QUALITY MANAGEMENT CONCEPTS, PRINCIPLES, TOOLS AND PHILOSOPHIES: A VALID METHODOLOGY FOR DEPLOYMENT WITHIN UK CONSTRUCTION-RELATED SMEs

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Abstract

Generally, there is confusion as to what constitutes TQM, though it can be regarded as a set of concepts and tools for getting all employees focused on continuous improvement, various schools of thought have defined or classified the critical success factors as constructs, concepts and principles. Therefore the main aim of this paper is to provide a practical approach for understanding the quality management terminology. Using the existing quality management measurement instruments available in literature, the terminology used is classified into constructs, practices and finally tools or techniques. Quality Management may then be viewed as a combination of the three sets of terminology.

Drawing on the quantitative study which investigated the implementation of TQM within the SME, the critical factors of TQM as used in that study as used to demonstrate the practical approach or methodology for the understanding of the terms thus used. For the benefit of practitioners within the Construction Management field, a bit of clarity is required as regards the terminology used. This study contributes to clarifying the conflicting results being reported in the quality management literature which inevitably leads to having different levels of analysis of Quality Management. Accordingly, the strength of quality management compared with other business philosophies should then focus on the practical methodology, namely the practices and techniques.

Keywords: Construction industry, deployment, quality management, quantitative, SMEs

Introduction

The TQM literature is inundated with articles related to the identification of critical success factors of TQM ([1]; [2]; [3]; [4]; [5]; [6]; [7] and [8]), other implementation-related issues, and the identification of links between TQM factors and performance within manufacturing and service industries. Other areas as identified by [9], and a comprehensive study by [10] found the following as the generally accepted areas of TQM; (1) research as related to issues in the implementation of TQM ([11]; [12]; [13]; [14]; [15]; and [16].) However it is evident that there is a lack of a definitive methodology for the deployment of the associated constructs, in particular, the

practice and its underlying tools and techniques regardless of TQM implementation or not.

Therefore, this paper aims to this paper is to provide a practical approach for understanding the quality management terminology. The objectives of this paper and the data for the quantitative studies are presented in three main sections each corresponding to a specific objective as follows;(1) to classify the quality management terminology into constructs, practices and tools or techniques based on existing quality management instruments; (2) to demonstrate how the terminology thus identified can by combined into Quality Management; and (3) to illustrate the deployment of the methodology thus developed within UK Construction-related SMEs

Classification of TQM research

[8] organised and reviewed Quality Management research in the following five key areas as: (1) the definition of quality management; (2) the definition of product quality; (3) the impact of quality management on firm performance; (4) quality management in the context of management theory and; (5) implementation of quality management. All the above cited articles differ in terms of specific firm size; they could be large or SMEs. Industry-wise they could be manufacturing or service and country factors could be affected by the cultural impact.

Classification of Quality Management (QM) Terminology

From the theoretical development viewpoint, the constructs or concepts can be defined as abstractions in the theoretical domain that express similar characteristics (e.g. construction effectiveness, executive commitment and organisation culture). For clarity purposes and to demonstrate the generally accepted confusion throughout this paper, a wide range of terminology will be used. Generally, there is confusion as to what constitutes TQM, though it can be regarded as a set of concepts and tools for getting all employees focused on continuous improvement. A concept may be defined essentially as a business philosophy, a company ideal or a policy statement [17]. Confusion in the terminology can lead to uncertainty, as noted by [18]. They further argue that what might be called core values such as customer focus, continuous improvement, or process orientation are one and the same thing as principles [19], dimensions, elements or cornerstones [20] and interventions [21].

[22] deduced that four **dimensions** represent a minimum common denominator of TQM principles and practices. Similarly, [23] identified the five concepts which constitute TQM levers while [24] classified the **elements** considered among academics and practitioners as to which elements implemented in the organisation when TQM is set up and classified them into five large blocks. These different wide range of terminologies ranging from concepts to dimensions are summarised according to the Author(s) and the Description in Table 1.0 using the TAD approach (Terminology-Author-Description)

Table 1.0: Summary of Building Blocks of TQM

T	Concepts	Elements	Dimensions
A	[23]	[24]	[22]
D	1. Orientation towards Quality 2. TQM links with Customers 3. TQM links with Suppliers 4. Process Control 5. Human Resources	1. Managerial leadership and Commitment 2. Human Resources Management 3. The relationship with customers and Suppliers 4. The internal culture of the Organisation 5. The Process Management	1. Customer Orientation 2. Continuous Improvement 3. Focus on People 4. Global Vision of the Organisation

The above terminologies are grounded in the following Principles of Quality Philosophers such Deming; Juran; Crosby and Ishikawa. These are; Top Management; Commitment; Employee Involvement; Supplier Participation; and Quality Program

Similarities in the Definitions of Constructs

Table 2.0 clearly establishes the compatibility of the Quality Management concepts used by [25] and the key drivers of change advocated by ([26]; [27]). This can be illustrated to show the linkages between Key drivers of Change as identified in the Egan Report and TQM Deployment Constructs used in this Study

Table 2.0: The Compatibility of Powell constructs and the requirements advocated by ([26]; [27])

[25] Constructs	([26], p. 13-14)
Executive Commitment	"Committed Leadership"
Customer Focus	"Focus on the Customer"
Supplier Focus Open Organisation Measurement	"Product Team Integration"
Adopting the Quality Philosophy Benchmarking Zero Defects	" Quality-Driven Agenda"
Training Employee Empowerment	"Commitment to People"

A comparative analysis of some of the issues contained in Table 2.0 is now provided to further corroborate the link between the measurement instrument used by [25] and ([25]; [27])

Executive Commitment / "Committed Leadership"

Both the [25] Instrument and ([26]; [27]) are concerned with having an effective management support in for the quality initiatives. The requirements incorporate the 3c's defined as; commitment, championing; and communication
The [25] instrument considers all of the above and requires a top executive decision to commit fully to a quality program, actively champion the quality and communicate a quality commitment to employees. This is very much in line with [26] committed leadership which is about management believing in and being totally **committed** to

driving forward an agenda for improvement and **communicating** the required cultural and operational changes throughout the whole of the organisation. [26].

Despite the different terminology used in describing Quality Management, there is a striking similarity in the definition of the constructs. For example, [25] provides the following definition of **Executive Commitment** as "A near-evangelical, unwavering, long-term commitment by top managers to the philosophy, usually under a name something like TQM", whereas [26] describes one of the Key Drivers of Change, **Committed Leadership** as; "Committed Leadership is about management believing in and being totally committed to driving forward an agenda for improvement and communicating the required cultural and operational changes throughout the whole of the organisation". Similarly, for the concept of Continuous Improvement, [25] offers the following: "A system in place to stop defects as they occur, rather than through inspection and rework", which is very much similar to [26] **Quality Driven Agenda;** "Quality means the total package exceeding customer expectations and providing real service"

Conclusion of literature review

From the brief review above, the key areas relating to the research in TQM and the classification of the QM terminology are highlighted. The similarities in the definitions of constructs with the concepts and drivers of changes propagated in the Egan reports are illustrated. Based on the above review, it's evident that the issues surrounding quality management have focussed on the identification of various practices, however little research has been conducted on the actual extent of implementing the deployment constructs. Furthermore, one obvious omission is that construction firms, particularly SMEs, do not feature regularly and there is an obvious omission of a practical methodology of understanding the stated terminology. This study therefore aims to fill this gap.

Research Method

The Principal aim of this paper is to provide a practical approach for understanding the quality management terminology. Using a triangulation approach of data collection, the existing quality management instruments are reviewed and the different terminologies as used by various authors to classify the critical success factors of QM are classified into concepts, principles, tool and philosophies. The demonstration of a valid practical methodology for the deployment of the identified terminology is then provided. This is achieved through the empirical demonstration that TQM can in fact be implemented through the operationalisation of constructs found in literature and grounded in the principles of TQM as advocated by the Quality gurus and current excellence models.

Data for the Investigation

The second part of the questionnaire was designed to identify the critical success factors and was based on [25]. This has 34 variables (X_1 through X_{34}) based on the ten deployment constructs (**F1** through **F10**) as illustrated in Table 3.0 (Appendix A): executive commitment, quality philosophy, customer focus, supplier focussed,

benchmarking, and training, open organisation, employee empowerment, quality initiatives and measurement. The questionnaire used is illustrated in Appendix A.

Survey Methodology & Sampling Procedure
The sample for the study consisted of 350 UK construction-related organisations randomly selected from the FAME database. A total of 82 organisations responded giving a response rate of 23%. Nineteen of the responses were unusable due to incomplete data. The quantitative analyses refereed to in this paper are based on the remaining 63 organisations

To measure the extent of TQM deployment, respondents were asked to rate the extent to which their implementation of the quality features was implemented on a five-point scale, where 1= have not begun implementation but intend to and 5 = highly advanced in implementation. The rate of deployment of each construct (**F1** to **F10**) is the average score of its associated measures. For example for the first construct F1, "Executive Commitment" it would be X_1 through X_3 whereas for "Adopting the Philosophy" it would be X_4 to X_6 as shown in Table 3.0, Appendix A

Demonstration of the Tripate Methodology

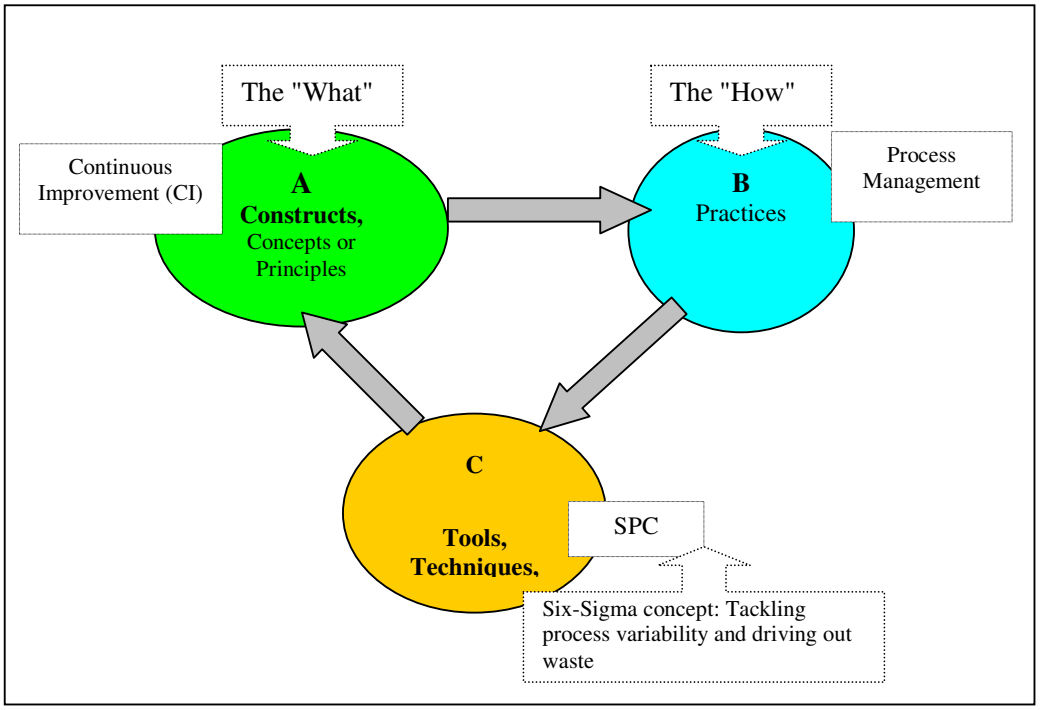

Figure 1.0: The Precepts of TQM

Demonstration of the Practical Approach

To illustrate this tripartite model with an example, the Quality Management Principle (A) of "Continuous Improvement" can be supported by the Practice (B) of "Process Management", which in turn can be implemented using several Techniques (C) such as "Statistical Process Control" and "Pareto Analysis". According to [9], this has led to conflicting results being reported in the literature and may have to do with different levels of analysis of Quality Management. Accordingly, as suggested by [28], the

strength of quality management compared with other business philosophies should focus on the practical methodology, namely the Practices (B) and Techniques (C). According to [29], the concept, and the practice of Continuous Improvement (CI) though well established in manufacturing, is still relatively unfamiliar to the Construction Industry. However they observe that the theme of CI underpins the philosophy of TQM. In order to ascertain the level of Continuous Improvement within the construction processes, organisations could focus on the practices of Zero Defect (**F9**) and Measurement (**F10**) with the associated items shown in Table 3.0. (Appendix A)

Findings

The emerging picture from the quantitative study and literature review is that construction-related SMEs can align their TQM application into one of the following areas; Customer Oriented TQM; Supplier Oriented TQM; HRM Oriented TQM; and Process Oriented

Orientation towards Quality
The following constructs as used in this study addresses the issue of orientation towards quality. These are; Executive Commitment (**F1**), Zero Defects (**F9**) and Adopting the Quality Philosophy (**F2**). There is clear evidence that these are the most important factors for the implementation of TQM as evidenced by the high scores achieved for both types of organisations. This is consistent with the management theory on Leadership and the teachings of the Quality Gurus like ([30]; [31]; and ([32]; [33]) who believe in such philosophies like “Quality is Free”, and “Do it Right the First Time". Deming approaches the problem of Quality Management from a statistician's perspective "Improving quality in manufacturing through the usage of SPC". Both statements attributable PIC, Juran proposed three basic processes; quality control, quality improvement and quality planning.

TQM Links with Customers or Customer Focus
The TQM links with customers can be matched with the customer focus construct as used in this study. The application and importance of "customer focus" was recognised by both TQM and non-TQM organisations in this study. For example Tsang and Antony [34] ranked customer focus 'first' out of the 11 factors used in their study of UK Service organisations. The fact that the study was conducted within the service organisations, drew similar results with this research conducted within Construction highlights the importance of understanding the concept of Customer Focus regardless of the industry.

TQM Links with Suppliers or Supplier Focus
The application of supply chain management within the industry is still slowly being implemented. In particular the focus is more towards customers than suppliers. The findings are consistent with literature on service management which notes that supplier development and management is not as critically important for service organisations as it is for manufacturing organisations, [34] though creating long-term relationships can lead to increasing the competitiveness. As pointed out by [21], at least 50% of TQM organizations collaborate with their suppliers in some way to increase the quality of component parts.

Process Control
One of the concepts identified in the precepts of TQM in the tripate model illustrated in Figure 1.0 was that of Continuous Improvement. According to [35], this is one of the principles of TQM. They further state that in TQM, it is that all work is a process, and problem-solving processes are a continuous cycle of opening one's mind to a wide range of possible solutions.

Benchmarking
Constructional related SMEs have not embraced this concept entirely. While acknowledging that it is suited for manufacturing organisations, it is recommended that they adopt at least one type of benchmarking, (be it generic) where they can learn from other industries.

Measurement
There is also a lack of training managers and employees in the usage and understanding of SPC aspects, despite the concerns raised by various authors such as [36] and [37] who have argued for SPC training and education which has a prerequisite for a successful TQM implementation, this area has been found wanting.

Human Resources
The human resources as used in this study is similar to Human Resources Management, and includes such constructs as 'Training and Education', Employee Empowerment', Employee Involvement as used by [38] in their study of the service industry in India. An effective HRM system can lead to a sustained competitive advantage through the creation of knowledge stocks at individual levels, which is human capital. UK Construction-related SMEs must put more emphasis on human resources management as it plays an important role in sustaining competitive advantage through the socialising of employees [22]. [39] suggest that where SMEs do not have the capacity to employ HR and training specialists; therefore they need specialist advice which they can buy in.

Training

This is one area of concern between the SME's. Despite the advocated benefits of training as illustrated in the ([26] and [27]) reports, constructional related organisations have been found to be slow in embracing this concept. One way forward is as suggested by [40], Organisations must integrate learning within day-to-day work processes, in such a way that they not only share knowledge and continuously improve, but also, operate efficiently in response to their changing environment. Training should be considered as primarily a vehicle for implementing and reinforcing quality practices.

The training construct used in this study focussed on management training in quality principles, employee training in quality principles, problem-solving skills and training in teamwork. This according to [41] is the usage of training for a myriad of other purposes. The training issues are not only applicable to SMEs, but large firms as well.

Open Organisation
An earlier study [42] showed that there was evidence of a strong culture environment among the non-TQM organisations based on the mean scores. For non-TQM this was

ranked second, as compared to the TQM deploying organisations which achieved the 5th rank.

Employee Empowerment

The involvement of employees in designing and planning, an active employee suggestion system including autonomy in decision-making can advance and help the implementation of TQM. These "hard" factors such as usage of graphs and charts to measure and monitor quality would help employees progress their Quality Initiatives and Zero Defects.

Future Directions

Future research could extends the work of ([3]; [14]; [43]; [44] and [45]) by allowing for the separation of direct effects of infrastructure practices on performance from indirect effects of these through the core practices. The main contribution to be made, would be related to two aspects; the development of a theoretical justification of the influence TQM has on business and organisational performance and the existence of a factorial structure that differentiates the soft and hard factors in the assessment of a TQM initiative. This is only achievable through developments of valid methodologies for understanding the quality management concepts, principles, tools and philosophies.

Conclusions

This paper has provided a practical approach for understanding the quality management terminology. Drawing on some of the existing quality management measurement instruments, the paper highlighted the need for focussing on the Practices and Techniques in the quest for the deployment of quality management within UK Construction-Related SMEs. For the benefit of practitioners within the Construction Management field, a bit of clarity is required as regards the terminology used. This study contributes to clarifying the conflicting results being reported in the quality management literature which inevitably leads to having different levels of analysis of Quality Management. Accordingly, the strength of quality management compared with other business philosophies should then focus on the practical methodology, namely the practices and techniques

The study through its objectives has offered a comprehensive and yet simple methodology for scientifically examining how the multitude of precepts, Concepts (A) and Practices (B) involved in Quality Management can be structured into a systematic framework as shown in Figure 1.0 for the development of an empirical understanding of TQM. Further understanding of the relationships between the indicants can be achieved through the usage of fine grained methods such as Structural Equation Modelling (SEM).

The study through the second objective which was to classify the quality management terminology into constructs, practices and tools or techniques based on existing quality management instruments, has through the testing the existing instrument to measure Quality Management practice or dimensions, typically developed using samples of large companies in well developed industry such as construction, but in a

less well studied context such as SMEs. Furthermore, the study extends the work of [9]. Additionally, this is the only research that has focussed exclusively on construction, and in particular SMEs. The empirical validation of the concepts thus identified in [42] strives to enrich the subject of theory building in view of the scarcity of empirical research works in constructional related literature. This contributes towards producing contingency knowledge.

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Appendix A: Table 3.0: Sample of Questionnaire used in the Quantitative Study

Respondents should indicate their implementation of the quality features given below based on five-point likert scale (5 = highly advanced in implementation: 1= have not begun implementation but intend to).

F1. Executive Commitment
X_1 = A top executive decision to commit fully to a quality program
X_2 = Top executives actively championing our quality program
X_3 = Executives actively communicating a quality commitment to employees
F2. Adopting the philosophy
X_4 = Quality principles included in our mission and vision statement
X_5 = An overall theme based on our quality program
X_6 = Entering a European Quality Foundation Model (EFQM) Award competition
F3. Closer to customers
X_7 = Increasing the organisation's direct personal contacts with customer
X_8 = Actively seeking customer inputs to determine their requirements.
X_9 = Using customer requirements as the basis for quality
X_{10} = Involving customers in product or service design
F4. Closer to supplier
X_{11} = Working more closely with suppliers
X_{12} = Requiring suppliers to meet stricter quality specifications
X_{13} = Requiring suppliers to adopt a quality program
F5. Benchmarking
X_{14} = An active competitive benchmarking program
X_{15} = Researching best practices of other organisations
X_{16} = Visiting other organisations to investigate best practices first hand
F6. Training
X_{17} = Management training in quality principles
X_{18} = Employee training in quality principles
X_{19} = Employee training in problem-solving skills
X_{20} = Employee training in teamwork
F7. Open Organisation
X_{21} = A more open, trusting organisational culture
X_{22} = Less bureaucracy
X_{23} = Use of empowered work teams
F8. Employee empowerment
X_{24} = Increased employee involvement in design and planning
X_{25} = A more active employee suggestion system
X_{26} = Increased employee autonomy in decision making
X_{27} = Increased employee interaction with customers and suppliers
F9. Zero Defects
X_{28} = An announced goal of zero-defects
X_{29} = A program for continuous reduction in defects
X_{30} = A plan to drastically reduce rework
F10. Measurement
X_{31} = Measurement of quality performance in all areas
X_{32} = Valid charts and graphs to measure and monitor quality
X_{33} = Appropriate statistical methods to measure and monitor quality
X_{34} = Employee training in Statistical methods for measuring and improving quality