INVESTIGATION OF QUALITY MANAGEMENT PRACTICES IN BUILDING CONSTRUCTION SITES IN THE UK

Ramesh Marasini¹ and Paul Quinnell

Faculty of Technology, Southampton Solent University, East Park Terrace, Southampton SO14 0YN

Some large construction companies have adopted quality certification such as ISO9000 to manage their construction projects to ensure the effectiveness, flexibility and competitiveness of a business as a whole. A study presented in this paper investigates the status of quality management on building construction sites of a major ISO9000 certified construction company in the UK. A questionnaire survey of site managers working in eleven projects was conducted and views of thirty five site managers were analysed. The findings of the study suggest that site managers possess familiarity with some techniques used to ensure quality in their respective projects. However, they were reliant upon their own experience and concepts to manage quality. It was perceived that senior management did not demonstrate any leadership with respect to the quality system and lacked uniformity in methods and frequencies of communications. The majority of site managers suggested that they considered quality management equally important when compared to health and safety. However, the site managers perceived that senior management attention to the quality was less. The study shows a lack of training of the site managers in the skills required for quality management. There is a need to make site managers more aware of quality management systems, procedures and their importance in delivering projects within the stipulated quality.

Keywords: quality management, site practice, training.

INTRODUCTION

Quality management is a way of managing to improve the effectiveness, flexibility and competitiveness of a business as a whole (Oakland 1993). In construction the problem of quality and its value of importance to the construction industry has been an area of great concern and debate for many a year (CIRIA 1990). The construction industry is widely criticized for the low quality of delivery of construction projects both the finished product quality but also in the processes used during the project design and construction stages. Significant time and cost is currently spent in correcting problems during the snagging process and the majority of projects either suffer from time overrun or cost overrun or both. Sommerville et al. 2004 suggest that lack of care and a poor attitude towards quality on behalf of the contractor is leading to the snagging problems.

Construction clients quite often assess quality in terms of how they experience the building (product) in use, rather than its components and assembly (Fryer et al. 2004). The lack of attention and focus upon the quality of the final product places a greater

¹ ramesh.marasini@solent.ac.uk

emphasis on the snagging process (Sommerville et al. 2004) and therefore on inspection and quality control. However, this discounts the importance of process-based approach to deliver final product with desired quality. As suggested by Haupt and Whiteman (2004), the quality of the product must be built into the product from the outset.

Clients are demanding the highest standards of quality (Griffith and Watson 2004). Egan (1998) emphasizes that the client’s requirements must be fully addressed through a quality management system in an efficient and effective manner. The industry has begun to take up the challenge (Delgado-Hernandez and Aspinwall 2008). As a result, many construction companies, mainly large, have implemented quality management techniques and quality assurance systems (QA) including ISO9000. A study by Delgado-Hernandez and Aspinwall (2008) shows that there are still shortcomings in the construction company quality management practices such as lack of internal communication, ineffective decision-making processes and poor identification of client needs.

In order to deliver projects successfully, the top level policies must be translated into SMART objectives at tactical and operational level. The quality of the product and processes at the operational level i.e. site level are the main contributor to the overall output quality of the construction projects. Latham (1994) recognizes that the site management team plays a significant role in raising construction standards and improve the delivery of the projects. Haupt and Whiteman (2004) also argue that the benefits of quality management systems will be minimal unless the principles are transferred to site operations. This paper explores the current practices and perception of quality management at construction site level through a study of site managers working in various projects of an ISO9000 certified large construction company in the UK.

QUALITY MANAGEMENT AT SITE LEVEL

There are different quality management systems that construction companies use including Investors in People (IIP), ISO9000, EFQM, custom designed systems and or third party certifications (Griffith and Watson 2004). Irrespective of the system used, quality should be managed in ways which are clearly identified, well documented and efficiently planned, implemented and controlled (Fryer et al. 2004).

Key elements of quality systems include quality planning, quality control and quality assurance (Office of Government Commerce, PRINCE2 2009). Quality assurance starts from top management who have the responsibility of creating the quality policy. Once established the quality policy is expanded and transferred into objectives in the form of a quality manual. The quality manual sets out what management requires its staff to do to assure quality (Chung 1999). The quality manual is recognized as the key document on site as it will detail how the project will operate through quality procedures and instructions. Based on the quality manual, quality procedures and work instructions are developed for site use. A project quality plan (PQP) is prepared to establish project level quality procedures bringing together the project information and the companies’ policies, procedures and inspection routines’ (Griffith and Watson, 2004). This theoretically links the relevant parts of all of the supply chain participants’ own quality systems together around the needs of the project (Barrett 2000).
The pressure to reduce the initial costs of construction and supervision often lead to an adverse effect on quality. Chung (1999) and March (2009) state that a senior member of the management team should be appointed to take control and act as the quality manager. It is a common practice to have preliminaries for a representative to health and safety on every major construction site. However, there is a lack of evidence of having a site-based “Quality Manager” and included costs to the initial bid. Griffith and Haworth (2001) state that management of health and safety is without doubt the most important function of construction management. This is accepted as it is driven and governed through the legislation, however, many companies would rank quality and health and safety as having equal priorities. Clarke (2003) argues that health and safety and the quality assurance system have much in common. In 2009 a study by Griffith and Bhutto; highlighted the fact that integration of quality, safety and environmental management systems were being hindered as a result of senior management struggling with system configuration and implementation. The study established that contractors generally agree that better training and knowledge of management systems will assist them to appreciate and improve their own systems whilst acknowledging that it will only be effective and successful if developed in a way that employees can easily understand.

The role of site management is crucial to improve the quality of the delivery of construction projects. With reference to total quality management implementation, Haupt and Whiteman (2004) further stress that quality management principles should be applied beyond management levels and include workers on site. To achieve this, it is very important that site managers and their teams must understand the importance of quality management, use appropriate quality management tools and techniques. Effective training to the implementation of such a system is equally important to ensure a building is constructed right first time with zero defects. Training is the single most important factor in improving quality, once there has been a commitment to do so (Oakland 1993). For training to be effective, however, it must be planned in a systematic and objective manner.

**RESEARCH METHOD**

The company discussed in this research study is an international construction company with projects in Canada, Jamaica, Dubai and the UK which is ISO 9001:2008 certified and operates throughout the UK in Building and infrastructure sector. Site managers working in 11 different projects including schools, hospitals and privately funded builds within the South, Midlands and South East regions were selected for the study so that typical trends and attitudes of site management working within the company can be established fairly. With access to the company email and intranet, an online questionnaire was developed using Kwiksurveys© and 86 site managers were contacted through e-mail. This approach provided speed of data collection and ease of tracking invitations and status. Particular attention was taken to make questions simple, easy to understand and respond avoiding any potential misinterpretations that could occur. A pilot study was carried out which helped to improve the readability and focus of the questions. A sample questionnaire with analysis of responses is presented in Table 2. The questionnaire was divided into 5 different sections: Personal and Project Details, Awareness of Quality, Quality Implementation, Quality Perception and Importance of Quality.
RESULTS AND ANALYSIS

Out of 86, 35 responses were returned, working on sites covering 11 different projects as shown in Table 1. To ensure anonymity remained throughout the research; each project was assigned a letter of the alphabet from A – K. This information was obtained from Question 2 of the questionnaire. Simple statistics were used to evaluate the responses of the site managers for closed questions and qualitative analysis was used to highlight individual experiences and views of site managers on quality management issues through open ended questions and when supplementary question was asked to justify their responses in the closed questions.

Personal and Project Details

The analysis of responses shows that 89% of the respondents were experienced with more than 5 years (Table 2 Q2) and all the respondents (Table 2 Q3) had worked with the company under study for more than a year, which established the familiarity of the respondents with industry and company practices respectively and therefore, the responses provide substance and objectivity of the responses for analysis.

Table 1: Details of the projects where respondents were involved

<table>
<thead>
<tr>
<th>Project Code</th>
<th>Type of project</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>School</td>
<td>South East</td>
</tr>
<tr>
<td>B</td>
<td>School</td>
<td>South West</td>
</tr>
<tr>
<td>C</td>
<td>School</td>
<td>South West</td>
</tr>
<tr>
<td>D</td>
<td>Hotel</td>
<td>South West</td>
</tr>
<tr>
<td>E</td>
<td>School</td>
<td>South East</td>
</tr>
<tr>
<td>F</td>
<td>Infrastructure</td>
<td>Midlands</td>
</tr>
<tr>
<td>G</td>
<td>Office Based</td>
<td>Midlands</td>
</tr>
<tr>
<td>H</td>
<td>Business Park</td>
<td>South East</td>
</tr>
<tr>
<td>I</td>
<td>Hospital</td>
<td>South East</td>
</tr>
<tr>
<td>J</td>
<td>School</td>
<td>South East</td>
</tr>
<tr>
<td>K</td>
<td>Hospital</td>
<td>South West</td>
</tr>
</tbody>
</table>

Figure 1: Percentage of respondents working on different projects

Figure 2: Type of projects studied

Awareness of Quality

Questions (3 to 5) were designed to evaluate the awareness of site managers regarding quality management as part of their job role and their appreciation of the company’s policies and systems, types of quality management systems utilized and dissemination of quality management strategies from senior management to the site managers.

The majority (97%) of site managers (Q3, Table 2) used at least a form of quality management system in the construction industry, other than a site manager working on project D suggesting that any form of formal quality management did not exist.

Figure 3 highlights that 86% of site managers recognize the information received from senior management through e-mail, memo, seminar, monthly briefings, and intranets.
E-mail was recognized as the frequently used method of communication and no “One-to-One” discussion was used. It is interesting to note that 14% (5) of site managers who did not realize any form of communication regarding quality management (Q4, Table 2). These managers were involved in Projects A, C and J and had served at least three years, no obvious reasons could be identified for this response. It is likely that these managers felt that quality issues were not specifically addressed through email, memos or any other methods.

Table 2: Details of questionnaire and analysis of responses

<table>
<thead>
<tr>
<th>Questions</th>
<th>Yes</th>
<th>No</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Please select in years your overall experience within the construction industry?</td>
<td>&lt;5 years 11% (4) 5-10 years 14% (5) 10-15 years 9% (3) &gt;15 years 66% (23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Please select the number of years you have been employed by your current company?</td>
<td>&lt;1 year 0% &lt;3 years 11% (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Have you used any form of quality management system in the construction industry?</td>
<td>97% (34) 3% (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Have you ever been communicated or advised about Quality Management from Senior Management in your current project?</td>
<td>86% (30) 14% (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Are you currently using any of these Quality Management systems on your project?</td>
<td>Figure 3 and Figure 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Do you use any of the following activities in order to ensure quality in your current project?</td>
<td>Figure 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Do you use a Quality register on site?</td>
<td>Figure 6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. In direct comparison to that of health and safety on site; please give your opinion on the importance of quality management in your construction project.</td>
<td>More 6% (2) Same 68% (24) Less 26% (9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. How do you rate the attention your company gives to Quality Management in comparison to that of H&amp;S?</td>
<td>More 0% Same 37% (13) Less 63% (22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Do you think each site should have a Quality Manager responsible for implementing Quality Plans and Checklists?</td>
<td>57% (20) 43% (15)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Do you feel that a quality management system is a necessity for the site team to deliver a project with zero defects?</td>
<td>Strongly Agree: 51% (18) Agree: 40% (14) Neutral 9% (3) Disagree 0% Strongly Disagree 0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Do you agree quality management systems help reduce defective work and the number of snag corrections in your current project?</td>
<td>91% (32) 9% (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. In a typical working week; please identify how much time you spend ensuring quality assurance activities?</td>
<td>Strongly Agree 51% (18) Agree 40% (14) Neutral 9% (3) Disagree 0% Strongly Disagree 0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 Have you ever received training in any form of Quality Management system?</td>
<td>34% (12) 66% (23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Do you feel Site Managers need to be trained in Quality Management skills?</td>
<td>91% (32) 9% (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Would you be spending more time to achieve zero defects if there were incentives provided to you?</td>
<td>66% (23) 34% (12)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4 shows the use of different quality Management systems on different projects. For the ISO90000 certified company, the use of ISO90000 was recognized by 23% of site managers which is less than the use of other approaches such as common approaches of specialist contractors system (26%) and a checklist template (26%). This clearly suggests that there is no consistency and uniformity of quality management approaches deployed in the delivery of projects. A site manager working in Project C commented that “apparently we are ISO9000 but that has never meant to me that there is a set quality system. Everything I’ve ever done for quality assurance has been customized to suit different projects”.

Quality management
Quality Implementation

Question 6 and 7 focused on the site managers' understanding of quality implementation to investigate if, by the very nature of their job role, they undertook valuable quality management tasks; whether a quality register is maintained and updated frequently to record and manage quality issues.

Although quality management techniques are recognized by site managers (Figure 5), the diversity in the range of answers suggests the lack of uniformity among the project and site managers who interpreted their understanding of ‘quality’ in their own unique manner. This provides an indication that site managers require more training on the concepts of quality management and its importance due to a lack of defined processes within the company.

The quality register is a main document whatever approach to QMS is used. The quality register provides key audit and assurance information regarding what was planned and agreed to the quality activities actually performed. Figure 6 portrays that the quality register is either never or sporadically used on company projects equating to 62% of the response. While analysing the individual responses, it was identified that respondents from Project C had varied responses, some answering ‘weekly’ and some saying ‘never’. It can therefore be argued that site managers lacked proper understanding of the quality register and its purpose.

PERCEPTION OF QUALITY MANAGEMENT

Priority of Quality Management over HandS

The objective of this section (Question 8 and 9) was to evaluate the company’s priorities of quality and health and safety as well as the respondents’ own attitude.
Site manager’s personal views

As HandS is mandatory, it was expected that the majority of respondents would be “same or less” as the default answer. 26% of the respondents who argued that quality is of less importance to that of health and safety. In this regard, some responses from site managers were very reinforcing: ‘Health and Safety must always be the number one priority’; “this is fact, based on the attitudes of senior management; ‘breaching health and safety legislation could lead to prosecution under the Health and safety at Work (HASAWA) 1974. No such legislation for breaches in quality assurance’.

Encouragingly 68% of the respondents’ felt that the importance of quality management was equal to that of health and safety and additionally provided justification to their answer. The views of site managers suggested that whilst ultimately the health, safety and wellbeing of individuals should be of higher importance than the quality of a built product; there is a direct correlation between the two. Completed poor quality work can be detrimental to the health and safety of all those around it and if safe health and welfare conditions are not provided to undertake the work, there is every chance that they will be reflected in poor quality product delivery and quality and safety are intrinsically linked.

Some responses (6%) stating ‘more’ has suggested that there are people who actually appreciate the importance quality management for the business profitability and success. As 68% site managers stated the importance was equal, it is evident that the majority of site managers are recognizing that both the management of health and safety and quality management are fundamentally linked and must be managed well.

Perception of site managers on Company’s priority

The perception of management views towards HandS compared to quality was different from their own personal view. The majority of respondents (63%) perceived that the company’s guidance and focus in quality management was less when compared to health and safety. Some noteworthy responses include: ‘the company have been inclined to put the main emphasis on health and safety, quality has been less of a concern over the years ’, ‘No real attention has been paid to maintaining a quality management system and no training of staff has been carried out’, ‘Quality is a poor relation to health and safety, there is no or very little investment, no regular audits and the reliance is from the sub-contractor’.

A number of site managers had highlighted that the company was beginning to introduce new systems targeting quality. One site manager stated that quality has noticeably improved over the last six months and other acknowledged that the company appears to be addressing the issue of quality with the aim to raise quality management to the same status as health and safety.

Role of quality manager

ISO9000 clearly identifies the role of a quality manager on construction sites (ISO 9001:2008, BSI). The majority of site managers (57%) realized the significance of having one person with overall quality management responsibility. The responses from the site managers in their own words ‘without a quality manager, quality will be overlooked’ and ‘it is more likely to continually happen if there is an individual managing it’ reinforce the importance of quality managers role on site.

An analysis was also carried out why 43% of site managers did not feel a need for a quality manager. Some views included that some sites are simply not large enough to carry a man dedicated to quality and the size of job would be the influencing factor simply acknowledging that the preliminaries of the job could not afford a manager
dedicated to quality. Quality management is seen as a behavioural issue. A view supporting this argument was that ‘responsibility and ownership for quality inspections should be with every member of the construction team. Insisting on a manager for quality could delegate some of the responsibility away from the people who need to take ownership of checking and implementing quality plans’. These views can be linked to the size of the projects and appreciation by the site managers how the role of Quality Manager would support them in fulfilling their duties and responsibilities.

**Importance of Quality**

Questions 11 to 13 were aimed to identify the importance of quality from site management perspective. The majority of site managers (91%) acknowledged that a quality management system is necessary for a site team to deliver a project with zero defects with some strong views in support as “compliance can never be achieved without a system”; however other respondents argued that the delivery of a project with zero defects is possible without a formal quality management system, however, the existence of quality management procedures, whilst no guarantee of zero defects; provides a disciplined, structured approach and greatly assists in final delivery”.

Another interesting response highlighted the importance of the quality of workmanship who stated that ‘regrettably we inhabit a world where, for many, the old virtues of pride in one’s work and achievements have been replaced by a build it quick and take the money mentality. If the quality output specified is to be quality assured then the performance of the average operative must be policed’.

Question 13 aimed to establish how much time is spent by site managers in quality assurance activities. Thirty four percent the site managers spend less than five working hours a week (equivalent to 1 hour per day), 66% spent between six and over fifteen hours per week ensuring quality assurance on site. This indicated that a typical site manager was spending somewhere between 2-3 hours per day on this task. Intriguingly no correlation to this statistic could be established to question five where only nine respondents offered any detail in the type of system they were operating. It can be inferred that if 66% of site managers are spending between 2-3 hours per day on quality then this must be an individual interpretation of ‘quality’ which may simply involve a visual inspection of work undertaken etc. without any specific use of quality control techniques.

**Training status of site managers**

Questions 14 and 15 were aimed in evaluating whether site managers are trained in quality management skills and whether the company is providing adequate training opportunities and eliciting the views of site managers in their training needs. 34% of respondents had never been trained in any form of quality management system. 66% of the respondents had been trained in some aspects of quality management. Some respondents provided additional details about the training undertaken. Only 4 out of 10 had received training in the company studied. The topics included in the training were "Quality Procedures Talk", "How to operate QMS and subcontract system" which were undertaken in 2009. The topics on training taken by others who had training in their previous employment included "basics of QA" and "internal quality auditor". The company has not trained site management in implementing or understanding quality management systems in the past. Any knowledge would appear to have been gained from previous employers and the majority of training has been carried out in excess of five years. The company has offered limited training into
quality management systems. However, looking at the training dates, it seems that the company has commenced a training matrix that could continue beyond the date of study. Overall, the ISO9000 principles are not implemented as expected in the company studied.

Most of the site managers (91%) agreed that they require training in quality management skills. One of three respondents who answered “no” to a follow up telephone conversation, clarified his response as “site managers should hold the necessary skills to competently undertake quality management systems as a standard pre-requisite of the job title”. This view, however, ignores the importance of continuous improvement and therefore is of less significance.

**Need for a standardized quality management system**

Question 16 was to find out if the company could introduce a standardized quality management system to each project that if proved to be successful through a clear reduction in abortive work and return visits; the site team could in some way be rewarded. A site manager highlighted ‘quality of our workforce is patchy – as a whole, we fail to read specifications sufficiently, we do not read drawings sufficiently and often operate on auto pilot’. The majority of respondents (93%) agreed that they would pay more attention to achieving zero defects if there were incentives. However, respondents (3 responses) felt that quality management should be part of a site manager’s role and it should be a standard practice and not something that needs incentivizing, as a fact of life we usually only do what we are obliged to do.

**CONCLUSIONS**

The investigation of responses from eleven construction projects run by an ISO9000 company suggested that the company lacked the use of a uniform quality management system in the different projects and no standard approach existed. As a consequence the company engaged in a variety of different methods that were regularly devised based largely upon the comprehension and acquaintance of quality from the project team; not as part of a standardized system recommended through the use of the ISO 9000 family. Site managers were familiar with the techniques used to ensure quality in their respective projects.

Evidence from the literature review suggested senior management must create the company’s quality policy and implement this through direct involvement in the process. However, there is no uniformity in the methods of communication and frequency of such communications. Senior management did not demonstrate any leadership with respect to the quality system.

The perceived importance of quality when compared to health and safety by the site managers and the priority given to the management of quality by the senior management was found to be different. The majority of site managers stated they ‘shared’ equal importance; however the priority of the company, as perceived by the site managers, was of less importance when compared to health and safety.

The need for training in developing good site practices is of paramount importance. Although ISO9000 puts high priority on training, the provisions of training in quality management skills were currently inadequate. The site managers were reliant upon their own experience and concepts to manage quality. The majority of the site managers highlighted a need for quality management skills and adoption of a standard quality management system would help minimize defects in the finished product and utilize efficient processes to improve customer satisfaction. Incentives to site
managers to adopt quality management systems would be a positive step to enhance on site quality in the construction projects. Enforcement of quality manager role is seen as essential to improve the quality management on site.

REFERENCES


