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Exploring total quality management for information systems in Indian firms

Application and benefits

Z. Rahman
Department of Management Studies, Indian Institute of Technology, Roorkee, India, and
J. Siddiqui
Department of Computer Science, Aligarh Muslim University, Aligarh, India

Abstract

Purpose – Considering IS as an integral part of the Indian firms under the purview of this study the paper seeks to investigate the TQM-IS relationship. Describing total quality management (TQM) on the basis of five principles: top management commitment, customer-centric advancements, benchmarking, relentless improvement and strengthening the employee base, it aims to analyze the realization of pragmatic goals by Indian firms through TQM for IS.

Design/methodology/approach – Data collection was done by mail survey questionnaires. The data set was intended to represent a large variance in their annual turnovers, worth of assets, IS budgets and the segment of the industry to which they catered. Addressed to the top executive In charge of the IS department the survey questionnaire was mailed to 300 Indian companies assumed to be making use of TQM in their information systems department. The questionnaire recipients were selected from a wide array of business areas and the firms belonged to different classes such as insurance, banking, software, manufacturers, etc.

Findings – It was found to be catching fast in India as a synergy between TQM and IS accrues benefits for improving the quality of products and services – the most common ones being greater customer satisfaction, increased productivity of IS personnel and enhanced quality of services and products. However, the other benefits such as cost and time cutting on production and optimization of human resources too are rated well. Best implementation success was received in the principles of customer-centric advancements and employee enrichment by strengthening the employee base.

Practical implications – This shows that TQM has the capability to entice the primary as well as the secondary customer. It was found that the most important factor on which TQM implementation benefits rely is the top management support. The key influencers of TQM benefits were customer-centric advancements and top management's support.

Originality/value – Despite the limitations of respondent bias in the methodology the findings are in compliance with other relevant studies and it is argued that the study is of global applicability.

Keywords Total quality management, Information systems, Technology led strategy, Competitive advantage, India

Paper type Research paper

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1. Introduction

An effective model of success for companies is total quality management (TQM henceforth), which is a customer-centric, set of management policies that deliver quality to maintain a sustainable competitive edge. Where dynamics of business

environments are acquiring new paradigms by the moment organizations need to remain on constant vigil over the quality of products and services. A model that cuts across sectors, TQM takes care of the basic components of business processes. It can also be effectively applied to Information Systems as they permeate over most structural and functional attributes of organizations. Computer-based information forms the baseline for many managerial decisions, business strategies, policies and mission of an organization and this is where TQM realizes its optimal value.

1.1 TQM – concept and framework

TQM is a management philosophy that makes use of a particular set of principles, practices and techniques to expand business and profits. Because unequivocally, increased market share is a direct consequence of better quality that provides a bypass to enhanced productivity by avoiding rework, rejects, waste, customer complaints and high cost (Deming, 1986). It is based on five basic pillars as outlined by Anderson *et al.* (1994), Dean and Bowen (1994) and Waldman (1994):

(1) *Top management commitment.* It works effectively for all quality improvement programs with a compounded trickle down effect as the executive spends the greatest time in formulating such measures.

(2) *Customer-centric advancements.* Considering the customer (both internal and external) as a potential partner, ultimate trendsetter and the recipient of all quality enhancement initiatives by identifying its needs, taking feed back and building a long trustworthy relationship.

(3) *Relentless development.* It instills an ambition in employees so that they continuously strive to surpass themselves working within the organizational framework and finally setting goals and deadlines (Lynch and Werner, 1992). Yet TQM believes in gradual and incremental change rather than radical innovations, which are more likely to leave some aspect of a process or product quality unaddressed.

(4) *Benchmarking.* It involves structured problem solving and identifying processes and finding opportunities for improvements and future developments. There are several specific tools and quality-adding techniques as mentioned by Hackman and Wageman (1995) and Zahedi (1995) such as quality function deployment, Pareto charts, statistical process control charts, cause and effect diagrams and affinity diagrams. Benchmarking, however, comes with the basic objective of minimizing variance or deviation of achieved success from the established quality standards.

(5) *Strengthening the employee base.* The basic tenet here is that perpetual development can be achieved not only by enriching the employees with knowledge, learning and training but also by entrusting them the power to take decisions.

1.2 TQM viz-à-viz *IS*

Application of TQM principles applied to IS can be quite fruitful in improving the quality of products and services for the end customer as it helps in decelerating wasteful expenditure in technology for the sake of technology (Ayers, 1993).

Abandoning the stereotype mindset that IT/IS is just a tool for performing several tasks faster and cheaper top management initiatives can streamline procedures to make information more accessible by reducing costs, eliminating bottle-necks and responding to the customer's needs without wasting any time (Reese, 1995). ISs can be used to measure, identify, monitor and design such product and service attributes that are of value to the customer by the IS professionals. Dedication to systematic formal improvement of software pays for it self in quality and efficiency enhancement. This includes standardization and simplification of processes for limiting variability by IS, and being focused on the systematic process (Kiely, 1993). IS organizations can make extensive use of benchmarking in maximizing data center efficiency and cost control (Criner, 1994; Freedman, 1992) by documenting, analyzing and measuring all activities performed by an IS organization. Only teams can accrue the magic of TQM so group living and productive liaisons amongst IS employees needs to be encouraged. Abetting innovation and creativity in them, imparting IT skills, developing a culture of communication, encouragement and excellence, recognition and reward – all contribute to quality improvement (Shrednick, 1992). But care should be taken not to force employees to adapt to new developments in IS (Prince, 1993).

If the above principles are successfully implemented TQM may benefit IS (Carroll and Swatman, 1997; Pearson *et al.*, 1995) by improving quality and productivity, building conducive atmosphere for staff and management, accruing customer satisfaction; and strategic benefits such as increased alignment with corporate culture and organizational objectives and better targeting of business values.

2. Rationale

It was reckoned by the perusal of past publications that organizations have had unqualified success in pursuing quality management on account of multiple failures such as compound focus of programs leading to dilution of results. Also it has been felt that IS professionals are still hesitant and apprehensive about adopting TQM in software engineering as a consequence of a general misunderstanding of its practices and principles (Zadrozny and Tumanic, 1992). A special emphasis on IS in this paper is aimed at clarifying upon these misunderstandings. We also wish to elaborate upon the ways in which IS can make use of TQM in India.

3. Objectives

To defend the given hypothesis based on the philosophy of TQM and its applicability to IS the specific objectives of this study are to explore the following areas in the sector of IS functions of India:

- the awareness usage and length of experience of TQM in IS;
- the extent of top management support for TQM in IS;
- the extent of benefits realized by TQM;
- the extent to which the TQM principles are applied to IS;
- relationship between IS-TQM realized benefits and top management support; and
- relationship between the IS-TQM realized benefits and TQM principles implemented.

4. Study area

After a spending half a century of protectionism in the economy during the last decade India opened itself to the liberalized market. Acquitted of stiff regulations in business strategy, the manufacturing and service industries have made a significant contribution to the phenomenal economic growth made by the nation in the global market. However, it has been realized that the national market has suffered deterioration in some areas due to a lack of competitive sustainability. For example, the influx of foreign goods – Chinese locks for instance, has caused a serious blow to the native lock industry. Similarly in many other sectors the Indian products and services are losing out to competition with imported goods, as they are either more cost effective or better in quality. Further more as the Indian customer becomes more and more brand savvy – largely owing to the media exposure, quality consciousness is doomed to increase and if quality issues in the Indian industry are not addressed in time, competition might result in elimination.

This new wave of quality awareness has had an impact on business operations in India forcing the industry to take a paradigm towards being high-quality producers rather low-cost producers. As a result lately Indian firms have increased investment on quality management imperatives rather cost-cutting alone, as they have realized that competition solely on the basis of cost is extremely difficult. Now that some firms have awakened to the need of quality improvement and adopted TQM as the remedial measure it is time to evaluate the success of their achievements and quantify the goals realized by them in practicality.

5. Methodology

5.1 Data collection

Similar studies conducted in various sectors abroad (Pearson *et al.*, 1995; Ahire *et al.*, 1996; Cheon and Stylianou, 2001) were consulted and due modifications were done to suit the Indian firms and information systems departments to design a questionnaire that could derive information and opinions from organizations. Data collection was done by mail survey questionnaires. The items were written in the form of statements to which the respondents responded using a seven-point Likert-type scale (ranging form strongly disagree to agree).

The data set was intended to represent a large variance in their annual turnovers, worth of assets, IS budgets and the segment of the industry to which they catered. Addressed to the top executive in charge of the IS department the survey questionnaire was mailed to 300 Indian companies assumed to be making use of TQM in their information systems department. The list was procured from the BT-500 list of top Indian companies published by *Business Today*. A follow up questionnaire was mailed to those who did not respond up to eight weeks and another follow up was sent after a no-reply for 12 weeks.

Out of the total questionnaires dispatched only 134 came back with responses, however, after sorting out duly it was found that 14 of them were rendered unreliable due to ambiguous answers. Finally 120 responses (40 percent) were included for analysis and drawing an inference. The questionnaire recipients were selected from a wide array of business areas and the firms belonged to different classes such as insurance, banking, software, manufacturers, etc. The received bulk of responses also represented this spectrum chosen for the study.

5.2 Data analysis

Usable responses were sorted out from the bulk of responses received. Non-response bias was checked by comparing the answers provided by the first respondents with those provided by respondents following the second and third mailing (Fowler and Jeffs, 1998). This could be done safely because analysis indicated that there is no significant difference at the level of $P => 0.05$ among these three groups with respect to their total sales, number of employees, IS budgets and number of IS employees. As an added advantage this lack of non-response bias implies that the results obtained from this study sample can be implied to a larger set of population too.

6. Results

6.1 Comprehension level of TQM amongst IS managers

Table I illustrates that all the 120 managers who responded to the survey had heard of TQM. However, their levels of familiarity and awareness about the process varied from a range of 3.3 percent (very little)-37.5 percent (somewhat). This indicates that a larger portion of the group had quite a fair idea of the TQM principles. It further reveals that their perception about the impact of TQM on IS was also on the positive side, i.e. almost two-third of the group believed that TQM contributed positively towards IS improvement.

6.2 Length of TQM in IS experience

Responses depict (Table II) that all the 120 respondent firms – 100 percent, were making use of TQM in IS, however a miniscule (3 percent) of them have a long drawn experience (more than five years) of TQM in IS. The largest percentage (43 percent) is

Comprehension level		Frequency		Percent	
Heard of TQM	Yes	120	120	100	100
	No	0		0	
Familiarity with TQM principles	Very much	15	120	12.5	100
	Much	30		25	
	Somewhat	45		37.5	
	A little	26		21.66	
	Very little	64		3.33	
Concept of effect of TQM on IS	Very much	14	120	11.6	100
	Much	66		55	
	Moderate	32		26.6	
	A little	8		6.66	
	Very little	0		0	

Table I.
Comprehension level of TQM amongst IS managers

Length (year)	Frequency	Percent
Less than 1	39	32.5
1-3	52	43.33
3-5	25	20.83
Above 5	4	3.33
Total	120	100

Table II.
Length of TQM in IS experience

of those firms, which have been exploiting TQM for more than a year but less than three years. About 21 percent are senior to this group by one or two years and 32.5 percent are yet to mature to a years' experience.

6.3 TQM benefits for IS

As already mentioned in the methodology respondents were asked to rate the TQM benefits for IS on a seven-point Likert-type scale ranging from disagree to strongly disagree. Most respondents felt that the most desirable benefit of TQM for IS, is increased quality of services and products followed by a greater productivity of IS professionals (Table III).

6.4 Implemented TQM principles

The questionnaire contained a Likert-type seven-point scale ranging from disagree to strongly agree regarding the implementation of the five principles of TQM in IS. The respondents measured the success achieved in this implementation on the scale. It was found after analyzing the opinions that the most effectively used TQM principles were those of customer-centric advancements and employee enrichment by strengthening the employee base (Table IV). However, when implemented to IS other TQM principles also did fairly well.

6.5 Relationship between top management and TQM benefits

Of the 120 responses received 58 percent ($n = 70$) felt that TQM for IS receives strong support from the top management in their firm and 42 percent ($n = 50$) in their firms TQM for IS receives somewhat less or very little support from the top management. Relationship analysis was done by subdividing the respondents opinions into two categories – high for much and very much; and low for little and very little.

TQM benefits	Mean	Standard deviation
Cost cutting on maintenance of applications	4.6333	1.3014
Increased IS management control	5.2175	1.0041
Superior quality of services	5.3245	1.1147
Greater customer satisfaction	5.2126	1.1834
Enhanced IS professional productivity	5.0999	1.0738
Slashed time consumption on production	4.2133	1.1873
Improved quality of products delivered	5.2526	0.9768
Optimization of human resource use	5.0106	1.1867
Flexibility in reaching out to customer	5.1349	1.2013

Table III.
Benefits of TQM for IS

Implemented TQM principles	Mean	Standard deviation
Conviction of top management	4.8563	1.1432
Customer-centric advancements	5.3675	1.1046
Relentless improvement	4.8823	1.2768
Strengthening of employee base	5.2363	1.1134
Benchmarking	4.7342	1.3391

Table IV.
Degree of implementation success with TQM principles in IS

Subjecting to the test of goodness of fit revealed that there is a significant difference between benefits accrued from TQM through strong management support and those of less management support (See p-value in Table V). Hence, it can be concluded that top management commitment to TQM is a decisive factor of TQM benefits for IS organizations.

6.6 Implementation of TQM principles and benefits realized

The simple regression analysis was performed to test the significance of the relation ship of each TQM principle implemented and TQM benefits realized. The key motive of each test was to see if the simple linear equation is significant or the observed frequencies are just a matter of chance. Analysis revealed that each equation was significant at 0.05 level with R^2 ranging from 0.30 to 0.35.

The results of all possible regression analysis shows that two independent variables provide the key impressions for TQM benefits of IS organizations – these are customer-centric advancements and support of top management. Therefore, from Table VI we may conclude that the successful implementation of TQM principles and realization of benefits relies on these two important factors of critical value. Hence, the null hypothesis that the frequencies of different observations for TQM principle implementation are chance observations and there is no working mechanism behind them is rejected.

7. Discussion

7.1 Limitations

The results have been promulgated on the basis of opinions expressed by one individual of a firm hence, any difference of opinion between individuals of the same company has not found scope of representation as well as multiple opinions from a firm have not been entertained. There may be respondent bias as data is opinion based and not numerical based. We assumed at the beginning of the commencement that the respondents have a fair understanding of TQM philosophies and hence we did not include any statements that test the comprehension level of the respondents about TQM. These lacunae in the methodology leave future ground for explorations and research on the subject.

Table V.
Relationship of top management support and TQM benefits

Variable	Top management support	Mean	T-value	p-value
TQM benefits	High ($n = 70$)	5.6234	3.186	0.0023
	Low ($n = 50$)	4.1867		

Table VI.
Relationship between implemented TQM principles and TQM benefits

	TQM benefits realized		
TQM principles implemented	T for H_0: parameter $= 0$	p-value	R^2
Conviction of top management	4.476	0.0001	0.3527
Customer-centric advancements	4.378	0.0002	0.3271
Relentless improvement	3.324	0.0005	0.3043
Strengthening of employee base	4.276	0.0002	0.3297
Benchmarking	2.547	0.0328	0.1189

7.2 Global applicability

Since this study was conducted in India when almost the entire market had adopted itself to globalization it will not be out of place to suggest that the research findings also have global applicability apart from being of use to the academics and business environment of India. If not to the well-advanced west at least for neighboring countries such as Pakistan, Bangladesh, Nepal, Maldives, Sri Lanka, Bhutan in the SAFTA (South Asian Free Trade Association) these findings are well applicable because they have a similar cultural and traditional milieu. The applicability may even radiate to the not so far off Middle East and the Polynesia.

7.3 Compliance with previous work

Comparison with other published work reveals similarities in the outcome. For example, Howard and Foster (1999), Hua *et al.* (2000), Rao and Raghunathan (1997) and Sohal (1998) also support the importance of top management commitment for TQM implementation. Our findings are also in agreement with the publication of Pearson *et al.* (1995) with regard to the extent of TQM awareness amongst IS professionals. Dahlgaard *et al.* (1998) however imply that a significant gap remains between the success with TQM for IS in the west and the east. But there too additional emphasis on top management commitment and employee strengthening by on the job training and education is stressed. If the gap is only in the extent of success and adaptability and not regarding a basic philosophy or trend then it is only matter of time when business traditions in the east too will incorporate TQM as an integral element as in the west.

8. Conclusions

On the basis of the study results, we might state that TQM for IS organizations is catching up fast amongst Indian organizations because 100 percent respondents had heard of TQM. Also the greater portion of the sample (more than two-third) was familiar with TQM and were convinced that it has a good impact for IS organizations. Further detailed quest reveals that organizations in India are adopting TQM readily as most of them have several years of experience with TQM for IS. We may argue based on this finding that in future more and more companies will subscribe to the philosophies of TQM. This readiness may be attributed to the benefits of TQM realized by IS functions. The most common ones being greater customer satisfaction, increased productivity of IS personnel and enhanced quality of services and products.

However, the other benefits such as cost and time cutting on production and optimization of human resources too are rated well as TQM benefits. This shows TQM is taken in a good light for the allover performance of the company. Amongst all the TQM principles described earlier the best implementation success was received in the principles of customer-centric advancements and employee enrichment by strengthening the employee base. This shows that TQM has the capability to entice the primary as well as the secondary customer. In depth relationship analysis of TQM implementation and TQM benefits depicts that the most important factor on which TQM implementation benefits rely is the top management support. Most of the respondents felt the degree of success achieved in implementing TQM has a strong relationship with the commitment and support provided by the top management, as it is the fountainhead for all key policies of the firm.

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Corresponding author

Z. Rahman can be contacted at: yusuffdm@iitr.ernet.in