

# TOTAL QUALITY MANAGEMENT AND PROJECT MANAGEMENT SYSTEMS: A SOLUTION TO RE-THINKING CONSTRUCTION

Nicholas Chileshe, Norman Watts and Paul Watson

Sheffield Hallam University, School of Construction, City Campus, Pond Street, Sheffield, S1 1WB, UK

This paper is in response to the Re-Thinking Construction Task Force Report chaired by Sir John Egan. The report focuses on the scope for improving quality and efficiency in the UK Construction Industry Housing Sector. However, it is the authors intention to establish the transferability of the problematic issues to all sectors of the UK Construction Industry. The identified problematic issues requiring particular attention are : *Cost, Quality and Time* and this is put most succinctly in the report as “Projects are widely seen as unpredictable in terms of delivery on time, within budget and the standard of quality expected” The authors will offer Total Quality Management and Project Management Systems (PMS) (interlinked) as advocated solutions to the problematic issues. The paper is based upon an extensive literature review and two ongoing research projects.

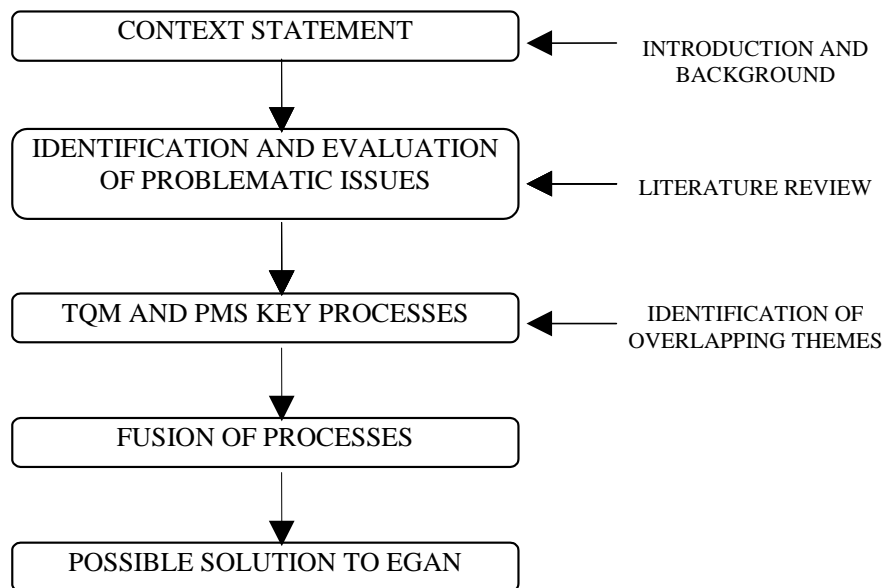
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## INTRODUCTION

The Construction Industry Council believe the Egan report (1998) to represent a great opportunity for construction professionals. “ But the means of measurement and assessment will have to be developed in an independent way, by construction professionals through their institutions and research associations” (*The Building Engineer*, Oct. 98). The main thrust of this paper is the identification of problematic issues associated with time, cost, and quality related issues in the construction industry. Advocated solutions are provided by adopting the systems approach, the external environment in which construction organizations operate is also examined. Woodward (1997) stated that at the centre of the construction process, for the construction firm is the enhancement of production value through the balancing of three opposing objectives; the reduction of cost and time and the maintenance of quality. All three factors are influenced by external bodies which maybe directly or indirectly involved in the product.

## RESEARCH METHODOLOGY: PART A

The method is illustrated in Figure 1. The first step was the introduction and background to the report which we termed as the context statement, this involved highlighting the terms of reference of the report and formulation of the objectives. This was followed by literature search on the management writings on Total Quality Management and Project Management Systems. The third step identifies the key processes in both areas of research and the identification of overlapping theme , particular attention being paid to *cost, quality* and *time* related issues. Step four is the



**Figure 1:** research methodology flow chart

fusion of the processes as identified and finally with the advocating of solutions to the problematic issues.

### Aims

The paper addresses the following issues: firstly it identifies the rationale behind the Task Force's report, secondly by drawing particular attention to the problematic issues related to *Cost*, *Quality* and *Time*, analyse the key points. There are 5 key drivers of change noted, targets set and tools and techniques identified to do this. As the report sets stiff targets, recommends large-scale changes, it however falls short of providing any solutions. To address this the Construction Trichotomy is presented. The Research project(s) applies systems theory and advocates the fusion of PMS and TQMS as a means of addressing the problematic issues raised in the Egan Report.

The main objectives of this paper are to identify the problematic issues leading to the commissioning of the report, this essentially will provide the background to this response. The paper evaluates the key points of 'Egan' and how it impacts upon other sectors of the construction industry. A critical evaluation of the targets will be identified within this paper and the development for a possible strategy for their attainment.

### Ongoing research projects

Both research projects form part of 2, three year doctorates:

Research Project 1: An Investigation into the application of TQM within Small and Medium Sized Construction Enterprises. The main aim is to establish the rationale for TQM providing a competitive advantage for constructional organizations and the development of a generic model for the implementation process.

Research Project 2: An Investigation into project management within a construction operational environment. The main aim of the research project is to identify problematic issues associated with the construction trichotomy and specialist trade contractors at the post tender construction stage. The objective of which is the further

development of the partnering paradigm to aid participation in the reward process, maximizing the effectiveness of co-operation and teamwork down the supply chain.

### **Background to the report**

The Construction Task Force was established in October 1997 by the Deputy Prime Minister (John Prescott) to advise him on the scope for improving quality and efficiency in the UK Construction industry by paying special attention to housing. One of the terms of reference of the construction task force was to quantify the scope for improving efficiency and derive performance measures and the other to which the papers evaluates is the Identification of specific actions and good practice which would help achieve more efficient construction in terms of quality and customer satisfaction, timeliness in delivery and value for money

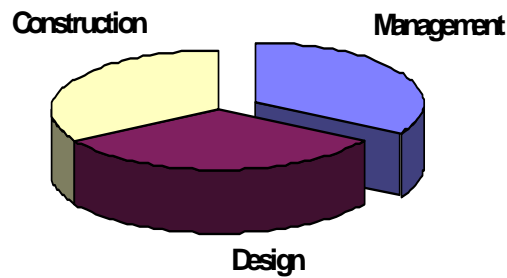
It is the author's view that although a great deal of research has been undertaken regarding the Egan Report, the challenge posed to construction professionals to come up with improvement tools still needs to be addressed. Therefore the approach adopted is based on the existing theories and assumptions from past research findings. The Egan report is not calling for a change in the way the industry does its business but a new approach.

## **SYSTEMS AND PROCESSES: A MEANS OF ADDRESSING ISSUES RAISED BY EGAN**

The Concise Oxford Dictionary defines a system as: "a complex whole; a set of connected things or parts: an organized body of material or immaterial things". It can be interpreted as a model used in practice or theory to show relationships, interactions and functions. A closed system is one that is not responsive to factors outside the system. Walker (1996: 35) considers a machine as a closed system in that each part has a specific function and that the machine will only do the predetermined task. Variations from the actual output can be measured and compared against a desired output. If the values differ, action from a relatively simple control mechanism or system, will re-establish the systems goals. This simple internal approach to this type of system with limited variables, is posited to be linear and therefore predictable.

In simplistic terms an open system can be considered non-linear, where factors interact in ways that are influenced both from within and outside the system including time factors. Thompson (1967: 6) recognized that, "*an organization is a set of interdependent parts which together make up a whole in that each contribute something and receives something from the whole, which in turn is interdependent with some larger environment.*" This external approach, based on complexity occurs within a construction milieu is governed by the make up and relationship of parties within the project environment. Uncertainties within these systems exist when differences occur between information needed to perform tasks and information that's held Galbraith (1973), due to the complexity of the variables within the system and within its environment.

Processes can be considered as the methodologies used in navigating through a system to reach the goal. Process definition is important because the inputs and outputs change with the scope of the process. Once the process is defined to provide customer requirement, the inputs (suppliers), outputs (customers) can also be defined, together with the requirements at each of the interfaces. The most difficult area in which to do this are in non-manufacturing organizations or parts of the organizations. The



**Figure 2** The construction trichotomy

construction Industry falls into this category. In order to monitor and analyse any process, it is necessary to first of all identify what the process is, and what the inputs and outputs are. Prevention of failure in any transformation is possible only if the process definition, inputs and outputs are properly documented and agreed.

The following section provides the definitions of Project Management, Total Quality Management from the process (systems theory) point of view. Newcombe *et al.* (1990) provide the following steps in the ‘open systems approach’

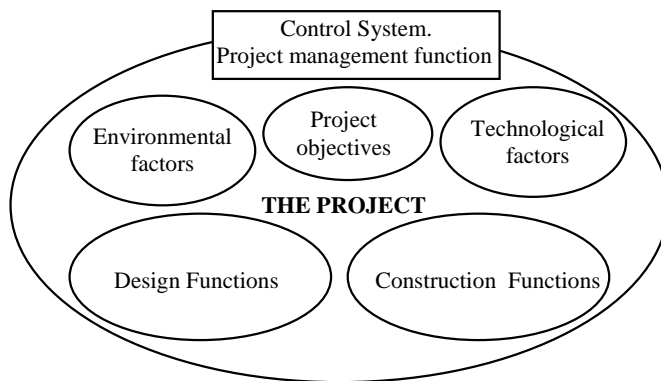
- Define the system
- Identify the component parts of the system
- Define the environment of the system

In terms of the latter, there is the inherent complexity of factors that shape the internal and external environment of construction projects, which in turn influence the system. Shirazi *et al.* (1996) identified this environment as a “*collection of conditions with specific impacts on the organization*”. Post modernism (Watson and Chileshe 1998) embraces the ethos of organization flexibility associated with dynamic and changing environments.

## PROJECT MANAGEMENT SYSTEMS

The Chartered Institute Of Building (CIOB) (1996:3) defines (construction) project management as: “the overall planning and co-ordination and control of a project from inception to completion aimed at meeting a client’s requirements and ensuring completion on time within cost and to required quality standards.” BS 6079 (1996:2) in a more generic sense defines it as: “the planning, monitoring and control of all aspects of a project and the motivation of all those involved in it to achieve the project objectives.” Essentially planning, co-ordination, control and monitoring are then the processes. Collectively the interrelationships can be considered as the system.

Project management can be viewed as one of the constituents of the construction trichotomy (Figure 2). It is in essence the separation of the management from the design and construction or execution functions CIOB (1996:3). The management function objectives include the supervision and co-ordination to solve problematic issues associated with complex undertakings. Munns *et al.* (1996:81) noted that project management has been recognized over the last 30 years as an efficient tool to handle novel or complex activities. Walker (1996:23) saw the development, highlighted in a 1965 pilot study of construction project management from what he



**Figure 3:** Project management control system

terms as a ‘passive procedural activity’ to more dynamic integrated procedural activity.

### Organization

Project management advocates the creation of a temporary and unique organization structure at project inception as a precondition to project success. The relative autonomy of project teams provides a more holistic management approach with the ability to meet the demands of complex projects quickly and effectively. An advocated advantage of project management is that creative solutions to problems are achieved through its independence from the construction and design side of the construction trichotomy.

### Outline System

Figure 2 shows project management in terms of the construction trichotomy. Certainly beyond the design and construction phases the project identified by Munns *et al.* (1996) in its entirety consists of 6 stages: conception, planning production, handover, utilization and closedown of which the overlap between the project and project management occurs within planning, production and handover. However, within construction the role of project management can also occur at inception/conception, feasibility and strategy stages.

The control system is the mechanism in which the organized integration of players and resources are effectively managed to achieve for the clients the project objectives.

## PARTNERING RELATIONSHIPS

The concept of partnering in essence is trust and openness between parties, advocated by Latham (1994) it was an attempt to reduce the adversarial attitudes of parties within construction.

The partnering paradigm advocated by Hellard (1996) a procurement option on major projects should be considered in relation to other general procurement approaches to managing the owner-contractor relationship. Other benefits formed from empirical studies for example: Larson (1995) in a study of 280 construction projects concluded that partnered projects achieved superior results in controlling costs. CIB (1997) cited 5 case studies with realized benefits in terms of reduced costs and programme times. Bennett *et al.* (1998) illustrated the routes of 6 case studies and concluding that each

case study benefited from significant reduced costs and programme times as well as other peripheral benefits.

## PARTNERING WITHIN PROJECT MANAGEMENT

In terms of Project Management the concept of partnering can be defined as both ‘a structured management approach to facilitate teamworking across contractual boundaries’ and ‘as a structured methodology for organizations to set up mutually advantages commercial arrangements’ CIB (1997:1,3).

Kaming *et al.* (1997) showed that improving construction efficiency by means of cost-effectiveness and timeliness would certainly contribute to cost savings for a country as a whole.

## TQM DEFINED

There is no generally agreed definition of TQM. The literature suggests that its a management philosophy or a collection of techniques aimed at improving the efficiency and effectiveness of a given process. However the generally accepted definition of quality is that of “ Conformance to the established requirements”. In the Construction Industry these requirements are the established characteristic of a product, process or service (Wills and Wills 1996) and are usually derived from:

- Customer Contracts, Engineering Specifications , Drawings and
- National recognized codes and standards, and self-imposed requirements

The above sources of requirements would be integrated into the construction process in order to highlight the potential sources of conflict, which would lead to project delays. The client normally determines the requirements at the initial stage, these are supplied to the designer, who translates them into design documentation. The contractor (depending on form of contract) uses the designer’s plans and specification, processes the construction, and supplies the completed facility to the client. It is clear that the roles of the three parties (client, designer and contractor F) have not traditionally been viewed this way, but this clearly illustrates that construction is a process and the TQM view implies that if the customers (client) are to be kept satisfied, the process must be constantly be improving. Customer satisfaction at each stage of the construction process implies that the goals of the construction process are met.

In order to address the problematic issues raised in the Egan report, the fig 4 shows how the *Product* should be taken as the focal point for an organization purpose and achievement. Quality in the product is impossible without quality in the *process*. Quality in the process is impossible without *organization*. The right organization is meaningless without the proper *leadership*. Strong, bottom-up *commitment* is the support pillar for all the rest. (Creech 1994: 6)

The above model in Figure 4 answers one of the drivers of change advocated by the Egan report. This involves integrating the *process* and team around the *product*. An acknowledged problem of the construction industry is that of fragmentation. From a project management’s point of view, the success of any major construction project is the dependency in the co-operation and temporary integration of the clients sub-organization, the project team and the main contractor’s sub-organization and specialist contractor’s organization.

## KEY PERFORMANCE INDICATORS (KPIs)

The Egan report calls for the construction industry to produce its own structure of objective performance measures agreed with clients. KPI also define critical success criteria and the processes in project implementation plans, providing an ongoing knowledge base of project information. Benchmarking against previous projects enables the potential for achieving best practice. Lau and Anderson (1998) stated that adopting clear quality measurements allows specific goals to be established and specific results to be forecast. Since the publication of the Egan Report, a set of ten key performance indicators on project delivery and company performance has been produced for the construction industry by a working party under the direction of a working group of the Movement for Innovation chaired by Alan Crane. These Key Performance Indicators (KPIs) would be used to show the range of performance achieved across the construction industry.

Schalkwyk (1998) provided ten fundamental changes occurring frequently in performance measurement systems of manufacturing companies that have successfully implemented TQM. Schalkwyk argues for a move from predominantly financial focus to non-financial measures that directly measure quality performance. Schonberger (1992) points out that 'The techniques of TQM are changing the way service industry firms measure and improve quality. Traditional measures of the bottom line such as *sales, profit and resource utilization*, while still in use, have declined in importance'. Whereas studies (GAO 1991) of twenty finalists of the Malcolm Baldrige National Award showed that measured improvements in *employee relations, operating procedures, customer satisfaction and financial performance* can be achieved in companies that practice the principle of TQM.

The empirical evidence shows that applying and practising the principles of TQM would help construction organizations deliver their projects on time, on budget, free from defects to the clients' satisfaction. However, they are measurement limitations as TQM may not be applicable in all situations (Lau and Anderson 1998)

## TRADITIONAL PROBLEMATIC ISSUES ESTABLISHED THROUGH EMPIRICAL RESEARCH

The identification of the factors that are associated with problematic issues have been collected and identified (Table 1) from wide-ranging and established literature sources too numerous to identify within this paper. However, it should be stressed that the factors are merely indicative of the relative issues associated with cost, quality and time and are by no means exhaustive.

## ADVOCATED SOLUTIONS

Organizations must conduct a strategic analysis (Johnson and Scholes 1993: 18) to obtain a true picture of their present circumstances, opportunities and threats. After this has been accomplished the organization must:

1. Identify industry best practice thus allowing benchmarking to position the company in relation to its competitors. The areas of focus for the benchmarking activity should be the 'critical success factors' (CSFs) of the organization
2. Upon identification of the CSFs and their analysis senior management must then formulate a strategy to provide a platform for instituting improvements. This would require information in the form of the:

**Table 1:** The problematic issues established at both organizational and project level

<b>Cost Related</b>	<b>Quality Related</b>	<b>Time Related</b>
Estimating	Philosophy	Planning
Forecasting	Specification	Estimating
Budgeting	Administration	Scheduling
Controls	Progress Review	Control
Application	Support	
	Evaluation methods	

- Senior management must attain a full understanding of the philosophy and requirements of TQM they are responsible for establishing a quality focused organization;
- Development of objectives (shared objectives between both organizational and functional levels);
- Development of performance measures (Performance indicators). These must be consistent with CSFs and market requirements;
- A common vision is required by all employees of the organization, this may be accomplished by adopting awareness sessions, customer surveys, and common vision workshops;
- Development of a means of communication and evaluating at all levels of the organization.
- The development of an implementation strategy which may be based on an incremental process. Senior management must review the quality management system in order to maintain progress;
- Designing procedural systems appertaining to work practices, concentration of organizational effort should be on prevention rather than corrective actions.

## CONCLUSIONS

This paper has highlighted a number of principles and benefits of applying TQM and PMS as a means of improving the effectiveness and efficiency of the construction industry

Miozzo *et al.* (1997) have purported that drawing on the processes and organizational methods utilized in the manufacturing industry, could provide a strategy for improving both the efficiency and effectiveness of organizations employed within the UK construction industry and hence should be explored in earnest in order to meet the requirements of the Task Force's report.

Project management functions (cost, quality and time management) identified and effectively managed within all phases of the project life cycle and the application of TQM would enable construction organizations embrace the fundamentals laid out in the Egan Report under the banner of 'Drivers of Change'. It is the author's view that while the Egan Report is advocating radical changes and suggesting ways of improving the efficiency and effectiveness of the industry, there are already management techniques/concepts such as TQM, which has been adopted successfully in the manufacturing industry and remains to fully implemented in the Construction Industry and could address the key issues of the report. The methodology embraced by manufacturers to provide a competitive vehicle encompasses TQM. However, TQM



and the concept of benchmarking have been amalgamated under the heading of 'Best Practice' Construction organizations could adopt the manufacturing best practice model as a vehicle for empowering them to improve their performance.

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