its Management 3. Education and Dissemination 4. Collection, Dissemination and use of Information on Quality 5. Analysis of Data	7. Control 8. Quality assurance 9. Results 10. Planning for the future

Table 3: Broad categories for the Deming Application Prize
Source: Total Quality: Management, Organization & Strategy (1999), Evans & Dean [8]

Furthermore, Saraph et al. developed an instrument consisting of 78 items classified into eight critical factors of TQM. These are: top management leadership, role of quality department, training, product and service design, supplier quality management , process management, quality data and reporting and employee relations [23].

An attempt is made to look at the core values which are common for all the three excellence models as described in the earlier part of the paper. Specifically, the fourth criteria for performance excellence, MBNQA 2007, which is Measurement, Analysis and Knowledge Management is explored in the next part of the paper.

2.1.1 Total Quality Management Strategy Implementation – Measurement, Analysis and Knowledge Management – Concerns and Issues

The criteria on performance excellence as given by three popular models, MBNQA, EFQM and the Deming prize, are built on the following set of interrelated core values and concepts.
These values and concepts, described below, are embedded beliefs and behaviors found in high-performing organizations. They are the foundation for integrating key performance and operational requirements within a results-oriented framework that creates a basis for action and feedback. These are visionary leadership, customer-driven excellence, organizational and personal learning, valuing employees and partners, agility, focus on the future, managing for innovation, management by fact, social responsibility, focus on results and creating value, systems perspective

Measurement , Analysis and Knowledge Management category of MBNQA 2007 examines how an organisation selects, gathers, analyzes, manages, and improves its data, information, and knowledge assets and how it manages its information technology. The category also examines how an organization reviews and uses reviews to improve its performance.

a. Performance Measurement

1. How does an organisation select, collect, align, and integrate data and information for tracking daily operations and for tracking overall organizational performance, including progress relative to strategic objectives and action plans? What are the key organizational performance measures, including key short-term and long term financial measures? How its uses the data and information to support organizational decision making and innovation?
2. How does an organisation select and ensure the effective use of key comparative data and information to support operational and strategic decision making and innovation?
3. How does an organisation keep their performance measurement system current with business needs and directions? How it ensures that performance measurement system is sensitive to rapid or unexpected organizational or external changes?

b. Performance Analysis, Review, and Improvement

1. How does an organistion review organizational performance and capabilities? What analysis does an organistion perform to support these reviews and to ensure that conclusions are valid? How these reviews are used to assess organizational success, competitive performance, and progress relative to strategic objectives and action plans? How does an organisation use these reviews to assess the organization's ability to respond rapidly to changing organizational needs and challenges in your operating environment?
2. How does an organistion translate organizational performance review findings into priorities for continuous and breakthrough improvement and into opportunities for innovation? How are these priorities and opportunities deployed to work group and functional-level operations throughout the organization to enable effective effective support for their decision making? When appropriate, how are the priorities and opportunities deployed to suppliers, partners, and collaborators to ensure organizational alignment?
3. How does an organistion incorporate the results of organizational performance reviews into the systematic evaluation and improvement of key processes?

c. Management of Information Resources

1. How does an organisation make needed data and information available? How does an organisation make them accessible to their workforce, suppliers, partners, collaborators, and customers, as appropriate?
2. How does an organisation ensure that hardware and software are reliable, secure, and user-friendly?
3. In the event of an emergency, how an organisation ensures the continued availability of hardware and software systems and the continued availability of data and information?
4. How does an organisation keep its data and information availability mechanisms, including the software and hardware systems, current with business needs and directions and with technological changes in their operating environment?

b. Data, Information, and Knowledge Management

1. How does an organistion ensure the following properties of your organizational data, information, and knowledge: accuracy, integrity and reliability, timeliness, security and confidentiality
2. How does an organisation manage organizational knowledge to accomplish the following:
    - the collection and transfer of workforce knowledge
    - the transfer of relevant knowledge from and to customers, suppliers, partners, and collaborators
    - the rapid identification, sharing, and implementation of best practices
    - the assembly and transfer of relevant knowledge for use in your strategic planning process

(**Source:** Adapted from Criteria for Performance Excellence, Baldridge National Quality Program – 2007, National Institute of Standards and Technology, USA) [6]

Research studies have identified various critical success factors (CSFs) or critical factors of success for ERP implementation. This is discussed in the next section of the paper.

2.2 ERP-Implementation Issues & Concerns

CSFs can be viewed as few key areas where things must go right for the ERP implementation to be successful. The paper looks at these factors and discusses how adoption of TQM principles and Business Excellence Models result in the creation of improved processes, practices and capacities. These quality

initiatives mandate a transformational change in the mindsets, attitudes and culture and focuses on critical elements like leadership, employee involvement, training and education, teamwork and many others. This critical elements create a foundation which facilitates ERP implementation.
Somers and Nelson [29], have proposed a comprehensive list of 22 CSF's (**see Table 4**), associated with project/system implementation derived through a process that involved identification and synthesis of critical requirements recommended by practioners and academicians. Among the most important factors are top management support, project champion/leader, user training and education, management of expectations, vendor/customer partnerships, use of vendors' development tools, careful selection of the appropriate package, project management, steering committee, use of consultants, minimal customisations, data analysis and conversion, business process reengineering, defining the architecture, dedicated resources, project team competence, change management, clear goals and objectives, education on new business processes, interdepartmental communication, interdepartmental cooperation and ongoing vendor support. The mean for the 22 CSFs in descending order of importance (5=critical, 4=very high, 3=high, 2=moderate and 1=low) is given below in Table 4. Top management support was viewed as most important factor by the 86 Information System executives surveyed for the research.

Critical success factors	Mean	Critical success factors	Mean
1 Top management support	4.29	12. Dedicated resourses	3.81
2. Project team competence	4.20	13. Use of steering committee	3.79
3. Interdepartmental cooperation	4.19	14. User training on software	3.79
4. Clear goals and objectives	4.15	15. Education on new business process	3.76
5. Project management	4.13	16. Business process Reengineering	3.68
6. Interdepartmental communication	4.09	17. Minimal customization	3.68
7. Management of expectations	4.06	18. Architecture choices	3.44
8. Project champion	4.03	19. Change management	3.43
9. Vendor support	4.03	20. Partnership with vendor	3.39
10. Careful package selection	3.89	21. Use of vendor's tools	3.15
11. Data analysis & conversion	3.83	22. Use of consultants	2.90

Table 4: Mean rankings of CSFs by degree of importance in ERP implementation
Source: Somers and Nelson, 2001

An exploratory research study, based on the ranked list of CSFs suggested by Somers & Nelson, as given above in Table 4, was later conducted by Akkermans & Helden. The study investigates, through a single case study, as propogated by Yin, Robert K.[33], the inter-related causality of the ten most important CSFs. ERP systems are meant to integrate different business functions and different organisational departments. It is therefore appropriate to say that communication and collaboration across project team members from different departments, CSFs 3 and 6 of the Somers and Nelson list, are at the core of the ERP implementation process. Not only do these two CSFs go hand in hand, but they also seem to reinforce each other. In the case study of the aviation industry, these CSFs affected each other in a reinforcing manner. For eg. if the quality of the colloboration increases, communication also increase or better communication will lead to better colloboration. This loop, will continue to increase, in an upward spiral of ever-better performance, or become caught, in a never-ending downward spiral of ever-lower performance. The former is known a virtuous cycle, the latter a vicious one. During the project crisis the company, and top management in particular, took several decisions that turned this whole vicious cycle around into a clear success, into a virtuous cycle, which is shown in **Figure 3**[1].

Plant and Willcocks [22], have studied the critical success factors in international ERP implementations. Two different organisation with relevant ERP implementations have been used in the study. The results showed that only three of Somers and Nelson critical success factors (ranked: 1st, 4th and 19th) were

considered prior to the implementation of the ERP implementation. However, post implemnation there was an agreement upon the top four ranked factors as shown by Somers and Nelson.

Figure 3: The Core reinforcing loop in the ERP integration effort
Source: Akkermans and Helden, 2002

Zhang, Lee, Zhang and Banerjee [34], based on the ERP literature review, have classified the hypothesized factors into five categories with 1) organizational environment including top management support, re-engineering business processes, effective project management, and company wide commitment, 2) people characteristics, including education and training and user involvement, 3) technical problems, including hardware and software suitability and data accuracy, and 4) ERP vendor commitment, including vendor support; and 5) cultural impact including organizational cultures.

Nah, Lau, and Kuang [20], have identified eleven key critical factors for ERP implementation success, aiming to give practical suggestions to the companies in broader perspective. These factors were listed randomly, from business strategy to technological issues. The most critical factors are top management support, BPR, project team & change management, and effective communication. The medium critical factors are ERP strategy, consultant and vendor support, and organizational culture. And the remaining 4 factors belong to less critical category. A list of eleven CSFs is given in **Table 5** below.

Today's organizations rely on integrated information systems in order to be productive and efficient. This goal can only be achieved if high standards are maintained for the quality of data and only if virtual technology is used to make the information readily available for decision-making purposes to all members of the supply chain network. While organizations may see their major goal as the integration of the business units and functional departments as a way to achieve better coordination and a more accurate customer profile, quality is in fact tenet of such an integration process [18].

Not all firms have been successful in their ERP implementations and to that end research has helped to identify many factors that might be critical to a successful implementation. Such factors as the use of business process reengineering (BPR), and establishing a total quality management (TQM) culture have all shown to play important roles in ERP implementation [24].

1. ERP teamwork and composition 2. Top management 3. Business plan and vision 4. Effective communication 5. Project management 6. Appropriate business and legacy systems	7. Project champion 8. Change management program and culture 9. Business process reengineering and minimum customization 10. Software development, testing and troubleshooting 11. Monitoring and evaluation of performance

Table 5: Critical success factors in ERP implementation (Source: Nah, Lau & Kuang, 2001)

Markus and Tanis [19], in their research work on the enterprise system experience - from adoption to success, have looked at the characteristics of several important implications for any organization which adopts an ERP system. The important implication of ERP adoption could be issues of integration,

enterprise system package selection and adoption, best practices development and implementation, and the ever evolving system architecture. He also stresses the importance of information system research on ERP due to reasons like financial cost and risks, technical issues, managerial issues, IT adoption, use & impacts and integration of systems within an organization. Boersma and Kingma [3], in their research on developing a cultural perspective on ERP have highlighted three perspectives from which ERP systems can be experienced, defined and analyzed. These perspectives are specified as the "constitution" of ERP, ERP as "condition" of organizations and the "consequences" of ERP. They have looked at how individuals in organizations define and experience ERP standards, how and to what extent management and working positions are redefined in the process of developing and implementing ERP, complementing this perspective with a cultural approach.

Shang and Seddon [26] have examined the deficiencies and sources of deficiencies in process changes associated with implementation of enterprise systems. They have discussed six sources of influence: configurability, in-built processes, multiple options, data and process integration, streamlined processes, and standard processes. Their key finding is that implementation of enterprise system is risky not only because of the strengths and weaknesses of factors such as top management support, user involvement, clearly-defined goals and scope, adequate resources, effective leadership, clear communications, etc. but also because each of these six software-specific factors has the potential to bring either benefits or problems to the adopting organization. Soh, Sia, Boh, & Tang [28], have investigated misalignments in ERP implementation, which arise due to incompatibilities between the embedded structures of ERP and the implementing organization. They found that misalignments are the result of the tensions between the forces of integration and differentiation, process-orientation and functional specialization, flexibility and restrictiveness, and packaged versus organizational domain specificity.

Buonanno, Faverio et al. [4], have worked on factors affecting ERP system adoption. They emphasize the extent of organizational change represents the degree of company transformation as a consequence of a technological innovation. This measure depends on the evaluation of the organizational and economic impacts such as the competence of internal staff or their expected resistance to change to the adoption of new technology.

Enterprise resource planning (ERP) and total quality management (TQM) are practices that continue to have an enormous effect on business. The changes introduced to the company by the ERP system usually affect many internal business units. In order to have a successful implementation, substantial support of top management and involvement of every employee must exist. This is exactly the essence of TQM culture. Without such TQM culture and its methods, the chance for an ERP system to succeed is very slim. TQM triggers an inimitable competitive advantage due to its ability to streamline processes and capacities generating a wealth of distinctive competencies.

ERP is not just a software package; it's a way of doing business for productivity improvement for effective decision making across the whole organization, integrated in the philosophy of TQM. Applying TQM in an organization across dimensions require certain processes and operations to be standardized. Furthermore, the focus of a quality-based paradigm has also shifted from the traditional company-centered setting to complete supply chain systems. This has made quality initiatives and enterprise resource planning complementary activities because of the shared effects that can occur. These complementary elements of quality initiatives and ERP implementation are listed in **Table 6** below.

S. No.	Critical Factors for Success	TQM	ERP
1.	Top Management Commitment/Leadership (Personal involvement of CEO in building organizational culture conducive to business excellence and ERP implementation)	√	√

2.	Effective Teamwork	√	√
3.	Effective Communication and Dissemination (Newsletter, poster, pamphlets and the like)	√	√
4.	Training and Education	√	√
5	Stakeholder Involvement and Empowerment	√	√
6.	Identification of Resources, Structure and time-frame for Implementation (Planned Strategy)	√	√
7.	Measurement and Statistical Analysis	√	√
8.	Change Management (Issue of Culture in Adoption of TQM and ERP)	√	√

Table 6: A Comparison of Critical Success Factors for TQM and ERP Implementation

If maximum benefits are to be derived out of implementing ERP, e-commerce, etc., these have to be brought under the TQM umbrella to ensure that all the linkages are managed in a coherent manner and the best systems and processes are put in place to exploit the new approaches. Today, the implementation of ERP is not successful at many sites due to lack of this integration through TQM [9]. This is supported by the research carried for select Indian companies by Jha, Vidhu Shekhar [12]. In his doctoral thesis, he has amply shown through the case study methodology of research for select Indian companies, which have been applying the concept of TQM as part of their corporate strategy through various popular Business Excellence models available for TQM strategy implementation. ERP implementation becomes an inherent part of the pillars like the leadership process, the strategic planning or policy framework and process management for any Business Excellence model, for gaining competitive advantage.

Customer focus is among the basic principles of total quality management. ERP implementation can facilitate communication with the customer improve organization's ability to capture what the customer is communicating, faster response to customer requests, and increased quality in the services offered to the customer. **Teamwork** involves full participation in business processes in the organization. TQM implementation mandates understanding of the existing processes and the formation of teams to facilitate change. In a successfully realized ERP implementation, all departments better understand the needs of each other. The entire culture of quality environments must also be committed to cooperative **training/learning/teaming** approaches in striving for continuous improvement. Access to information and knowledge about the processes enable the employees to understand the problem and propose solutions. Training in the tools and analytical methods of a quality environment will also be part of team training efforts. ERP implementation requires employee understanding of existing processes so that they can appreciate the technological improvements. Hence understanding of existing processes during quality training enables the employees to develop a better understanding of process changes and redefined roles and responsibilities in ERP implementation.

Any process improvement entails a series of steps that are common with any change movement. Whether it's the quality initiative or an ERP implementation requires a thorough study of the existing processes and entities affected by change. Secondly, a new process is conceptualized and a buy-in is sought from all stakeholders. Next, the technology for setting up the new process is implemented. Then the employees and the other stakeholders are trained on the new system. Apart from factors like resistance to change, gaps in understanding, escalating project cost etc, there can be various impediments during the project implementation. Yet if properly implemented, this can directly impact customer satisfaction and can result in a new success story. One such success story, illustrated here is Sundaram Clayton Limited, which was the first Indian company, which won the Deming Prize in 1998 for its quality initiatives, applying the Japanese Integrate Framework/model for Business Excellence. This is briefly illustrated in the following part of the paper.

Sundaram Clayton Limited: Sundaram-Clayton Limited (SCL) is part of the US $2.6 billion TVS group of companies, the largest automotive component manufacturing and distributing group in India. The focus at SCL is total customer satisfaction. Comprehensive integration of the supply chain through implementation of ERP (Enterprise-Wide Resource Planning) programme has further enhanced SCL's responsiveness. TEI (Total Employee Involvement) forms the base of SCL's quest for excellence through TQM. They understand the importance of the need to continuously honing the expertise of our human resources and learning from the best practices across the world. Training is imparted not only to the employees but also the suppliers. Their policy statement, "Sundaram-Clayton will deliver a level of quality that totally meets customer expectations. Supplying products of the right quality will obtain this customer satisfaction, at the right time, and at the right place. Total employee involvement and continuous improvement in every sphere of activity will be the twin supports on which Sundaram-Clayton quality will stand" spreads across the entire organizational value-chain, including marketing, operations, product development, finance, and personnel. Hence, we see that the SCL's strategic clarity about its long term goals has facilitated its journey towards business excellence. A brief snap shot for the Journey to Excellence at Sundaram Clayton, an Indian auto-component manufacturer, which has become world class is given below in **Figure 4.** The road map for competitiveness is an attempt of integrating various initiatives and the major outcomes of those initiatives, which makes an organization to move towards Business Excellence. This has been clearly illustrated by the **Figure 4**, which was adapted by Sundaram Clayton in their journey to Excellence. [5]. The major benefits derived during the ERP implementation in the excellence journey for SCL are Process and activities standardized as per Japan Institute for Plant Maintenance (JIPM) for their Total Productive Maintenance (TPM) standards, Better control over costs and delivery, Increased integration and collaboration with suppliers & customer and Improved controls and reduced transaction processing time; and operational quality excellence. **Source:** Sundaram Clayton SAP Implementation - Success Story [30]

Emerging winners are taking an integrated view of their supply chain with a clear understanding that connecting and synchronizing the supply chain from end-to-end and beyond can not only create financial benefits but significantly improve relationships with the channel partners including suppliers, intermediaries, third-party service providers, and customers. This includes leveraging ERP software opportunities for procurement, forecasting, replenishment and other supply chain activities to gain competitive edge. One of the primary causes of poor quality is the misunderstanding and inconsistent communication surrounding specifications, expectations, and requirements among supply chain members. One dimension is the buyer's ability to communicate these requirements uniformly throughout the organization. Issues like product specifications, raw material grades, delivery requirements, request-for-proposals, or specific tasks and responsibilities require integration and centralization of information. ERP systems have built in functionalities to integrate and streamline these activities so that consistency and accuracy of the information is maintained.

One of the most important facets of TQM is managing relation with its customers. TQM in its broadest sense is about empowering people to take control of the quality of the goods and services they produce. TQM says that businesses don't buy from businesses; businesses buy from people, and it is the people that make a difference with their attitudes to quality. And this applies all throughout the business, from product development, delivery and installation, and after sales support. Hence buying decisions are not just price-based, but quality of the product, sales and support and relationship with the customer plays an important role. Hence the relationship with the customer is getting more complicated and there is a need to track customers at each stage to serve them better. There is a view that CRM concept emerged from TQM concept. To manage quality relationships, ERP applications facilitate keeping a tract of customer contacts, their requirements, and complaints for personalizing responses. The model integrating, the philosophy of TQM, CSFs, Business Excellence Models for TQM implementation, ERP implementation, as explained in this paper earlier, is shown **in Figure 5**.

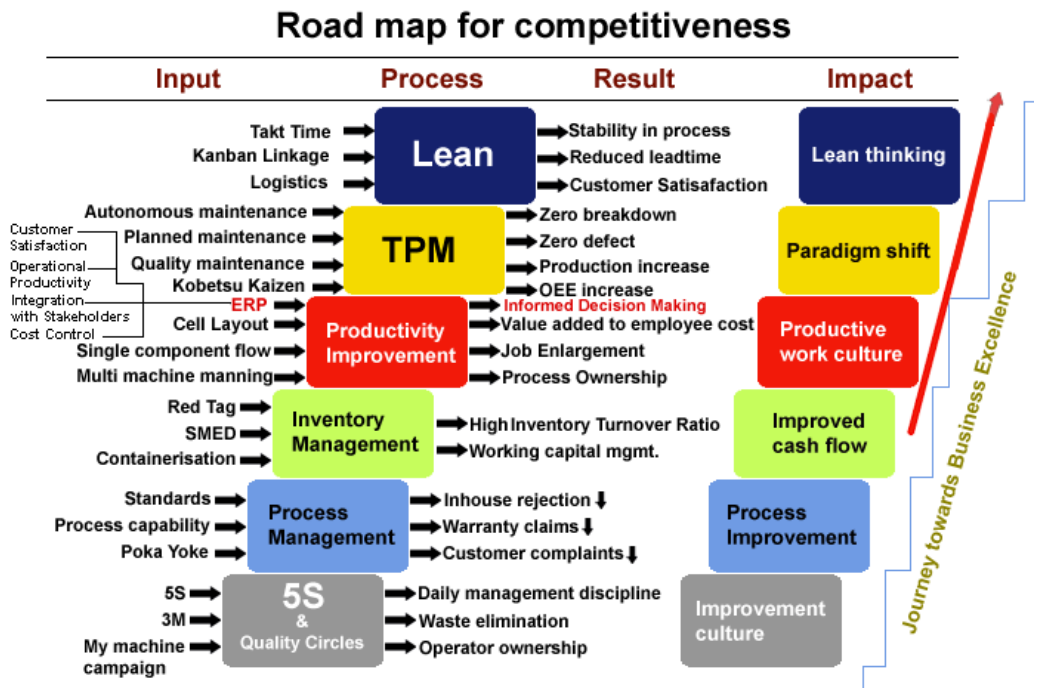

Figure 4: Road map for competitiveness as applied by SCL (Source: "Model for Competitiveness", Confederation of Indian Industry (CII) Institute of Quality, Bangalore, India)

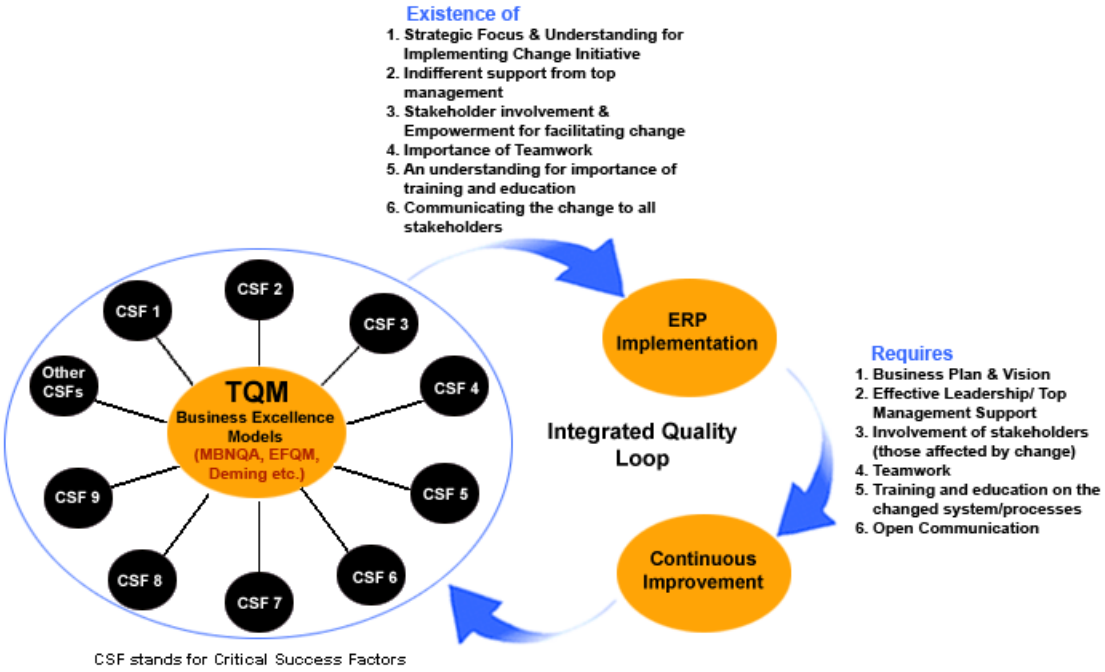

Figure 5: Relationship of TQM in ERP Implementation in Organizations – Towards formation of a Quality Loop

Hence we can see that TQM philosophy-as a corporate strategy, and applying any model for Business Excellence for Strategy implementation can facilitate ERP implementation as both are approaches require development of capacities for company-wide changes. Once individual and organizations develop elements of management like leadership, teamwork, stakeholder empowerment and involvement, resource

allocation and measurement/metrics etc., the result is the creation of a mindset and approach, which can facilitate any future change management. This results in the formation of an Integrated Quality Loop. This loop comprises of individuals and teams who have the capacity to internalize the concept and view the entire business as a continuous quality loop, or process, with the customer as its initiator. ERP systems play an important role for high-level management and coordination of procedural quality functions.

3.0 Conclusion

An attempt has been made through this exploratory research to emphasize the relevance of TQM or Business Excellence Strategy implementation for facilitation of ERP implementation. Organizations can realize the full benefits of TQM through successful integration of several improvement activities, each of which addresses a key element of the TQM philosophy. These organizations share several common characteristics or develop common elements of management, which enable them to realize the true potential of TQM over a longer period.

TQM brings problem solving techniques and continuous improvement opportunities, which facilitate implementation of ERP systems. The effective use of TQM helps companies obtain the maximum return on investment. Therefore organizations adopting TQM philosophies in the true spirit of understanding the TQM philosophy as part of their corporate strategy and applying any model for Business Excellence for TQM Strategy implementation will result in reducing the cost of ERP implementation and will give a solid foundation of required enhanced human capacities and capabilities, conducive organizational culture, optimal utilization of all resources and improved processes. This will facilitate the change and transformation in an organization and enable them to move towards Business Excellence. For those businesses that have not yet started applying the TQM philosophy as part of their corporate strategy, need to integrate ERP implementation as part of their TQM Strategy for moving towards Business excellence to gain competitive advantage.

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