iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 7 **Issue:** VIII **Month of publication:** August 2019

DOI: http://doi.org/10.22214/ijraset.2019.8097

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.177
Volume 7 Issue VIII, Aug 2019- Available at www.ijraset.com

Analysis of Total Quality Management (TQM) Barriers on its Performance using TOC

Rakesh Kumar[1], Prof. R.S. Mishra[2]
[1]*Ph.D Scholar,* [2]*Professor, Department of Mechanical Engineering, Delhi Technological University, Delhi, India-110042*

Abstract: ***This study examines and analyzes the TQM factors which act as barrier and affects its performance. TQM view the organization as a collection of processes that must be continuously improved through utilization of the knowledge and experience of associates in all functions and at all levels. The industries must be more focused on understanding their own structure in terms of production/ service processes. Theory of Constraints (TOC) focuses on the weakest ring(s) in the chain to improve the performance of process systems. In this situation, TOC becomes an important problem structuring and solving methodology which changes the way of thinking of decision makers. This paper includes the extensive literature review on Theory of Constraints and suggested that how the same approach to analyze the performance of the Total Quality Management system.***

Keywords: Performance measurement, Theory of constraints (TOC), TQM.

I. INTRODUCTION

In today scenario of the industrial increasing competitiveness and cutthroat competition to capture wide market has led to the introduction of unconventional manufacturing management strategies such as just-in-time (JIT), material resources planning (MRP), Six-sigma quality control (SSQC), Lean Manufacturing and the theory of constraints (TOC). The basic concept of Theory of Constraints, shortly known as TOC assumes that the performance of the organization or say organizational system is adversely affected by constraints present in the system. Within the organizational system process, various functions are performed that are part of aiding the increase within production. The TOC then develops an explicit approach to manage these constraints to maximize throughput with continuous improvement. That's why it was also called that TOC is a multi-faceted systems methodology that has been progressively developed to assist people and organizations to think about problems, develop breakthrough solutions and implement those solutions successfully. The TOC defines a constraint as, *"Anything that prevents the organisation from achieving higher performance versus its goal"*. So, in the case of a profit-making organisation this centers on what limits. The TOC claim is that there are few constraints to any system preventing it from achieving its goal. Although TOC originally focused on physical resource constraints the underlying constraints are commonly policy, or deeper paradigm constraints. TOC uses cognitive mapping to verify this assumption where necessary, but there are many other authors who acknowledge the importance of underlying core problems that constrain system improvement. The main objective of this study is to identify the critical factors which behaves like bottleneck is required for TQM implementation in the organization, and these factors act as the critical chain. TOC is a complex methodology requiring skill and cooperation to implement. The past literature about the link between TQM practices and organization performance gives contradictory results. So the purpose of this study is to develop a conceptual framework and a research model showing the relationship between TQM implementation and performance measures of organization. Most of the previous works show that TQM has significant relationship with firm's performance. However, the examining of moderators is less given in previous work, which mediators are known generally as general tools and techniques without specific focus on types of improvement. And also to determine the effects of moderators TPM, SPC, Lean such as which improve the relationship between TQM practices and firm's performance.

II. LITERATURE REVIEW

In past TOC has developed rapidly in terms of both methodology and area of applications. Dettmer (1995) in his literature compared the system approach taken by TQM and TOC. He argued that TQM views the system in terms of discrete processes and then optimizes the quality in each process, whereas TOC improves performance by concentrating on the weakest link in the total system. It is apparent, however, that without subsequent identification of the weakest links, and application of the philosophy to these groups or processes within the organization, major improvements cannot be achieved. Dettmer further described the CRT technique of TOC is as functional rather than organizational and as such is blind to internal and external system boundaries.

©IJRASET: All Rights are Reserved

The TOC is providing a method of focusing improvement on the critical areas, and thus has the potential for much faster improvement towards a more global goal. The TOC can also contribute by emphasizing methods of dealing with change. The main obstacle for broader implementation of TQM in many industrial organizations, the need to win over those who do not believe in the method and who find it difficult to wait for TQM payoffs when they are battling daily problems.

The TOC provides some answers to these problems by contributing the Socratic thinking process for dealing with change, and potentially creating ownership and commitment throughout the organization. The focus on the weakest links helps also in hastening the improvement and generating more apparent results at a quicker pace. To address the policy constraints and effectively implement the process of on-going improvement, Goldratt (1990, 1994) develop a generic approach called the "thinking process" (TP).

Literature concerning TOC in different manufacturing system, like, JIT and TOC buffering philosophies are compared and suggested that improved system performance stems from the strategic placement of buffers in DBR(Drum-Buffer-Rope), which maximizes protection of the constraint from variation rather than attempting to protect each individual station is given by Watson, K.J.et.al (2008). Spencer, M.S. et.al (1995) also supported through his paper that DBR technique of TOC can be used to improve current production operations.

Gupta, S., (1997), Perez, J.L. (1997) and Watson, K.J. et.al (2003) advocated for the same technique of TOC for managing the supply chains systems. Boyd and Gupta (2004) established TOC as a theory by identifying the underlying construct "throughput orientation" along with its three dimensions: Mindset, Measures and Methodology. The thinking process tools of TOC provide techniques for identifying and solving root problems – which is a stated aim of TQM practices. Cox et al. (2003) provided some real-life examples of the applications of the TOC thinking process tools to quality problems.

A. TOC Method to Address TQM

A number of authors and quality experts consider that TQM principles and practices are universally applicable to any organization (Deming, 1982) regardless of the organisational contextual factors (e.g. size, technology, culture or external environment) (Zhao et al., 2004). Despite the claimed benefits of TQM, the relevant literature points to many research studies that indicate a high rate of failures in the process of implementing TQM practices, due to barriers that hinder its implementation (Sila, 2007; Soltani and Wilkinson, 2010).

TQM, Six-sigma, Lean Manufacturing, TOC all these strategic tools aiming similar manner, but with distinct flavor. These quality improvement tools first create its own virtual system in the existing system where it has to be implemented with active participation of the employee. In our further analysis of the relationship between TQM and TOC we will use the following definition of TQM (Dahlgaard et al., (1998): TQM is a company culture characterized by increased customer satisfaction through continuous improvements, in which all employees actively participate.

Researchers exploited these strategic tools far away from its actual usages. Like Six-sigma was initially developed by Motorola in later 80's for the product centric defect reduction and quality improvement tool, later it was experimented and successfully implemented in various areas.

Schonberger (2008) points out that the objective of Six Sigma programs is to create a higher perceived value of the company's products and services in the eyes of the customer. Six Sigma is a well-established approach that seeks to identify and eliminate defects, mistakes or failures in business processes or systems by focusing on those process performance characteristics that are of critical importance to customers (Snee, 2004).

Ehie and Sheu (2005) were able to integrate the theory of constraints with the DMAIC concept for achieving continuous quality improvement. Similarly, Lean manufacturing is designed for the process improvement as well as reduction/elimination of the existing waste, and further it also applied in the field which were substantial.

TQM is a wide concept since it embraces the whole organization and its processes instead of focusing on the product. It is also considered by many to be a holistic approach, which seeks to convert the culture and structure of the organization into a total commitment to quality (Barad, 1996). TQM is generally considered to be based on a number of core values such as customer focus, decisions based on facts, process orientation, continuous improvement, everybody's commitment and leadership; see Hellsten and Klefsjo (2000).

©IJRASET: All Rights are Reserved

Table I: Linkage of Barriers to TQM

Factors	Barriers
Support Quality	• Lack of Leadership commitment • High turnover of management level • Company work culture is not synergetic with company goal and objectives • Difficult to change employee mindset about quality • Lack of information about quality
Support Internal Communication	Lack of coordination amongst departments
Provide quality resources	Lack of sufficient funds to mobilize TQM driven activities
Use competent personal	• Poor education levels of workers • Low morale (absenteeism, industrial action etc.) • Lack of skill of workers • High worker turnover • Indiscipline (non-conformances with procedures)
Support Competence	• Insufficient Training about quality • Management related training is not achieving organizational training targets
Provide quality Infrastructure	• Poor condition of machine • Ineffective maintenance programs • Poor condition of equipment spare part procurement
Control Purchasing Process	• Raw material does not confirm with the specification • Spontaneous delivery of raw materials • Difficulty in procurement of raw material

The core idea of TOC is that every system has at least one constraint that prevents from achieving the goal to a larger degree. Constraints can be physical resources or policies. TOC develops a set of procedures and methodologies to identify and optimize such constraints. In this paper TQM is considered as a system under the organizational system and the barriers are considered as the constraints, which hinders the quality goal. And the well-known fact is that the success of the system depends on everybody's participation (one of the core principles of TQM).

The Theory of Constraints is based on five steps.

1) Identify the system's constraints(s)
2) Decide how to exploit the system's constraint(s)
3) Subordinate everything else to the above decision
4) Elevate the system's constraint(s)
5) If, in the previous steps, a constraint has been broken, go back to step 1, and do not allow inertia to cause a system's constraint.

The system's constraint is that part of the system that constrains the objective or goal of the system. The issues with TOC is that the constraints must be kept operating at its full capacity, if not then entire process slows further. The organization where TQM is implemented, and the barriers/hurdles/constraints even if identified must be kept operating to maintain the pace of the production. Upstream operations must provide only what the constraint can handle and downstream operations will only receive what the constraint can put out. Total Quality Management System is system of any organizational systems. It is known that System of systems is a collection of task-oriented or dedicated systems that pool their resources and capabilities together to create a new, more complex system which offers more functionality and performance than simply the sum of the constituent systems.

The failures in implementing TQM are typically attributed to organisational contingent, situational or contextual factors such as unsupportive organisational culture, resistance to change, lack of resources, or uncommitted leadership (Zhao et al., 2004; Sadikoqlu and Zehir, 2008). It is also said about TQM that it is system that starts with consumers and ends with them. So successful implementation of TQM improves organizational performance and leads to high degree of satisfaction to customers and employees.

©IJRASET: All Rights are Reserved

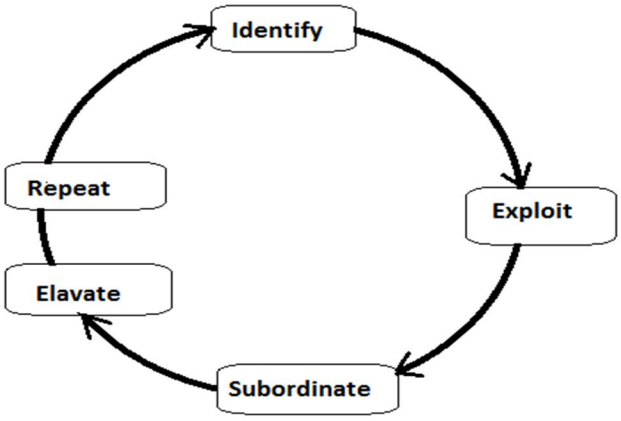


Figure1. Five aiming steps of the TOC

TQM systems include the procedures for quality planning strategy and operations, for setting capital and operating budgets, for measuring and rewarding performance, and for reporting progress and conducting meetings. many companies introduced total quality management as a new management system. But while TQM enabled firms to focus more effectively on process improvements, the ability to implement strategy across organizational units remained elusive. Companies' management systems were still tactical and operational, not strategic. In terms of the TQM system's constraint is the existing barriers. The whole performance of TQM system depends on successful run of the TQM drivers and enablers and the TQM driver depends on the TQM capability. Consequently, it is essential to keeping in view the quality goals. In Step 1 this needs to be identified. By identifying these barriers, company management can increase their understanding of implementation failure and the subsequent removal of these barriers can lead to the possibility of successful implementation. Thus, any company that was rated as high performing was evaluated as moving toward successful implementation of TQM practices. Activities to remove barriers for consensus encompasses a wide range of activities including leadership, decision-making tools, and other tools or tactics to restructure culture and/or to re-motivate employees to the TQM paradigm. As it is a system, then the maximum possible utilization needs to be achieved. This may mean to eliminate those factors which were identified as obstacle for the accomplish the quality improvement procedure as soon as possible or reducing the number of barriers. It will mean ensuring that there is always analysis of the system to do. Thus the system's constraint is exploited (Step 2). If this is the constraint, then there is no point running the enablers: so every other TQM tools needs to be subordinated to remove the bottleneck if still present (Step 3). To achieve the goal/ objective, the system's constraint may need to be `eliminated' or minimized. The enablers, the capacity of the system, has been increased, or `elevated' (Step 4). The application of Step 4 may have changed the system's constraint. With its increased drivers, the original bottleneck may no longer be constraining the system, so the new bottleneck needs to be identified, and the process repeated (Step 5). Thus, this is a process of continual improvement.

B. TOC Strategies

The core premise of TOC is that any organization or system's performance is limited most by a "constraint" — the thing that most blocks throughput. Identifying the nature and location of the system's constraint is the key to continuous system improvement, stated by Srikanth et al. (1997). TOC is a data-driven approach like other continuous improvement processes uses Identify the system's constraints, decide how to exploit the constraint(s), Subordinate everything else to the above decisions, Elevate the constraint(s) and Don't let inertia become the new constraint - go back to step 1, but do not allow previous decisions made in steps 2 to 4 to become constraints because TOC views constraints as positive, not negative. Because constraints determine the performance of a system, a gradual elevation of the system's constraints will improve its performance. According to Dettmer (1995), he compared the system approach taken by TQM and TOC. He argued that TQM views the system in terms of discrete processes and then optimizes the quality in each process, whereas TOC improves performance by concentrating on the weakest link in the total system. Whether organization manages stand-alone or multiple projects, whether those projects are small or large, whether customers are internal or external, or whether the nature of the work performed is product development, construction, design, IT, or service; most projects are difficult to manage because of two things:

©IJRASET: All Rights are Reserved

1) They involve uncertainty, and
2) They involve three different and opposing commitments: Due date, budget, and content

The main strategies of TOC along with tasks and its descriptions summarized in Table II.

Table II

TASK	Description
Identifying "What to Change?"	Organization must effectively address the underlying root causes that lead to the problems.
Identifying "To What to Change To?"	To address these root causes and coping mechanisms, a comprehensive solution must be provided. The solution includes: 1) a robust planning process, 2) a more effective scheduling process, 3) a methodology for introducing work that actually leads to increased capacity, 4) execution processes that provide excellent project control, visibility and decision support, and 5) work behaviors that are more conducive to good project performance.
Identifying "How to cause the change?"	The right people must be brought into the picture at the right time, in just the right way. The process must move slowly enough to permit identification of essential changes, yet fast enough that it does not lose the momentum that is necessary to sustain continued progress.

III. CONCLUSION AND FUTURE RESEARCH

The performance of the Total Quality Management (TQM) System is the responsibility of every person involved in all activities related to the company. As in this work TQM considered as a management system for a customer-focused organization that involves all employees in continual improvement. This paper combines the powerful and practical management theories – theory of constraints over TQM. When applied this concept enable managers to analyse and control the most important factors in their firm – the constraints – in new ways.

TOC may be also applied for the lean manufacturing, six-sigma, Business process reengineering (BPR), supply chain management (SCM) and logistic system by considering them as a system inside the system. Cellular manufacturing system and group technology is also one of the untouched field where TOC strategic management tool may be implemented in the similar fashion for the better result. All the above mentioned the defined process or system functions as intended and produces intended results under normal operating conditions. So, as a future work, the barriers may be ranked and weighted to get the precise result is recommended. Choosing the right TOC tool for the desired solution is also the one of the most challenging job always.

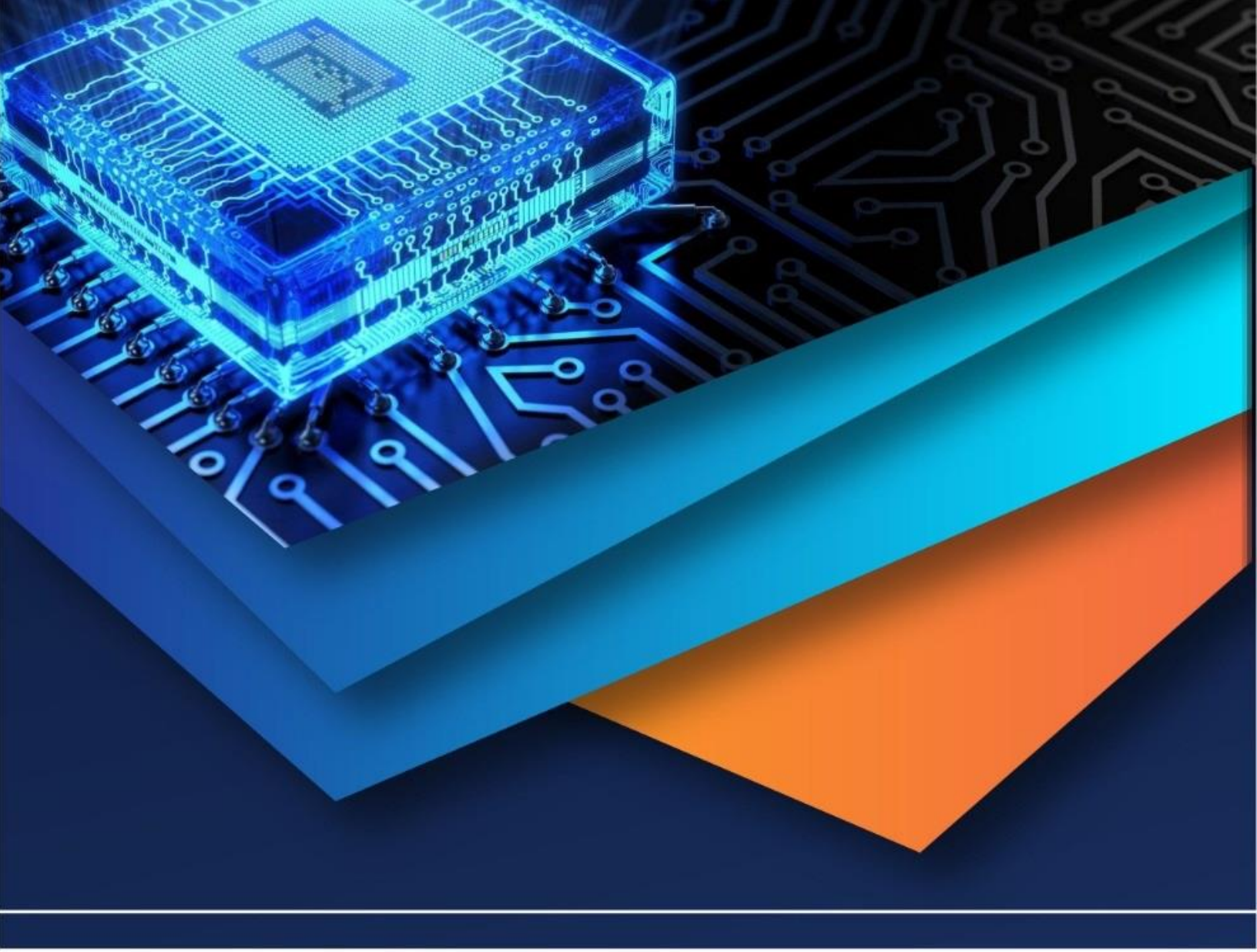
REFERENCES

[1] Boyd, L.H., Gupta, M.C. (2004), "Constraints management: what is the theory?", International Journal of Operations & Production Management, Vol. 24 No. 4, pp. 350-371.
[2] BARAD M,. (1996) Total quality management, International Encyclopedia of Business and Management, 5.
[3] Baladhandayutham, R., Devadasan, S. R., Selladurai, V., & Senthil, V. (2001). Integration of BPR and TQM: Past, present and future trends. Production Planning Control: The Management of Operations, 12(7), 680–688.
[4] Catalin, S. H., Bogdan, B., & Dimitrie, G. R. (2014). The existing barriers in implementing total quality management. Annals of the University of Oradea, Economic Science Series, 23(1), 1234–1240.
[5] Cox, J.F., Blackstone, J.H. and Schleier, J.G. (2003), Managing Operations: A Focus on Excellence, North River Press, Great Barrington, MA.
[6] C. Carl Pegels, Craig Watrous, (2005) "Application of the theory of constraints to a bottleneck operation in a manufacturing plant", Journal of Manufacturing Technology Management, Vol. 16 Issue: 3, pp.302-311,
[7] Chakravorty, S.S., Atwater, J.B., (2006) Bottleneck management: theory and practice. Production & Planning Control 17 (5), 441–447.
[8] Dahlgaard, J.J., Kristensen, K. and Kanji, G.K. (1998), Fundamentals of TQM, Carfax, London.
[9] Deming, W.E., (1982) "Quality Productivity and Competitive Position" Massachusetts Institute of Technology, Cambridge.
[10] Dettmer, H.W., (1995) "Quality and the theory of constraints", Quality Progress, Vol. 28 No. 4, pp. 77-81.
[11] Ehie, I. and Sheu, C. (2005), "Integrating Six-Sigma and theory of constraints for continuous improvement: a case study", Journal of Manufacturing Technology Management, Vol. 16 No. 5, pp. 542-53.

©IJRASET: All Rights are Reserved

[12] Goldratt, E.M., (1990), "What is This Thing Called Theory of Constraints and How Should it be Implemented?", North River Press, New York, NY.
[13] Goldratt, E.M., (1994), "It's Not Luck", Gower, England.
[14] Gupta, S., (1997) "Supply Chain Management in Complex Manufacturing", IIE Solutions, vol. 29(3), 18-21.
[15] Hellstenu & Klefsjob,. (2000) TQh.1 as a management system consisting of values, techniques and tools, The TQM Magazine, 12, No. 4, pp. 238-244.
[16] Hakes, C. (1991), Total Quality Management: The Key to Business Improvement, Chapman and Hall, London, UK.
[17] Ho, S.K.M. and Fung, C.K.H. (1994), "Developing a TQM excellence model", The TQM Magazine, Vol. 6 No. 6, pp. 24-30.
[18] Issac, G., Rajendran, C. and Anantharamanan, R.N. (2004), "A conceptual framework for total quality management in software organizations", Total Quality Management, Vol. 15 No. 3, pp. 307-44.
[19] Jun, M., Shaohan, C., & Peterson, R. (2004). Obstacles to TQM implementation in Mexico's Maquiladora industry. Total Quality Management & Business Excellence, 15(1), 59–72.
[20] Koh, S. C. L., Demirbag, M., Bayraktar, E., Tatoglu, E., & Zaim, S. (2007). The impact of supply chain management practices on performance of SMEs. Industrial Management & Data Systems, 107(1), 103–124.
[21] Mabin, V.J. and Balderstone, S.J., (2000) The World of the Theory of Constraints: A Review of the International Literature, (CRC Press LLC: Boca Raton, FL).
[22] Moorthy, M. K., Tan, A., Choo, C., Wei, C. S., Tan, J., Ping, Y., & Leong, T. K. (2012). A Study on Factors Affecting the Performance of SMEs in Malaysia. Academic Research in Business and Social Sciences, 2(4), 224–239.
[23] Meredith, J., Mantel, S., 2003. Project Management: A Managerial Approach. Wiley, New York, NY.
[24] Perez, J.L. (1997), "TOC for World Class Global Supply Chain Management", Computers and Industrial Engineering, vol 33(1-2), 289-293.
[25] Nair A (2006). Meta-analysis of the relationship between quality management practices and firm performance – implications for quality management theory development. Journal. Operations. Management. 24: 948-975.
[26] Pyzdek, T., (2003), The Six Sigma Handbook: A Complete Guide for Green Belts, Black Belts, and Managers at All Levels. McGraw-Hill, New York, NY.
[27] Rahman, S. (1998), "Theory of constraints: a review of the philosophy and its applications", International Journal of Operations & Production Management, Vol. 18 No. 4, pp. 336-56.
[28] Snee, R.D. (2004), "Six Sigma: the evolution of 100 years of business improvement methodology", International Journal of Six Sigma and Competitive Advantage, Vol. 1 No. 1, pp. 4-20.
[29] Sila, I., (2007) "Examining the effects of contextual factors on TQM and performance through the lens of organizational theories: an empirical study", J. Oper. Manag. 25, 83–109.
[30] Salenga, G. and Fazel, F, (2000), "Obstacles to implementing TQM", Quality Progress, Vol. 33 No. 7, Milwaukee, July,pp 53-64
[31] Salegna, G., & Fazel, F. (2000). Obstacles to implementing quality. Quality Progress, 33(7), 53–57.
[32] Schonberger, R.J., (2008). Best Practices in Lean and Six Sigma Process Improvement. John Wiley & Sons, Hobokon, NJ.
[33] Soltani, E., Wilkinson, A., (2010) "Stuck in the middle with you: the effects of incongruency of senior and middle managers' orientations on TQM programmes". Int. J.Oper.Prod.Manag, Vol. 30,365–397.
[34] Srikanth, M.L., and Umble, M.M., (1997). Synchronous Management: Profit Based Manufacturing for the 21st Century Volume 1, The Spectrum Publishing Company: Guilford.
[35] Salaheldin, S. I. (2009). Critical success factors for TQM implementation and their impact on performance of SMEs. International Journal of Productivity and Performance Management, 58(3), 215–237.
[36] Spencer, M.S. & Cox, III, J.F., (1995) "Optimum Production Technology (OPT) and the Theory of Constraints (TOC): Analysis and Genealogy", International Journal of Production Research, vol 33(6), 1495- 1504.
[37] Sadikoqlu, E., Zehir, C., (2008) "The impact of contextual factors on total quality management practices". J.Glob.Strateg.Manag.4,88–97.
[38] Watson, K.J. & Polito, T., (2003) "Comparison of DRP and TOC Financial Performance within a Multi-Product, Multi-Echelon Physical Distribution Environment", International Journal of Production Research, vol 41(4), 741-765.
[39] Watson, K.J. & Patti, A., (2008) "A comparison of JIT and TOC buffering philosophies on system performance with unplanned M/C downtime", International Journal of Production Research, vol. 46(7), 1869- 1885.
[40] Zhao, X., Yeung, A.C.L., Lee,T.S.,(2004) "Quality management and organisational context in selected service industries of China.", J. Oper. Manag. 22,575–587.

©IJRASET: All Rights are Reserved



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)