

The Improvements of Positive Quality Planning and Application upon a Live Construction Project

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Abstract

The main aim is to evaluate the main pitfalls of quality management at site level and how improvements could be made as such to increase the level of quality produced on live projects. The basis of the paper is on evaluating the perceptions given by construction management professionals, actively working within the industry, some of which are based site managers, delivery quality as part of their work. A literature review has been written to acknowledge existing research into quality within the construction sector; this has been broken down into the following subjects: What is quality in construction? What constitutes a Quality Management System (QMS)? Preparation and advancement in planning for quality Applying and controlling quality on a live project. Differences and contradictions of statements by previous writers. Importance of innovative quality practice. From this a critical review was formed, 5 topics were chosen to structure a total of 21 questions, these questions were issued to a total of 50 construction management professionals, out of which there were 26 responses. There were also 4 interviews undertaken to expand on the areas of this research by senior management to form analysis on the topic. The survey indicated that the weak areas of quality management and delivery on site stem from poor technical knowledge on the trades which are being carried out. Interestingly it was also evident that managers responsible for implementation felt short resources were also responsible, as other initiatives were seen to be more important to achieve fulfilment of their roles. Identification was that with advancement in technology, IT resources could be used to boost efficiency when carrying out inspections or implementing quality delivery. This ideal was only supported when management were sufficiently trained to assess quality of the product, i.e. conformance to specification. The requirements for increased technology support is reflective of other authors research, however the call for more basic technical understanding is something key to address before carrying out advancement in IT based quality management style.

Introduction

Background to the Problem – What does quality mean

Historically the Construction Industry been one of the UK's largest sources of economic finance and with '*an annual turnover of £100 billion and accounts for almost 10% of the Country's GDP*' (Bolsover, 2012). This incorporates projects that take place at site level across the country, this it turn means that the UK relies heavily on the success of such projects for infrastructure, social and economic growth. However, historically construction has been one of the few industries to improve quality of its products and services, predominantly at a site project level, resulting in slow efficiency, sustainability, smaller profit margins and has been lower achieving than the potential available. (Shewhart, 1931) says '*Quality – a thing said to have a positive attribute of conformance to specified standards*', easy to understand and easy to apply to construction. In more recent time's modern definitions such as (Gitlow et al. 1989) who states '*Quality is the extent to which the customer or users believe the product or service surpasses their needs and expectations.*' So this can be interpreted differently, this is supported by a study by (Reeves and Bednar, 1994) who point out that '*the definition of quality has yielded inconsistent results, the concept has multiple and often muddled definitions and has been used to describe a wide variety of phenomena.*' It is key that those who carry out QMS (Quality Management Systems) understand the company aims and objectives and what defines their delivery approach. To some construction companies a quality delivered construction project may mean '*defect free*' and in Phillip Crosby Let's Talk Quality, the author enjoys the quote "*If we deliver on time, but the product has defects, we have not delivered on time.*" So, if obtaining this is a problem for contractors then what is being done now to prevent defects? It is clear that this misinterpretation of information has lead to confusion in construction as an industry as to what quality is, historically quality was measured throughout the manufacturing industry and was easier to classify and adopt an approach. How then in construction do we adopt a best practice upon our live projects to achieve the so called 'quality product'. (David Garvin, 1986) carried out research and used surveys form 'first line supervisors' in

the USA and Japan to compare practices and attitudes concerning quality. Within his studies, Garvin Identified that there were five distinct quality classifications as shown below, these will be further developed and explained later on in this research, however the basic terms are identified below:-

1. Transcendent definition
2. Product-based definition
3. User-based definition
4. Manufacturing-based definition
5. Value-based definition

These definitions have been adopted and changed more recently to ways of looking at and classifying quality developed, and evolved to the QMS used on the construction sites of today. Even now there is difficulty on construction projects in measuring quality and implementing QMS effectively, there are products available such as 'Priority one' – (defects monitoring and management systems) available now as technology has developed, these are having an impact in the way QMS is implemented, this will be further expanded on and discussed in this project. Referring back to the initial research shown by (Reeves and Bednar, 1994) it is important to review the change in perception of quality management and assess the development made by pioneers and what is available to improve QMS on a live project and how this can be done.

Research Goals

This research will explore the current standards of quality assurance and quality management systems on live projects, using the students knowledge and contact database working for a principle management contractor within the construction sector. The following aims and objectives will be explored. The aim of this research is to identify the current issues with QMS and highlight the benefits of positive quality management systems when applied correctly on a live construction project.

Literature Review

The purpose of this paper is to critically appraise the literature review; this identifies the similarity of text and statements, any common trends and patterns in information, differences and contradiction in opinions, facts and criticisms of the given evidence. To make this clearer, this has been divided into the following sections.

1. What is Quality in Construction?
2. What constitutes a Quality Management System?
3. Preparation and advancement in planning for quality
4. Applying and controlling quality on a live project
5. Importance of innovative quality practice
6. Differences or contradictions of statements by previous writers
7. Critical appraisal of chapter

What is Quality in Construction?

In recent years, with the economic climate in such a slump in the UK, especially within the construction sector, it is not surprising that such measures of construction practice such as time, cost and quality have become prevalent in construction professionals, clients and stakeholders minds. In the past it has been TIME and COST that has been focused on to best achieve a finished product, now, with such high expectations by all the parties that share an interest in the construction, of whatever the project, from the The Burj Al Arab in Dubai to a small primary school extension in Coventry, high emphasis is now placed on the quality associated with the construction. This has an overwhelming impact on a construction contractor's competitive edge in such a tight market sector. (Watson and Howarth, 2011) state *'it is easy to identify that there is no one singular, universally accepted definition of 'quality'.*' In fact there are so many definitions that define quality, it is sometimes difficult to take away a meaningful approach when trying to implement this in terms of a live construction project, as (Garvin, 1988) highlights, *'a host of competing perspectives each based on a different analytical framework, and employing its own terminology.'* So in the past definitions of quality have differed but do not necessarily contradict or object one another, it is in principle demonstrating that even some 25 years ago that quality was misunderstood or viewed in different ways. Since this time, quality management practice and quality management systems (QMS) have developed to try and enhance measurement and performance. An example of where studies in defining and improving quality was undertaken by (Gitlow et al. 1989)

who wrote a book on tools and methods for the improvement of quality, Gitlow wrote – ‘*Quality is the extent to which the customer or users believe the product or service surpasses their needs and expectations.*’ However, does quality have to surpass a customer’s needs or expectations?, why should something be better than first expected to have achieved a quality status. It is always important to strive to achieve quality, but at what cost and time do you enhance it as such to meet such a definition. Early definitions of quality such as this extract from (Feigenbaum, 1961) were much less easily understood and created the need for further research to improve the implementation of quality, Feigenbaum stated – ‘*Quality is a customer determination which is based on the customers actual experience with the product or service, measured against his or her requirements – stated or unstated, conscious or merely sensed, technically operational or entirely subjective and always representing a moving target in a competitive market.*’ This is a complex definition of quality but directly relates to Gitlows approach that the customer is the determinant in what defines quality.

From research there are two main categories, of which quality definition can be classified into (Watson and Howarth, 2011) explain how ‘‘*Objective quality*’ is where concept is grounded within precept that characteristics of a product of service are tangibly measurable in absolute terms such as size, design conformance, durability and performance.’ They go on to explain that ‘‘*Subjective quality*’ is the concept of quality being grounded in the perceived ability of a product or service to satisfy the various needs and aspirations.’ Here is where individual perceptions can be a huge variable regarding the exact same product or service. To narrow the way sectors consider quality, (Garvin, 1988) distinguished five main classifications for quality definition as follows, these appear to be the most widely recognised and accepted definitions of quality:-

What constitutes a Quality Management System (OMS)

In the early 1950’s quality management practices were developed rapidly, particularly in Japan during post-war development and economic re-building, this consisted of significant influential quality figures such as Deeming, Juran and Feignbaum. They set about setting up Inspection procedures for production of technical activities, measurement devices for controls and outputs and ‘statistical quality control’, these techniques were developed by Shewhart in the the mid 1920’s were later applied significantly to the betterment of the manufacturing industry in the late 1940’s. Over a period of time quality control established its importance within industry practice and in 1969 the 1st International conference on quality control was held in (Tokyo, Japan). Quality assurance and planned documentation for auditing was developed in the UK and lead to the introduction of the British Standard BS 5750 being published in 1979. By the time this standardisation had been seen to achieve better quality the ISO 9000 was introduced in 1987 and set the international standard for Quality Management Systems which have been revised since, these systems have been embedded in construction businesses ever since and continue to be developed, however further technology and review of construction site practice can assist in the betterment of quality practice.

Quality overview

Following on from the general questions that define the characteristics of the respondent sample, the first section for the questionnaire focused on the area of person’s quality overview. Questions number 3, 4 and 5 directly asks respondents to gauge their own knowledge of quality, as it applies to their position within the construction Industry. The respondents are also asked to gauge their knowledge of quality delivery and make an assessment of whether quality can be easily applied in their position within the business, these questions will present an indication of who applies quality within the organisation, and results are shown in the form of a column chart below. Here the respondents were asked to give a direct YES/NO answer giving objective data or give another written response should they have opinion otherwise.

Table 1: Respondents

QUESTION NO.	CATEGORY	ANSWER		
		YES	NO	OTHER
3	QUALITY OVERVIEW	26		
4	QUALITY OVERVIEW	26		
5	QUALITY	17	9	

	OVERVIEW			
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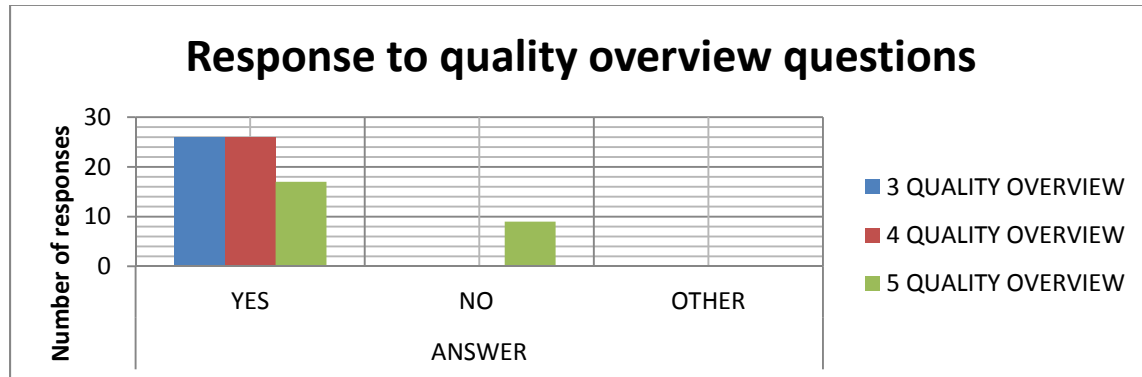


Figure 1: Response to quality overview questions

Comments on results

At first glance it is evident that the majority response to questions posed on quality overview was an outright YES for question 3 and 4, therefore this leads the author to conclude managers all feel they understand the meaning of quality in their role. It also demonstrates managerial staff understand the quality delivery strategy that is set-out by the company, this begs the question '*why is there any problem with delivering quality in construction?*', however by looking at the answers for question 5, 9 persons out of 24 said that quality is NOT easy to apply in their role in construction, therefore one can derive that this is an immediate weakness in quality delivery on a live construction project.

Quality management systems

Questions 6 and 7 ask the respondent to judge whether they believe quality managements systems have been overlooked due to other initiatives and whether quality management systems are easy to implement at site level, this once again is on a YES/NO basis with the opportunity for the respondents to give a greater level of detail if they wish to expand on their answer. Results are shown below of the average response: -

Table 2: Response with details for QMS

QUESTION NO.	CATEGORY	ANSWER		
		YES	NO	OTHER
6	QMS	21	5	
7	QMS	10	16	2

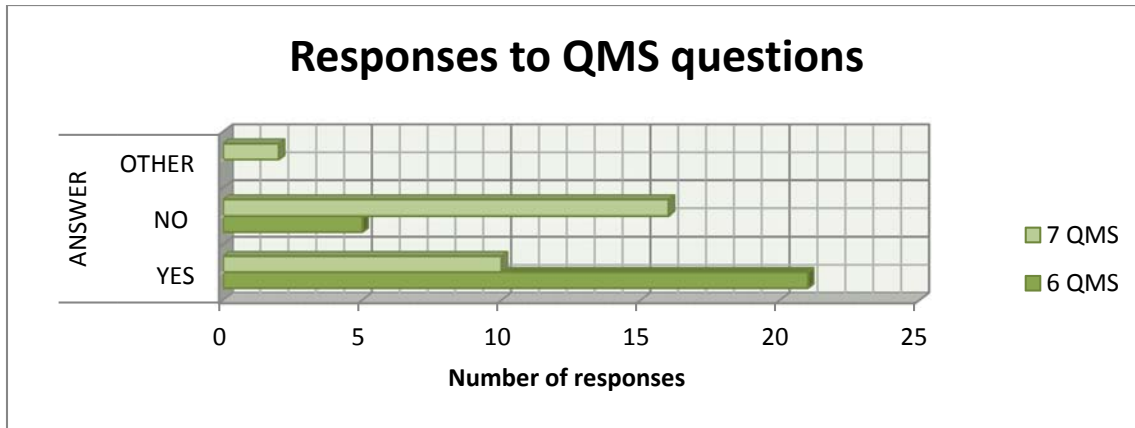


Figure 2: Response to QMS questions

Comments on results – The chart above demonstrates that the majority of respondents selected YES to question 6, only 5 staff felt that quality had NOT previously been overlooked due to other initiatives, this means that the majority of management felt that historically there had been more important focus on other KPI's, once again this could demonstrate reasons for weakness in quality delivery and could potentially link to persons finding quality difficult to apply in their position as something else took up the majority of their time or was seen to be more important, one questionnaire in particular mentioned there were financial constraints that blocked quality importance. Question 7 was more divided on response, the majority selected that QMS was NOT easy to deliver at site level, one of the reasons that might explain this variance of opinion was the position of the respondents, i.e. not all were site based staff and therefore found it more difficult to comment. Out of the 2 participants who selected OTHER, both commented on the dependency/ability of those carrying out the implementation or the paperwork exercise it appears to be. A direct quote from one such questionnaire is below:-

'I don't think the current QMS actually achieves what it sets out to do, and is more of a tick box exercise than driving a better end product'

Such views demonstrate an imperfect or deficient perceptive of QMS on site. Question 7 makes it clear there is dividing opinion in whether the QMS is strong enough to provide what individuals see as quality at site level.

Site

Questions 8, 9, 10 and 11 focus on the impacts of quality at site level, question 8 asks the respondent to give an answer on their opinion of whether QMS is implemented correctly on the sites managed by the business. Question 9 asks the respondent to indicate whether planning for quality is comprehensive enough on sites in the form of plans. These questions are again YES/NO or other answers identified in the results below in the form of a bar chart.

Table 3: Response with site based questions

QUESTION NO.	CATEGORY	ANSWER		
		YES	NO	OTHER
8	SITE	5	20	1
9	SITE	17	9	

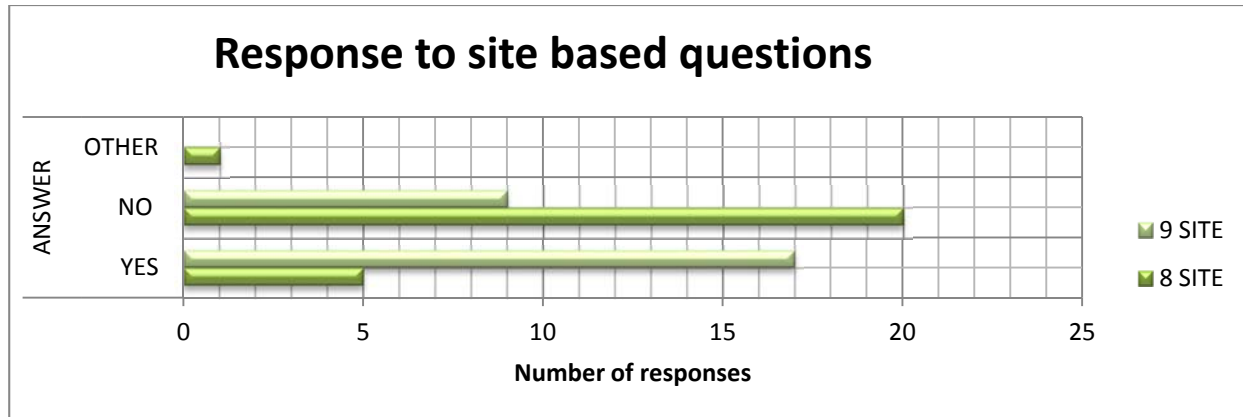


Figure 3: Response with site based questions

Comments on results – By studying the information demonstrated by responses to question 8 it is clear that most respondents felt that QMS is NOT implemented correctly at site level, 77% said NO and where OTHER answers were given, this very much depended on WHO was carrying out the system, a quote to support this from one questionnaire would be:-

‘Very much depends upon individual site team and the level of importance they give it’

Interestingly this was quote was from a director of operations, with their seniority, it is likely they have seen this case amongst live projects under their control.

It appeared evident from the feedback that staff felt this was down to the specific site management team. OTHER comments suggested staff potentially not being well trained in inspection due to technical knowledge or having lack of time to implement QMS efficiently particularly for trades at the end of a project, a supporting statement from one questionnaire is as follows:-

‘There are some trades such as Concrete and brickwork which lend themselves to good written/laboratory checks but other trades such as paintwork and carpentry which never enter the written record stage.

Trades generally at the back end of the project are often compromised by reducing time scales and suffer as a result’

Question 9 was again divided in response but 65% of the respondents answered YES to quality plans on live projects being suitably comprehensive, out of those who selected NO or sometimes even YES, many commented in the OTHER section stating that paperwork was available but this was not supported by action, this appeared to suggest a paper trail, audit culture inherent within the construction business. Several respondents suggested that the best quality planning resulted in the best product... however one point stood out on multiple respondents’ questionnaires, this being –

‘TOO COMPREHENSIVE – NEED TO BE MADE MORE STRAIGHT FORWARD’

This suggests that there is so much in QP’s they cannot be implemented efficiently, thus suggesting the need for advancement in technology to assist in this application on site. **Question 10** asks the respondent to select an option they believe would improve quality planning on sites; there is once again opportunity to give their own opinion as to what may help improvement. The response is shown in the form of a pie chart below.

Table 4: Site responses

QUESTION NO.	CATEGORY	OPTIONAL ANSWERS			
10	SITE	A	B	C	D
	RESPONSES	8	12	10	9

Question 10 response

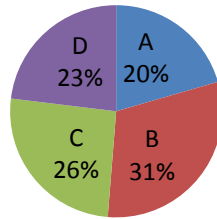


Figure 4: Site responses

Comments on results – Question 10 offered the respondent to select a means of improving quality plans on live projects, this interestingly in relation to question 9 was completely abject, those who thought quality plans were comprehensive enough all thought that they could also be improved, this again linked closely with the need to make quality plans less about bulk content and more of a useful tool for the site management. From this response it was clear that most respondents felt that each component whether it be training, management resource or sub-contractor input would equally benefit quality plans. In this question there was a particularly high OTHER response, this for the majority suggested that quality plans should be simplified for better reference and implementation. Question 11 asks the respondent to identify why quality appears to be applied differently from site to site. The results to these questions are given below from the sample, other answers also listed for analysis.

Table 5: Response from site to site

QUESTION NO.	CATEGORY	OPTIONAL ANSWERS			
11	SITE	A	B	C	D
	RESPONSES	2	9	13	11

Question 11 response

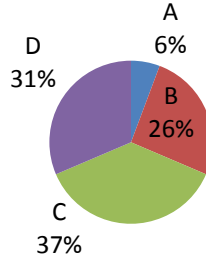


Figure 5: Response site to site

Stakeholders

Question 12, 13 and 14 concentrate on the stakeholders involved in quality on live projects. These questions are aimed at asking whether supply chain, i.e. subcontractors carrying out the works on live project are engaged and understand quality and are committed to achieving quality on live projects, this section also asks the respondent whether they believe quality has improved in construction in recent years. Answers are demonstrated in Table 6.

Table 6: Response of questions 12, 13 and 14

QUESTION NO.	CATEGORY	ANSWER		
		YES	NO	OTHER
12	STAKEHOLDERS	4	19	2
13	STAKEHOLDERS	8	14	3
14	STAKEHOLDERS	12	10	4



Figure 6: Response of questions 12, 13 and 14

Comments on results – From the questions posed relating to other stakeholders in quality, it was clear from question 12 that the majority of management staff felt that the supply chain, i.e. subcontractors were not in sync with the principal contractors quality standard, for those who selected YES or OTHER, generally comments used to support this were that sub-contractors knew the requirements but didn't necessarily apply this, other respondents suggested that the supply chain in some instances were very poor, or very good dependent upon their quality principals or the main factor effecting quality 'money' (cheap work = cheap quality). Noticeably, in relation to question 6 regarding site initiatives, some individuals linked that within the organisation H&S and Environmental expectations were highly promoted to the supply chain, quality however had not been thus leading to poorer standards.

For question 13, the highest answer was over 50% of respondents who said that they felt the supply chain were NOT committed to achieving quality on live projects, this tallies with the comments for question 12, most respondents felt passed comment whether they had selected YES or NO, simply to say that this was very much dependant on the sub-contractors quality alignments or how they were managed by the principal contractor, sub-contractors desire quality but do not necessarily achieve leading back to the importance of improving quality delivery at site level. Question 14 responses appear mixed on first glance, on average more persons thought quality had progressed in construction in recent years, this was closely followed by respondents feeling that quality had not progressed, where YES was selected it was supported by technological advancements and customer expectations, where NO or OTHER was chosen, there was a clear feeling that impacts such as a poorer economy had been detrimental to improving quality, some senior management felt that new staff did not have the technical understanding or trade background to make suitable assessment of quality and that once again other initiatives were seen to be more important thus no improvement. The majority of answers may conclude that although there has been slight improvement in quality, it has become slow and difficult to improve further.

Training

Finally questions 15 – 21 are all aimed at the improvement of quality, and the training associated with this improvement. Question 15 starts by asking whether new technology such as ‘Priority 1’ can be used for the improvement of quality at site level, this question assumes the respondent has a knowledge of this software as the particular company has invested in this as a QMS tool. Question 16 asks the respondents to give a judgement whether they believe that quality management could be more rigorous, i.e. could it be done better on sites, it is the hope that this will show up what could be done to improve in the respondents minds. Questions 17 and 18 follow the same pattern; they ask respondents whether they capture (read) information provided by the company or other technical literature available in their positions and whether indeed they find this useful. Question 19 and 20 focus on training further, the direct question is asked whether the respondent agrees that more training is required to improve quality implementation. Question 20 asks if current engagement with stakeholders to train them, therefore reducing defects at site level, creating variation or delays. The responses to these questions are demonstrated in Table 7.

Table 7: Response of questions 15 - 20

QUESTION NO.	CATEGORY	ANSWER		
		YES	NO	OTHER
15	TRAINING	22	1	3
16	TRAINING	21	5	
17	TRAINING	24		2
18	TRAINING	26		
19	TRAINING	23	3	
20	TRAINING	3	19	4

Conclusion

This conclusion section is written for the reflection of the initial investigation set-out. This chapter will be connected closely to the initial introduction chapter and refers back to the research aim, objective and key questions. Initially comments will be made on the research objectives, the student will conclude what has been achieved in conclusion to each and whether this was similar or dissimilar to that of other writers in the subject of quality. Following this, comments will be made of the research questions and whether they proved or disproved the initial hypothesis. Importantly this conclusion will comment on the research aim, here the research will demonstrate an achievement of the stated aim. The aim of this research was to:- '*Identify the current issues with QMS and highlight the benefits of positive quality management systems when applied correctly on a live construction project.*' After this a selection of personal recommendations will be given as a result of this research and a future development of this topic. Limitations of research will also be mentioned, the certain difficulties that were posed throughout research and any hindrances from achieving the objectives that were set-out.

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