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IDENTIFYING BARRIERS TO TOTAL QUALITY MANAGEMENT IMPLEMENTATION IN THE CONSTRUCTION INDUSTRY USING THE DELPHI TECHNIQUE

Ansah S. K.[1], Thwala D. W.[2], Aigbavboa C.O.[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) has been suggested in principle to improve the performance of an organization but its implementation in practical terms involves several challenges. This study therefore identifies the barriers that affect TQM implementation in the construction industry. Delphi survey technique was adopted to retrieve data for this study. The Delphi survey technique is a research technique which consist surveys conducted in two or more rounds and affords the participants in the second round with the results of the first, so that they can amend the original assessments if they want to, or stick to their earlier opinion. Based on the comprehensive analysis of the Delphi survey, the study identified twenty (20) barriers that affect TQM implementation in the construction industry. All the twenty identified barriers were considered by the experts to have reached good consensus and therefore could be considered as potential barriers to TQM implementation in the construction industry. The six most significant/ potential barriers among the twenty identified barriers in order of ranking were: lack of commitment from management, reluctance to change old management technique, lack of interest in the application of TQM, lack of efficient TQM management system, unavailable TQM policy, and limited knowledge of TQM. Hence, understanding these identified factors that are likely to impede the TQM implementation, will enable managers to develop more effective strategies for improving TQM implementation in the construction industry. It is recommended that further research should be carried out by using empirical fieldwork (questionnaire survey) to validate the finding of this study since Delphi survey technique is limited to few experts.

Keywords: barriers, construction industry, delphi technique, experts, total quality management

[1] skansah@hotmail.co.uk
[2] didibhukut@uj.ac.za
[3] caigbavboa@uj.ac.za; aigclinton@gmail.com

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INTRODUCTION

Total Quality Management (TQM) is an integrative management principle, for continuously improving the quality of products and processes to achieve customer satisfaction. Although, TQM has been suggested in principle to improve the performance of the organization, its implementation in practical terms involves several challenges. Notwithstanding these challenges, the consensus from various studies is that, TQM has been successfully applied in industries such the manufacturing industry. On the other hand, the construction industry is criticized for not taking the lead from the manufacturing industry that has successfully implemented the philosophy of TQM in all spheres of its activities. Though extensive research on TQM and its effect on project performance has been carried out (Kheni and Ackon, 2015; Zu, 2009; Jaafreh and Al-abedallat, 2012; Saeed and Hasan, 2012; Gonzalez, Jimenez and Lorente, 2013; Prajogo and Sohal, 2003), none of these researches aimed at identifying the barriers to total quality management implementation in the construction industry using the Delphi technique.

The Delphi technique was originally developed in the 1950s as a tool for forecasting and problem solving of complex topics at the RAND Corporation by Helmer and Dalkey (Buckley, 1995). The inspiration behind the naming of this technique is based on Greek mythology. The oracle at Delphi located at an ancient Greek Temple was consulted to forecast the future. This religious ritual was done to enhance accurate and timely decision making before carrying out major societal and state activities such as waging war against other States. The method adopted by the research team at RAND was that, experts in a particular subject matter could be solicited for their opinions about the likelihood of future events or scenarios within that same field of the subject matter. The Delphi technique is part of a group of decision-making (policymaking) techniques that includes the Nominal Group Technique (NGT) and Interacting Group Method (IGM). Delphi technique differs in various ways from the NGT and IGM largely because it is individual based, anonymous and independent. The element of group interaction is eliminated from the technique and feedbacks to questionnaires are in a written format (Loo, 2002).

According to Loo (2002), the Delphi process is mostly used when investigating and drawing up policy-making or policy evaluation strategies that will set the future direction for public or private sector respectively. Furthermore, the technique is a qualitative methodology seeking to produce a consensus of a group of experts on an issue of concern (Miller, 2001) through a survey consisting of rounds. The method is based on structural surveys and makes use of the intuitive available information from the participants, who are mainly experts within the discussed subject matter. The method provides both qualitative and quantitative results and has beneath it explorative, predictive and even normative elements (Cuhls, 2003) cited in (Aigbavboa and Thwalla, 2012). There is an agreement that the Delphi technique is an expert survey in two or more 'rounds' in which the results and findings of the second and later rounds of the survey of the previous round are given as feedback. That is, the participants who are experts answer from the second round under the influence of the other experts' opinions. The technique requires knowledgeable and expert contributors who will be individually responding to questions and submitting the results to a central coordinator or a researcher conducting the study (Aigbavboa and Thwalla, 2012). The coordinator processes

these responses, looking for central and extreme tendencies, and their validations (Grisham, 2006). The results are fed back to the input provided by the coordinator (researcher). The experts are then asked to resubmit their opinions, aided by the input provided by the researcher. This process continues until the coordinator sees that a consensus has been formed. The technique removes the bias that is possible when diverse groups of experts meet together. In the Delphi method, the experts do not know who the other experts are in the process. Hence, the Standard-Delphi-Method is a survey which is directed by a coordinator (researcher) as already stated, comprising several rounds with a group of experts, who are anonymous among each other and for whose subjective-intuitive prognoses a consensus is aimed at (Cuhls, 2003) cited in (Aigbavboa and Thwalla, 2012).

After each survey round, a standard feedback about the statistical group judgement which was calculated from median and interquartile range of single projections is given and if possible, the arguments and counter-arguments of the extreme answers are fed back. In the Delphi process, nobody 'loses face' because the study is done anonymously using a questionnaire. Rowe and Wright (1999) and Häder and Häder (1995) informed that it is commonly assumed that the method makes better use of group interaction whereby the questionnaire is used as the medium of interaction. The method is especially useful for long-range forecasting, as expert opinions are the only source of information available (Aigbavboa and Thwalla, 2012).

Over time, the method has gained a favourable popularity across many scientific disciplines as a method of inquiry (Czinkota and Ronkainen, 2002). Czinkota and Ronkainen (2002) identified that Delphi technique has been used as a study instrument in the fields of library and information science (Buckley, 1995), in the medical disciplines (Linstone and Turoff, 1975), and by actuaries to predict economic conditions (SOA, 1999). Czinkota and Ronkainen (2002) further reported that those experienced with the Delphi technique, indicated that the method produces valuable results which are accepted and supported by the majority of the expert community. The above instance proves that the Delphi method in research is an accepted practice. However, it is not entirely appropriate for all research activities. This study therefore sought to assess how the Delphi technique could be used to identify the barriers to total quality management implementation in the construction industry. Consequently, the specific objective was to identify the barriers to total quality management implementation in the construction industry using the Delphi technique.

LITERATURE REVIEW

Some studies in the field of Total Quality Management (TQM) attempt to provide reasons why in such extensive and growing manner, the rate of TQM failure is high (Soltani, 2003; Hamidi and Zamanparvar, 2008) and also attempt to outline factors that are likely to impede the TQM implementation (Whalen and Rahim,1994; Sebastianelli and Tamimi, 2003; Johnson and Kleiner, 2013; Mosadeghrad, 2014). Hamidi and Zamanparvar, 2008), in their study outlined problems and barriers to TQM implementation as lack of senior and middle management commitment. They stressed that without management commitment and creating appropriate and supportive organizational culture, there would be no progress. They added that in

both developed and developing countries, lack of senior management commitment was identified as an important factor that leads to failure reports in TQM implementation. They also mentioned training programs for managers and staffs to increase their abilities in TQM techniques as an important factor for effective TQM accomplishment. According to Pheng and Teo (2004), the degree of support that management takes in the implementation of TQM is very critical for the success of TQM implementation. Commitment of top management enables employees to follow their direction and way of working. Roberts (1997), also affirm that the degree of support and commitment by top management is critical for TQM success. He explains that true test of management commitment lies in the amount of resources (time, money and people) allocated to TQM implementation efforts.

In the literature there are a multitude of studies that address very different ways for the identification of the factors that hinder the successful implementation of TQM (Whalen and Rahim,1994; Sebastianelli and Tamimi, 2003; Johnson and Kleiner, 2013; Mosadeghrad, 2014). Some of the approaches which describe barriers that prevent the application of the TQM are emphasized in Table 1.

Table 1: Barriers that hinder the implementation of TQM

Barriers to the implementation of TQM	Author/Source
■Poor planning	Whalen and Rahim (1994)
■ Lack of management commitment	
■ The strength of the labour	
■ Lack of appropriate training	
■ Complacency team	
■ Use of an invalid program (outside of shelf-life/moral)	
■ The inability to change the organizational philosophy (culture)	
■ Insufficiency of resources	
■ The lack of improvement of the quality of the measurement.	
■ Poor planning	Sebastianelli and Tamimi (2003)
■ Practice management and development of human resources insufficient and inadequate	
■ Lack of quality planning	
■ The lack of leadership in the development of a quality culture	
■ Inadequate resources for TQM	
■ Lack of customer orientation.	
■Lack of benchmarking	Johnson and Kleiner (2013)
■Employee resistance to change	
■Insufficient resources	
■Ineffective or inappropriate TQM models	Mosadeghrad (2014)
■Ineffective or inappropriate methods for the implementation of the TQM	
■The wrong environment for the implementation of the TQM	

The authors grouped the barriers that are preventing the implementation of TQM in five categories:

- Strategic barriers: strategic issues are significant barriers for implementation of TQM and have the greatest negative impact on its success. These barriers are mainly related to the management and leadership of the organization.
- Structural barriers: are related to the structure, systems and physical resources necessary to implement the TQM
- Human resources barriers: are those obstacles that are related to human factors, such as lack of employee engagement and resistance to change in TQM

- Contextual barriers: are those difficulties that arise when there are developed a context and a culture appropriate to achieve the highest potential of the deploying of the TQM
- Procedural barriers: mainly are generated by the complexity of the processes, the lack of focus on the client, the lack of partnership with suppliers, the bureaucracy and the lack of a system of evaluation and self-assessment.

Table 2: Categories of barriers to the implementation of TQM

Categories	Example of barriers to TQM implementation
Strategic barriers	■ Inappropriate TQM program ■ Unrealistic expectations ■ Deficient leadership ■ Poor management ■ The lack of top management support ■ Poor involvement of managers ■ The strength of the middle management ■ Inadequate planning ■ The lack of consistency of objectives ■ Lack of long term vision ■ The lack of a vision and a clear directions ■ Conflicting objectives and priorities ■ The lack of priority of improving the quality ■ The previous failures in terms of initiatives of change ■ The lack of Government support ■ Political uncertainty
Structural barriers	■ Organizational structure inappropriate ■ Lack of organizational flexibility ■ Lack of physical resources ■ Lack of information systems ■ Lack of financial support, the cost of implementation ■ Lack of time
Human resources barriers	■ The lack of interest of employees ■ The lack of commitment and involvement of employees ■ Employee resistance to change ■ A deficient human resources management ■ Poor delegation at all hierarchical levels ■ Few employees work tasks and increasingly higher ■ Lack of training and education of employees ■ Lack of motivation and satisfaction of employees ■ The lack of recognition and rewarding for success
Contextual barriers	■ Inadequate organizational culture ■ Difficulties in changing organizational culture ■ Lack of guidance teams ■ Poor communication and ineffective ■ Poor coordination ■ The lack of confidence of employees in the management ■ Cultural issues resolution ■ Lack of innovation ■ Political behaviour ■ The diversity of the workforce
Procedural barriers	■ Lack of focus ■ The lack of an adequate process management ■ Lack of concentration on the client ■ The lack of involvement of suppliers ■ Bureaucracy ■ Lack of evaluation and self-evaluation ■ The change agent or counsel incompetence in implementing quality ■ Ineffective corrective action ■ Efforts to improve quality are time consuming

The categories of barriers to TQM implementation and their examples are further presented in Table 2. It can be seen from Table 2 that strategic barriers are the most common types of barriers that hinder the successful implementation of TQM system. Also, the human resources barriers have a very large impact on the success of TQM implementation. It can be affirmed that, within both the strategic-level barriers and the barriers related to human resources, leadership is a key factor in managing change necessary to implement the TQM.

METHODOLOGY

The research was conducted with reference to existing theoretical literature. This was followed up with a 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 and Pawlowski, 2004). The list of experts was generated from peer reviewed conference proceedings and journal articles. Seventeen invitation letters were sent to the experts through email to indicate their willingness to participate in the study. Thirteen out of the seventeen experts showed their interest to participate in the study. During the first stage of the Delphi questionnaire administration, three experts were further dropped from the list due to their busy scheduled and inability to meet the deadline of the survey. 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; Aigbavboa and Thwalla, 2012). 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 barriers to TQM implementation in the construction industry. An impact scale used is shown in Table 3. The level of influence and impact were obtained as a product of the consensus achieved. Studies suggest that there is little agreement on how to measure consensus in a Delphi Study (Holey, Feeley, Di and Whittaker, 2007; Rayens and Hahn, 2000; Raskin, 1994; McKenna, 1994). It is however agreeable that for consensus to have been achieved, there has to be a convergence of ideas and reasoning towards a subjective central tendency measure. Hence, in this study, consensus was determined to have been reached if the following was achieved:

1. More than 60% of responses are generally positive or negative with certain questions; and
2. The IQD was less than 1.00. Meaning that items with IQD = 0.00 were considered to have reflected high consensus.

Therefore the scales of consensus adapted for this research are as follows:

a. Strong consensus - median 9-10, mean 8-10, interquartile deviation (IQD) ≤1 and ≥80% (8-10);
b. Good consensus - median 7-8.99, mean 6-7.99, IQD≥1.1≤2 and ≥60%≤79% (6-7.99); and

c. Weak consensus - median ≤ 6.99, mean ≤5.99 and IQD≥2.1≤3 and ≤ 59% (5.99).

Data obtained from the Delphi survey was analyzed with Microsoft EXCEL, spreadsheet 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 4.

Table 3. 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

DISCUSSION OF RESULTS

Construction Company's inability to implement Total Quality Management (TQM) is due to several factors. Some of which may be beyond control and others out of reach due to limited resources. A set of relevant factors/barriers that affect the implementation of TQM in the construction industry were emphasized in this study through a comprehensive review of literature. The main factors/barriers obtained were based on the level of influence, as categorized in the Delphi questionnaire. 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 (see Table 3). In all, twenty (20) factors were identified as major barriers to the implementation of TQM in the construction industry. Among these twenty identified barriers, lack of commitment from management was ranked first as most significant factor/barrier, followed by reluctance to change old management technique, lack of interest in the application of TQM, lack of efficient TQM management system, unavailable TQM policy, limited knowledge of TQM, lack of understanding among construction professionals in applying TQM, lack of coordination of TQM implementation policy, inability to train/educate employees on TQM, TQM technique is costly, lack of finance in the management of TQM experts, absent of systematic TQM framework, lack of TQM expert, TQM technique is time consuming, lack of enforcement from the legislative bodies overseeing the implementation of TQM, complex nature of TQM technique, limited access to body responsible for the implementation of TQM policy, lack or limited company resources, inability to employ TQM personnel, and perception that TQM may not yield any better results was ranked last in that order (see Table 4).

By applying the Interquartile Deviation (IQD) to assess whether a factor reached consensus or not, nine (9) out of the twenty (20) identified factors (major barriers) to the implementation of TQM in the construction industry were considered by the experts to have achieved strong consensus with IQD score between 0.00 and 1.00 (see Table 4). Good consensus was also achieved for the remaining eleven (11) factors with an IQD score between 1.1≤ 2 (see Table 4). Hence, all the twenty (20) factors identified were considered by the experts to have reached a good consensus. As explained in the methodology section, for consensus to have been achieved, there has to be a convergence of ideas and reasoning towards a subjective central tendency measure. Hence, consensus was determined to have been reached if the IQD was less than 1.00. Meaning that items with IQD = 0.00

were considered to have reflected high consensus. The scales of consensus adapted for this research are group into three. These are Strong consensus - IQD ≤1, Good consensus – IQD ≥1.1≤2, and Weak consensus - IQD≥2.1≤3.

Table 4: Barriers towards Total Quality Management Implementation in the construction industry

Barriers towards Total Quality Management implementation in the construction industry	$\bar{x}$	M	SD	IQD	Rank
Lack of efficient TQM management system	8.50	9.00	1.08	2.00	4
Lack or Limited company resources	7.30	8.00	2.06	1.00	18
Unavailable TQM policy	8.50	9.00	1.08	2.00	4
Lack or Limited knowledge of TQM	8.50	9.00	0.85	1.25	4
Inability to employ TQM personnel	7.20	8.00	1.87	1.00	19
Absent of systematic TQM framework	8.10	8.00	0.57	0.25	10
Lack and Inability to train and educate employees on TQM	8.30	9.00	1.70	1.25	9
Lack of understanding among construction professionals in applying TQM	8.40	9.00	0.84	1.25	7
Lack of coordination of the implementation of TQM policy within the organization	8.40	9.00	1.17	1.25	7
Limited access to body responsible for the implementation of TQM policy	7.40	8.00	2.32	0.50	17
Lack of TQM expert	8.00	9.00	1.89	1.25	13
Reluctance to change old management technique	8.90	9.00	0.57	0.25	2
Complex nature of TQM technique	7.50	8.00	2.37	1.25	16
Lack of commitment from management	9.22	9.00	0.67	1.00	1
Perception that TQM may not yield any better results	7.10	8.00	2.33	1.50	20
TQM technique is time consuming	8.00	8.00	1.05	0.50	13
TQM technique is costly	8.10	8.00	0.74	1.25	10
Lack of finance in the management of TQM experts	8.10	8.00	0.57	0.25	10
Lack of enforcement from the legislative bodies overseeing the implementation of TQM	7.90	9.00	2.18	1.25	15
Lack of interest in the application of TQM	8.80	9.00	1.14	0.50	3

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

On the other hand, Median (M) was used to determine the impact/influence of the identified factors on TQM implementation. The range/scale of impact adapted for this research is shown in Table 3. Using the adapted range/scale, eleven (11) of the identified barriers (lack of efficient TQM management system, unavailable TQM policy, lack or limited knowledge of TQM, lack and inability to train and educate employees on TQM, lack of understanding among construction professionals in applying TQM, lack of coordination of the implementation of TQM policy within the organization, lack of TQM expert, reluctance to change old management technique, lack of commitment from management, lack of enforcement from the legislative bodies overseeing the implementation of TQM, lack of interest in the application of TQM) had Very High Impact (VHI) (VHI: 9-10) on the implementation of TQM in the construction industry (see Table 4). The remaining nine (9) of the identified barriers (lack or Limited company resources, inability to employ TQM personnel, absent of systematic TQM framework, limited access to body responsible for the implementation of TQM policy, complex nature of TQM technique, perception that TQM may not yield any better results, TQM technique is time consuming, TQM technique is costly, and lack of finance in the management of TQM experts) also had High Impact (HI) (HI: 7-8.99) on the implementation of TQM in the construction industry (see Table 4). These indicate that most of the

factors have very high influence which affects Construction Company for not implementing TQM.

CONCLUSION AND RECOMMENDATION

This study intended to apply Delphi survey technique for identifying the barriers to Total Quality Management (TQM) implementation in the construction industry. The conclusions of the study are anticipated to fill the gap in the literature on the very important barriers which affect TQM implementation in the construction industry. Through comprehensive analysis, twenty barriers to TQM implementation in the construction industry were identified. The six most significant barriers among the twenty identified barriers in order of ranking are: lack of commitment from management, reluctance to change old management technique, lack of interest in the application of TQM, lack of efficient TQM management system, unavailable TQM policy, and limited knowledge of TQM. All the twenty identified barriers achieved good consensus by the experts and were considered to have high influence on TQM implementation. Hence, understanding these identified factors that are likely to impede the TQM implementation, will enable managers to develop more effective strategies for improving TQM implantation in the construction industry. It is suggested that further research should be carried out by using the empirical fieldwork (questionnaire survey) to determine the importance, similarities and differences of the identified factors/barriers.

REFERENCES

Aigbavboa, C., and Thwala, W., (2012) An exploration of the use of Delphi methodology in housing satisfaction studies, In: Laryea, S., Agyepong, S.A., Leiringer, R., and Hughes, W., (Eds) Proceedings of the 4th West Africa Built Environment Research (WABER) Conference, Abuja, Nigeria, July 24-26, 2012.

Buckley, C., (1995) Delphi: a methodology for preferences more than predictions, Library Management, vol. 16, no. 7, pp. 16-19.

Czinkota, M. R., and Ronkainen, I. A., (2002) Global marketing 2000: a marketing survival guide, Marketing Management, January/February, pp. 37-44.

Gonzalez, L.P., Jimenez, D.J., and Lorente, A.R.M. (2013). Total Quality and its Relationship with Empowerment and Commitment: Their Effects on Firm's Performance. The 2nd Electronic International Interdisciplinary Conference. Retrieved from http://www.eiic.cz/.

Grisham, T., (2006) Cross cultural leadership, Doctor of Project Management, School of Property, Construction and Project Management, RMIT, Melbourne.

Häder, M., and Häder, S., (1995) Delphi und Kognitionspsychologie: EinZugangzurtheoretischenFundierung der Delphi-Methode, ZUMA-Nachrichten, vol. 37, no. 19, pp. 12.

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

Hamidi, Y, and A Zamanparvar. (2008) "Quality management in health systems of developed and developing countries: which approaches and models are appropriate?" Journal of Research in Health Sciences no. 8 (2):40-50.

Holey, E.A., Feeley, J.L., Dixon, J. & Whittaker, V.J. (2007). An exploration of the use of simple statistics to measure consensus and stability in Delphi studies. BMC medical research methodology, 7(52):1-10.

Jaafreh, A.B., & Al-abedallat, A.Z. (2012). The Effect of Quality Management Practices on Organisational Performance in Jordan: An Empirical Study. International Journal of Financial Research, 4(1), 93. Doi: 10.5430/ijfr.v4n1p93.

Johnson, Shawn, and Brian Kleiner (2013) "TQM can encompass success." Industrial Management no. 55 (2):27-30.

Kheni, N.A., &Ackon. F. (2015). Impact of Total Quality Management Practices (TQMPs) on Construction Project Quality Performance in Developing Countries: Study of Construction Businesses in Ghana. International Journal of Management Science, 2(3), 35-51.

Linstone, A., and Turoff, M., (1975) The Delphi method: techniques and applications, Addison-Wesley, Reading, MA.

Loo, R., (2002) The delphi method: a powerful tool for strategic management, Policing: An International Journal of Police Strategies and Management, vol. 25, no. 4, pp. 762-769.

McKenna, H. (1994). The Delphi technique: A worthwhile research approach for nursing? Journal of advanced nursing, 19(6):1221-1225.

Miller, G., (2001) The development of indicators for sustainable tourism: Results of a Delphi survey of tourism researchers, Tourism Management, vol. 22, pp. 351-362.

Mosadeghrad, AM. 2014. "Why TQM programmes fail? A pathology approach. ." The TQM Journal no. 26 (2):160-187.

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

Pheng, Low Sui, and Jasmine Ann Teo (2004) "Implementing total quality management in construction firms." Journal of Management in Engineering no. 20 (1):8-15.

Projogo, D. I., and Sohal, A.S. (2003) The Relationship between TQM Practices, Quality Performance, and Innovation Performance: An empirical Examination. International Journal of Quality& Reliability Management, 20(8), 901-918.Doi:10.1108/02656710310493625.

Raskin, M.S. (1994). The Delphi study in field instruction revisited: Expert consensus on issues and research priorities. Journal of social work education, 30:75-89.

Rayens, M.K. and Hahn, E.J. (2000). Building consensus using the policy Delphi method. Policy, Politics and Nursing Practices, 1(2):308-31.

Roberts, Emile (1997) "Team training: When is enough... enough?" The Journal for Quality and Participation no. 20 (3):16-20.

Rowe, G., and Wright, G., (1999) The Delphi technique as a forecasting tool: Issue and analysis, International Journal of Forecast, vol. 15, no. 7, pp. 1-23.

Saeed, N.M.N., & Hasan, A. S. (2012) The effect of Total Quality Management on Construction Project Performance. Case Study: Construction Firms in Yemen. Journal of Science & Technology, 17(2).

SAO, (1999) Final report of the 1999 Delphi study, Available: www.soa.org.

Sebastianelli, Rose, and Nabil Tamimi. (2003) "Understanding the obstacles to TQM success." The Quality Management Journal no. 10 (3):45-56.

Soltani, Ebrahim. (2003) "Towards a TQM-driven HR performance evaluation: An empirical study." Employee Relations no. 25 (4):347-370.

Whalen, M J, and MA Rahim. (1994) "Common barriers to implementation and development of TQM Program." Industrial Management no. 36 (2):19.

Zu, X. (2009). Infrastructure and Core Quality Management Practices: How do they affect quality?International Journal of Quality & Reliability Management, 26(2), 129-149. Doi: 10.1108/02656710910928789.