REVIEW OF CRITICAL SUCCESS FACTORS FOR THE IMPLEMENTATION OF TOTAL QUALITY MANAGEMENT IN THE CONSTRUCTION INDUSTRY

Ansah, S. K.[1], Aigbavboa, C. O.[2] and Thwala, W.[3]

[1]*Department of Building Technology, Cape Coast Technical University, Cape Coast, Ghana*

[1, 2, 3]*Department of Construction Management & Quantity Surveying, University of Johannesburg, Johannesburg, South Africa*

Total Quality Management (TQM) is a philosophy that involves every organization in the industry in the effort to improve performance. The concept is an integrative management principle for continuously improving the quality of products and processes to achieve customer satisfaction. To achieve this concept required a clear establishment of Critical Success Factors (CSFs). However, lack of clear establishment of CSFs for the implementation of TQM in the construction industry has led to failure of the system. In the pursuit of performance excellence in the construction industry and with an increasing awareness of construction quality, construction firms have no option than to implement TQM with clear CSFs. This paper therefore identifies and establishes the critical success factors for the implementation of Total Quality Management in the construction industry. Desk study and Delphi survey approach was adopted for this study. Based on the examination of existing literature and comprehensive analysis of the Delphi survey, the paper proposes eight (8) critical success factors of TQM for the construction industry. These include Leadership and Top Management, Supplier Quality Management, Quality System Evaluation, Client Focus and Involvement, Company Vision and Plan Statement, Product Selection and Design Management, Construction Process Management and Improvement, Construction Employees Involvement and Motivation. Hence to ensure successful implementation of total quality management in the construction industry, attention therefore should be given to the identified critical success factors in this study.

Keywords: total quality management, critical success factors, construction industry

[1] skansah@hotmail.co.uk

[2] caigbavboa@uj.ac.za

[3] didibhukut@uj.ac.za

Ansah, S. K., Aigbavboa, C. O. and Thwala, W. (2017) Review of critical success factors for the implementation of total quality management in the construction industry *In: Laryea, S. and Ibem, E. (Eds) Procs 7th West Africa Built Environment Research (WABER) Conference,* 16-18 August 2017, Accra, Ghana, 1213-1226

INTRODUCTION

Globally, much research has been conducted in the field of TQM implementation in the construction industry but yet there is lack of consensus and understanding of its critical success factors (CSF's). Different authors have differing views on the concept of TQM and its basic elements since its inception in 1920. However, most agree that TQM is a philosophy or approach to management focusing on continuous improvement, customer focus, systematic process management, supplier partnership, and teamwork (Vuppalapati, Ahire and Gupta, 1995., Kanji and Asher, 1996., Koh and Low, 2010, Agha (2011)

According to Steingard & Fitzgibbons (1993) TQM can be defined as a set of techniques and procedures used to reduce or eliminate variation from a production process or service-delivery system in order to improve efficiency, reliability, and quality. It integrates fundamental management techniques, existing improvement efforts, and the technical tools under a disciplined approach focused on continuous improvement (Department of Defense, 1988). Kanji and Asher (1996) posited that, TQM is a continuous process of improvement for individuals, groups of people, and whole firms; it encompasses a set of four principles (delight the customer, management by fact, people-based management, and continuous improvement) and eight core concepts (customer satisfaction, internal customers are real, all work is process, measurement, teamwork, people make quality, continuous improvement cycle, and prevention). TQM can also be defined as the application of quality principles for the integration of all functions and processes within the firm (Ross, 1993). There is another definition of TQM, which is a management approach for an organization, centered on quality, based on the participation of all its members and aiming at long-term success through customer satisfaction and benefits to all members of the organization and to society (ISO 8402, 1994). Flynn, Schroeder and Sakakibara (1994) defined TQM as: An integrated approach to achieving and sustaining high quality output, focusing on the maintenance and continuous improvement of processes and defect prevention at all levels and in all functions of the firm, in order to meet or exceed customer expectations. Ho and Fung (1994) however argued that, TQM is a way of managing to improve the effectiveness, flexibility, and competitiveness of a business as a whole. It is also a method of removing waste, by involving everyone in improving the way things are done. Vuppalapati, Ahire and Gupta (1995) on the other hand posit that TQM is an integrative philosophy of management for continuously improving the quality of products and processes to achieve customer satisfaction. Hackman & Wageman (1995) systematically reviewed the three quality gurus' (Deming, Juran, & Ishikawa) propositions about TQM. According to their review results, the following five interventions are the core of TQM: Explicit identification and measurement of customer wants and needs; creation of supplier partnership; use of functional teams to identify and solve quality problems; use of scientific methods to monitor performance and identify points of high leverage for performance improvement; use of

process management heuristics to enhance team effectiveness. Each of these interventions is in turn, supported by a wide array of techniques and critical success factors (CSFs). According to Metri (2005) CSFs are a guide for construction organizations contemplating on TQM initiatives. Hence, for a successful implementation of TQM, it is imperative that construction companies understand the TQM constructs and its critical success factors (CSF's).

Over the past few decades, quality gurus such as Deming (1986), Juran (Juran and Gryna, 1993), Crosby (1979), Feigenbaum (1991), and Ishikawa (1985), the primary authorities of TQM have developed certain propositions in the field of TQM, which have gained significant acceptance throughout the world. Their insights provide a good understanding of the TQM philosophy, principles, and practices. After careful study of their work, it has been found that these quality gurus have different views about TQM, although some similarities can be found. It was also found that the three quality award models also provide a framework for identifying a range of intangible and tangible processes that influence the firm's TQM implementation and the end results. These models provide a solid foundation for this research. But it was obvious that there are some gaps in their conceptual framework that have failed to capture the critical success factors for the implementation of TQM in the construction industry. Lack of clear establishment of these CSFs for the implementation of Total Quality Management (TQM) in the construction industry has led to failure of the system. This study is therefore undertaken to establish the critical success factors to serve as a guide for construction organizations contemplating on TQM initiatives. If these critical success factors are clearly established and implemented, it will lead to a successful implementation of TQM in construction industry. It is therefore imperative that construction companies understand the TQM constructs and its critical success factors (CSF's).

Objective of the Study

The objective of this study is to identify and establish the critical success factors for the implementation of Total Quality Management in the construction industry.

LITERATURE REVIEW

Lack of Consensus of Total Quality Management Concept and Constructs

Although much research has been conducted in the field of TQM implementation, no universally accepted TQM concepts and constructs presently exist. Actually, researchers have different ideas about TQM concept. The concept is still a subject of debate (Easton and Jarrell, 1998), still a hazy and ambiguous concept (Dean and Bowen, 1994). So far, TQM has come to mean different things to different people (Hackman and Wageman, 1995). Asian Institute of Technology (AIT), defines TQM as "a philosophy that strengthens the culture to foster continuous

organisational improvement through systematic, integrated, consistent effort involving everyone and everything, focusing primarily on total satisfaction of internal and external customers, where employees work together in teams with process ownership, guided by a committed top management, which takes a proactive participation" (Nukulchai, 2003). Also, according to Wessel & Burcher (2004), the British Quality Association defines TQM as "an all-embracing business management philosophy focusing on completely fulfilling customer requirements with a maximum of effectiveness and efficiency". Another definition of TQM, which is used by the Department of Defence in USA, is a philosophy and a set of guiding principles that represent the foundation of a continually improving organization (Tingey, 1997).

The above definitions define the TQM as a philosophy but from different point of view. British Standard described the TQM as the management philosophy aimed to achieve organisation objectives. While, the Asian Institute of Technology (AIT), defined the TQM as the philosophy aiming to satisfy the customers. The critical phrases in British Quality Association definition towards TQM is a management philosophy aiming to meeting the customer requirements. Therefore, the common word towards TQM concept is a *philosophy*.

The British Railway Board defines TQM as "the process, which seeks to meet and satisfy customer requirements throughout the whole chain of internal and external customers and suppliers" whereas the Royal Mail defines it as "A comprehensive way of working throughout the organisation, which allows all employees, as individuals and as teams, to add value and satisfy the needs of customer". The critical word toward the TQM definition is the *process and way of working*.

A definition by the US Department of Defence that succinctly captures the essence of the concept is: TQM utilizes both quantitative (technical) methods and human resource (behavioural) practices to improve material and service inputs, intra-and inter organisational processes, and to sharpen the focus on meeting customers' needs (Singh and Smith, 2004).

Zairi argues that total quality management can be defined by several parameters, such as leadership, attitudes, systems, continuous improvement and customer supply chains. He explains that leadership is perhaps the most important ingredient in the total quality management philosophy, as has been addressed by pioneers such as Deming, Juran and Crosby. A company's ambitions and desire to succeed is a reflection of the company's leadership which is implemented through a series of actions and initiatives. Total quality management is not about achieving certain standards of competitiveness or introducing new techniques, concepts, methodologies and technologies. It is about changing attitudes and behaviour towards doing business where parameters are set by the customer or negotiated with the customer. Zairi (1991: 42) argues that total quality management looks for continual improvement in the areas of cost, reliability, quality, innovation, efficiency and business effectiveness.

These definitions clearly indicate that TQM has come to mean different things to different people. This study therefore identifies constructs that will be brought together to form TQM definition and also help to better understanding the TQM concept in the construction industry. The three quality award models provide an insight into the practical way of applying TQM, as well as a solid foundation for this research. In this study, TQM could therefore be defined as follows: *A management philosophy for continuously improving overall performance of organization based on Leadership and Top Management, Supplier Quality Management, Quality System Evaluation, Client Focus and Involvement, Company Vision and Plan Statement, Product Selection and Design Management, Construction Process Management and Improvement, Construction Employees Involvement and Motivation.*

Critical Success factors (CSFs) for Total Quality Management Implementation

To successfully implement TQM, it is important to identify the factors required for the implementation process. Saraph et al (1989) defined CSFs as critical areas of managerial planning and action that must be practiced to achieve effective quality management in a business unit. These factors may be constructs with latent variables which cannot be measured directly, but can still be assessed indirectly from their manifestation. Saraph et al. (1989) in a pioneering study developed a quality management instrument, identifying eight (8) critical success factors of TQM: Role of divisional top management and quality policy, Role of quality department, Training, Product/service design, Supplier quality management, Process management/operating, Quality data and reporting and Employee relations. Their study had considerable influence on later studies, and subsequent research has resulted in the development of different frameworks and constructs based on varying perceptions and objectives (Zhang, 2000). Although these frameworks or models have different TQM approaches, they all lay emphasis on leadership, strategic planning, customer and market focus, human resources focus, process management, continuous improvement, supplier management and business results in one way or the other (Conca et al 2003).

Constructs or elements of critical success factors identified in frameworks for TQM point to two categories of factors: soft and hard dimensions of TQM (Kanji., 1995; Powel., 1995; Dow et al., 1999; Oakland., 2000). — Hard components of TQM concentrate on the tools and techniques, systems and the supplementary measurement and control of the work process, ensuring conformance to performance standards and the reduction of variability whereas — soft components relate to areas behavioural concerns such as increasing customer orientation, employee management, organizational and quality culture. These dimensions are interrelated and are together are very important for the successful implementation of TQM.

Choi and Eboch (1998) studied the TQM paradox using management of process quality, human resources management, strategic quality planning, and information and analysis as the constructs of TQM implementation.

Black and Porter (1996) identified ten critical factors of TQM: People and customer management, supplier partnership, communication of improvement information, customer satisfaction orientation, external interface management, strategic quality management, teamwork, operational quality planning, quality improvement measurement systems, structure for improvement, and corporate quality culture. In Powell's 1995 study, the following elements were identified as TQM framework: Executive commitment, adopting the philosophy, closer to customers, closer to suppliers, benchmarking, training, open organization, employee empowerment, zero-defects mentality, flexible manufacturing, process improvement, and measurement. Ho and Fung (1994) identified ten TQM elements: Leadership, commitment, total customer satisfaction, continuous improvement, total involvement, training and education, ownership, reward and recognition, error prevention, and cooperation and teamwork. Waldman (1994) identified eight key TQM elements as: Top management commitment to place quality as a top priority, a broad definition of quality as meeting customers' expectations, TQM values and vision, the development of a quality culture, involvement and empowerment of all organizational members in cooperative efforts to achieve quality improvements, an orientation toward managing-by-fact, the commitment to continuously improve employees' capabilities and work processes through training and benchmarking, attempts to get external suppliers and customers involved in TQM efforts. Mann and Kehoe (1994) divided TQM into ten elements. They are supplier improvement, process control and improvement, internal customer focus, measurement and reporting, leadership, quality system, participation, recognition, education and training, and external customer focus.

The study by Sila and Ebrahimpour (2002) reviewing 347 articles on TQM from 1989 to 2000 identified seventy–six studies that employed factor analysis to extract factors for successful implementation of TQM. Out of these, they compiled twenty-five TQM constructs which are widely used by researchers to measure TQM implementation. Their study revealed eight common cores of the factors viz: customer focus and satisfaction, employee training, leadership and top management commitment, teamwork, employee involvement, continuous improvement and innovation, and quality information and performance. Literature also reveals that different countries have adopted similar TQM factors as criteria for quality awards under different titles (Metri, 2005). However, the criteria for all these quality awards are derived from three basic frameworks: the Malcolm Baldrige National Quality Award (MBNQA), the European Quality Award (EQA) now called European Foundation for Quality Management (EFQM) Excellence Award and the Deming Prize.

In the field of TQM implementation, there are also three commonly referenced articles written by Saraph et al. (1989), Flynn et al. (1994), and Ahire et al. (1996), respectively. Ahire et al. (1996) strongly recommended that a combination of the three frameworks be undertaken for future research on TQM. In fact, this study followed that suggestion and

attempting to integrate their TQM constructs as much as possible and also incorporate the constructs identified in frameworks developed by Imbeah and Dansoh (2011) and Adusa – Poku (2014) for construction industry in Ghana. Table 1 lists the TQM elements in the five frameworks i.e. Saraph et al. (1989), Flynn et al. (1994), Ahire et al. (1996), Imbeah and Dansoh (2011), and Adusa – Poku (2014) frameworks. The two elements "Product quality" and "Supplier performance" in the Ahire et al. framework were not included in this framework since they represented TQM outcomes. "Role of quality department" in the Saraph et al. framework was excluded in this framework since every department in any organization would be involved in quality management. "Benchmarking" and "Internal quality information usage" in the Ahire et al. framework is similar with the element of "Evaluation" in this study. "Process control" and "Cleanliness and organization" in the Flynn et al. framework are relatively the same as the element of "Process control and improvement" adopted in this study. Also "Process Management" and "Continuous Improvement" in the Adusa - Poku framework are relatively the same as the element of "Process control and improvement" adopted in this study.

Table 1 Framework Comparison

Reference	Framework
Saraph et al. framework (1989)	1: Role of divisional top management and quality policy; 2: Role of quality department; 3: Training; 4: Product/service design; 5: Supplier quality management; 6: Process management/operating; 7: Quality data and reporting; 8: Employee relations.
Flynn et al. framework (1994)	1: Quality leadership; 2: Quality improvement rewards; 3: Process control; 4: Feedback; 5: Cleanliness and organization; 6: New product quality; 7: Interfunctional design process; 8: Selection for teamwork potential; 9: Teamwork; 10: Supplier relationship; 11: Customer involvement.
Ahire et al. framework (1996)	1: Top management commitment; 2: Customer focus; 3: Supplier quality management; 4: Design quality management; 5: Benchmarking; 6: SPC usage; 7: Internal quality information usage; 8: Employee empowerment; 9: Employee involvement; 10: Employee training; 11: Product quality; 12: Supplier performance.
Imbeah and Dansoh framework (2011)	1: Top management commitment and leadership; 2: Employee welfare and commitment; 3: Employee training and development; 4: Customer focus; 5: Planning; 6: process control and process evaluation; 7: Supplier management; 8: Continuous Improvement; 9: Team Work; 10: Information analysis; 11: evaluation.
Adusa – Poku framework (2014)	1: Process Management; 2: Leadership Commitment; 3: Customer Focus; 4: Continuous Improvement; 5: Training and Development; 6: Supplier Management

"Top management commitment and leadership" in the Imbeah and Dansoh framework are relatively the same as the element of "Leadership and top management" adopted in this study. "Customer involvement" in the Flynn et al. framework and "Customer Focus" in the Ahire et al., Imbeah and Dansoh and Adusa – Poku frameworks were merged in this study. This study included three more constructs, *"*Company Vision and Plan Statement *"*Product Selection and Design Management*""* *and "*Construction Process Management and Improvement*"* which were not found in their frameworks. Thus, TQM in this study consists of 8 constructs. These are Leadership and Top Management, Supplier Quality Management, Quality System Evaluation, Client Focus and Involvement, Company Vision and Plan Statement, Product Selection and Design Management, Construction Process Management and Improvement, Construction Employees Involvement and Motivation. Hence, to implement TQM in construction industry is merely to implement these constructs, which occurs through a set of practices such as using certain quality tools or techniques.

RESEARCH METHODOLOGY

The research was conducted with reference to existing theoretical literature, i.e. published and unpublished literature. This was followed up with Delphi survey method to collect data from experts (construction professionals) through email. A Delphi Study is a group decision mechanism requiring qualified experts who have deep understanding of the issues at hand (Okoli &Pawlowski, 2004). The list of experts was generated from peered reviewed conference proceedings and journal articles. It was also based on their articles written on Total Quality Management in the Ghanaian construction industry. Seventeen invitation letters were sent to the experts through email to indicate their willingness to participate in the study. Thirteen experts showed their interest to participate in the study. During the first stage of the Delphi questionnaire administration, three experts were further dropped.

The remaining ten experts concluded the survey. This number of panelists was considered adequate based on literature recommendations from scholars which have employed the technique previously. Hallowell and Gambatese (2010) suggested that since most studies incorporate between eight (8) and sixteen (16) panelists, a minimum of eight (8) is reasonable. Hallowell and Gambatese (2010) argued that the size of a panel should be dictated by the study characteristics, number of available experts, the desired geographical representation and capacity of the facilitator.

Experts in Ghana were asked to rate the impact and influence of the factors in predicting the success of Total Quality Management implementation in the construction industry. An impact scale used is shown in Table 2 below. Data obtained from the Delphi survey was analysed with Microsoft EXCEL, spread-sheet software. The output from the analysis was a set of descriptive statistics such as means, median,

standard deviations and derivatives of these statistics. The results were further presented in table. The steps in conducting Delphi survey has not been discussed in this paper due to limited space.

Table 2: Impact scale

No impact/influence		Low impact /influence		Medium impact /influence		High impact /influence		Very high impact/influence	
1	2	3	4	5	6	7	8	9	10

DISCUSSION OF RESULTS

A set of factors that were relevant to Total Quality Management were emphasised through a comprehensive review of literature. Although, most of the reviewed literature was based on studies from the developed countries, they were collectively used to examine the factors that determine the success of Total Quality Management in the Ghanaian construction industry. The influence of the factors on Total Quality Management was obtained as a product of the impact on the construction industry in Ghana.

The main factors were based on the level of influence, as categorized on the questionnaire. This was established by assessing the extent to which the listed factors will determine the Total Quality Management implementation in the construction industry. The rating was based on an ordinal scale of one to ten with one being low influence or no impact and ten being high influence or very high impact. The levels of influence and impact were obtained as a product of the consensus achieved.

By applying the Median Absolute Deviation to determine whether a factor reached consensus or not, all the eight (8) critical factors were considered by the experts to have reached consensus. Consensus was reached for four (4) attributes (Leadership and Top Management, Company Quality System Evaluation, Product Selection and Design Management, Construction Process Management and Improvement) under the critical factors that determine Total Quality Management in the construction industry, with an IQD score of 1.00 or cut-off (IQD $\leq$1) (Table 3). Seven (7) factors from the eight (8) identified critical factors that determine Total Quality Management in the construction industry were considered by the experts to have a very high influence (VHI: 9-10), with the exception of one (1) factor (Product Selection and Design Management) which had a high influence (HI: 7-8.99). These indicate that all the factors have high influence on Total Quality Management implementation in the construction industry.

Table 3: Total Quality Management (TQM) in the construction industry main factors

Total Quality Management in the Construction Industry Main Factors	$\bar{x}$	M	SD	MAD	IQD
Leadership and Top Management (LTM)	9.10	10.00	1.85	0.90	1.00
Company Supplier Quality Management (CSQM)	8.40	9.00	1.43	0.80	1.25
Client Focus and Involvement (CFI)	8.30	8.00	1.06	0.70	1.50
Company Quality System Evaluation (CQSE)	9.10	9.00	0.57	0.30	0.25
Company Vision and Plan Statement (CVPS)	8.40	9.00	1.43	0.80	1.25
Product Selection and Design Management (PSDM)	7.80	8.00	0.79	0.40	0.25
Construction Process Management and Improvement (CPMI)	8.60	9.00	0.84	0.40	0.50
Construction Employees Involvement and Motivation (CEIM)	9.00	10.00	2.21	1.00	1.25

M=Median; $\bar{x}$=Mean; σ_x=Standard Deviation (SD); $|Di|$=Median Absolute Deviation (MAD); IQD=Interquartile Deviation

CONCLUSION AND RECOMMENDATION

This study intended to identify critical success factors for the implementation of Total Quality Management in the construction industry. Eight critical success factors of TQM for construction industry were identified. These are: Leadership and Top Management, Supplier Quality Management, Quality System Evaluation, Client Focus and Involvement, Company Vision and Plan Statement, Product Selection and Design Management, Construction Process Management and Improvement, Construction Employees Involvement and Motivation. It is believed that attention to these factors will minimize difficulties related to the implementation of Total quality management and will enhance best performance in companies implementing Total quality management. Further research is also suggested to be carried out by using empirical fieldwork (questionnaire survey) to determine the importance, similarities and differences of the identified CSFs.

REFERENCES

Adusa-Poku, N. Y. (2014). Assessing Total Quality Management (TQM) In the Ghanaian Construction Industry: An Exploratory Study in Kumasi. *Master of Science Dissertation*. Department of Building Technology, Faculty of Architecture and Building Technology Kwame Nkrumah University of Science and Technology, Ghana

Agha, A. S. (2011). *Total quality management in construction industry*. Available at http://faculty.kfupm.edu.sa/CEM/bushait/cem515/term-papers/TQMinconstructionindustry.pdf

Ahire, S.L., Golhar, D.Y., and Waller, M.A. (1996). Development and validation of TQM implementation constructs. *Decision Sciences*, 27 (1), 23-56.

Al-Momani, A. (2007) Total quality management in construction: a case study of Jordan. In: Hughes, W (Ed) *Procs of the Inaugural Construction Management and Economics „Past, Present and Future" Conference*, 16th - 18th July 2007 University of Reading, UK, 741-752

Black, S.A. and Porter, L.J. (1996), Identification of the critical factors of TQM. *Decision Sciences, 27* (1), 1-21.

Boaden, R., and Dale, B. (1992). Total quality management in the construction industry: a preliminary analysis. *International Journal of Technology Management, 7* (4/5), 244-253.

Chini, A.R., and Valdez, H.E. (2003). ISO 9000 and the U.S construction industry. *Journal of Management in Engineering, 16* (2), 69-76.

Choi, T.Y., and Eboch, K. (1998). The TQM paradox: Relations among TQM practices, plant performance, and customer satisfaction. *Journal of Operations Management, 17* (1), 59-75.

Conca, F. J., Llopis, J., and Tari, J. J. (2003). Development of a measure to assess quality management in certified firms. Journal of Operational Research, 156, 683-697.

Crosby, P.B. (1979). *Quality Is Free*. McGraw-Hill, Inc., New York.

Dean, J.W. Jr., and Bowen, D.E. (1994). Management theory and total quality: Improving research and practice through theory development. *Academy of Management Review, 19* (3), 392-418.

Deming, W. E. (1986). *Out of the Crisis: Quality, Productivity and Competitive Position.* Cambridge University Press, Cambridge.

Department of Defense (1988). Institute of Defense Analysis, The role of concurrent engineering in weapons system acquisition. *IDA Report* R-338.

Dow, D., Samson, D., and Ford, S. (1999). Exploding the Myth: Do All Quality Management Practices Contribute to Superior Quality Performance. *Production and Operations Management*, 8, 1–27.

Easton, G.S. and Jarrell, S. L. (1998). The effects of total quality management on corporate Economist. (2000, January 15). Construction and the Internet. *The Economist*.

Feigenbaum, A.V. (1991). *Total Quality Control*. Third edition, McGraw-Hill, Inc., New York.

Flynn, B.B., Schroeder, R.G., and Sakakibara, S. (1994). A framework for quality management research and an associated measurement instrument. *Journal of Operations Management, 11*, 339-366.

Gunning, J.G. and McCallion, E.M. (2007). TQM in large Northern Ireland contracting organisations. *In*: Boyd, D (Ed) *Procs 23rd Annual ARCOM Conference*, 3-5 September 2007, Belfast, UK, Association of Researchers in Construction Management, 577-586.

Hackman, J.R. and Wageman, R. (1995). Total quality management: Empirical, conceptual, and practical issues. *Administrative Science Quarterly*, 40 (June), 309-342.

Hallowell, M. and Gambatese, J. (2010). Qualitative research: Application of the Delphi method to CEM research. Journal of Construction Engineering and Management, 136 (Special Issue: Research Methodologies in Construction Engineering and Management):99-107.

Hassin, E., Tookey, J.E. and Vidalakis, C. (2007). Sustainable development and TQM implementation in Libya: A study of the electrical generation industry. *In:* Egbu, C.O. and Tong, M.K.L. (Eds) *Procs of the 3rd Scottish Conference for Postgraduate Researchers of the Built and Natural Environment (PRoBE)*, 20-22 November 2007, Glasgow Caledonian University, 203-215.

Haupt, T.C. and Whiteman, D.E. (2003). Deploying total quality management on construction sites: inhibiting factors. *The International Journal of Construction Management, 3* (2), 51-68.

Ho, S.K.M. and Fung, C.K.H. (1994), Developing a TQM excellence model. *TQM Magazine*, 6 (6), 24-30.

Imbeah, K.A and Dansoh, A. (2011) Critical Success Factors for the Implementation of Total Quality Management (TQM) in Real Estate development in Ghana. *In* Laryea, S., Leiringer, R. and Hughes, W. (Eds), *Procs of 5th West Africa Built Environment Research (WABER) Conference*, 19 – 21 July 2011, Accra, Ghana, 291 – 303.

Ishikawa, K. (1985). *What is Total Quality Control? The Japanese Way*. Prentice-Hall, London.

ISO 8402 (1994). *Quality Management and Quality Assurance – Vocabulary*. International Organization for Standardization, Geneve, Switzerland.

Juran, J.M. and Gryna, F.M. (1993). *Quality Planning and Analysis*. Third edition, McGraw-Hill, Inc., New York.

Kanji, G. K. (1995). Quality and Statistical Concepts in Total Quality Management. *Proceedings of the first world congress* (Ed: Kanji, G. K.), London: Chapman and Hill

Kanji, G.K. and Asher, M. (1993). *Total Quality Management Process: A Systematic Approach, Advances in Total Quality Management Series*. Carfax, Abingdon.

Khadour, L. and Darkwa, J. (2008). TQEM in the UK construction industry: some key findings from a survey. *In:* Dainty, A (Ed) *Procs 24th Annual ARCOM Conference,* 1-3 September 2008, Cardiff, UK, Association of Researchers in Construction Management, 239-246.

Kiwus, C.H. and Williams, T.P. (2001). Application of TQM to environmental construction. *Journal of Management in Engineering, 17* (3), 176-184.

Koh, T.Y. and Low, S.P. (2010). Empiricist framework for TQM implementation in construction companies. *Journal of Management in Engineering, 26* (3), 133-143.

Lad, J. and Beck, B. (2009). Construction Quality: The Key to Successful Capital Projects Delivery. *Pharmceutical Engineering*, 29 (6).

Love, P. E. D., Li, H., Irani, Z., and Holt, G. D. (2000). Rethinking Total Quality Management: Toward A Framework for Facilitating Learning And Change In Construction Organizations. *The TQM Magazine, 12* (2), 107–116.

Love, P.E.D., Edwards, D.J. and Sohal, A. (2004). Total quality management in Australian Contracting organisations: pre-conditions for successful implementation. *Engineering, Construction and Architectural Management, 11* (3), 189-198.

Mahmood and Mohammed (2008). A conceptual framework for the development of quality culture in the construction industry *In:* Dainty, A (Ed) *Procs 24th Annual ARCOM Conference,* 1-3 September 2008, Cardiff, UK, Association of Researchers in Construction Management, 247-256.

Mann, R. and Kehoe, D. (1994), An evaluation of the effects of quality improvement activities on business performance. *International Journal of Quality & Reliability Management*, 11 (4), 29-44.

McIntyre, C.and Kirschenman, M. (2000). Survey of TQM in construction industry in upper Midwest. *Journal of Management in Engineering, 16* (5), 67-70.

Metri, B.A. (2005). TQM Critical Success Factors for Construction Firms. *Management Economics, 10* (2), 61-72.

Nukulchai, W. K. (2003). *Towards Total Quality Management In Higher Education: The Experience of Asian Institute of Technology*. Asian Institute of Technology.

Oakland, J. (2000). *Total quality management – Text with cases* (2nd edition). Butterworth-Heinemann

Okoli, C. and Pawlowski, S. (2004). The Delphi method as a research tool: An example, design considerations and applications, Information Management, 42:15-29.

Pheng, L.S. and Teo, J.A. (2004). Implementing total quality management in construction firms. *Journal of Management in Engineering, 20* (1), 8-15.

Powell, T.C. (1995). Total Quality Management as Competitive Advantage: A Review and Empirical Study. *Strategic Management Journal, 16*, 15–37.

Ramachandran, V. (2010). Total quality management in construction. Edwards, G. (Ed). Available at http://www.brighthub.com/office/project-management/articles/86518.

Ross, J.E. (1993). *Total Quality Management*. St. Lucie Press, Delray Beach, FL.

Sanni, A.A. and Windapo, A.O. (2008). Evaluation of contractor's quality control practices on construction sites in Nigeria. *In:* Dainty, A (Ed) *Procs 24th Annual ARCOM Conference,* 1-3 September 2008, Cardiff, UK, Association of Researchers in Construction Management, 257-265.

Saraph, J.V., Benson, G.P., and Schroeder, R.G. (1989). An Instrument for Measuring the Critical Factors of Quality Management. *Decision Sciences, 20*, 810–829.

Sila, I. and Ebrahimpour, M. (2002). An Investigation of The Total Quality Management Survey Based Research Published Between 1989 And 2000. *International Journal of Quality and Reliability Management, 19* (7), 902-970.

Singh, P. J., and Alan J. R. S. (2004). Relationship Between TQM and Innovation: An Empirical Study. *Journal of Manufacturing Technology Management, 15*(5), 394 - 401.

Steingard, D.S. and Fitzgibbons, D.E. (1993). A postmodern deconstruction of total quality management, *Journal of Organization Change Management*, *6* (5), 27- 42.

Tingey, M. (1997). *Comparing ISO 9000, Malcolm Baldrige, and the SEICMM for Software: A Reference and Selection Guide.* Prentice-Hall, Englewood Cliffs, NJ.

Tutesigensi, A. and Pleim, V. (2008). Why small and medium construction enterprises do not employ six sigma. *In:* Dainty, A (Ed) *Procs 24th Annual ARCOM Conference,* 1-3 September 2008, Cardiff, UK, Association of Researchers in Construction Management, 267-276.

Vuppalapati, K., Ahire, S.L. and Gupta, T. (1995). JIT and TQM: A case for joint implementation. *International Journal of Operations & Production Management, 15* (5), 84-94.

Waldman, D.A. (1994). The contribution of total quality management to a theory of work performance. *Academy of Management Review, 19* (3), 510-536.

Wessel, G., and Burcher, P. (2004). Six Sigma for Small and Medium-Sized Enterprises. *The TQM Magazine, 16*(4), 264 - 272.

Zairi, M. (1991). *Total Quality Management for Engineers*. Woodhead Publishing.

Zhang, Z. (2000). Developing A Model of Quality Management Methods and Evaluation Their Effects on Business Performance. *Total Quality Management, 11* (1), 129-137.