Quality Manual Based on ISO 9001 for Building Maintenance

Ayman Alshehri, Ibrahim Motawa, and Stephen Ogunlana
School of the Built Environment, Heriot-Watt University, Riccarton Campus, Edinburgh EH14 4AS
Email: {ara22, I.A.Motawa, S.O.Ogunlana} @hw.ac.uk

Abstract—The growth in the significance of building maintenance (BM) as a proportion of the output of the construction industry has led to a growing awareness of the need to manage and maintain buildings effectively. In Saudi Arabia, practically the projects in Riyadh city based on the annual report from high commission for development of Riyadh City (HCDR) in 2014, the total governmental construction projects was (2824) with total cost around SR 181 billion that not include the operation and maintenance projects that cost SR 10 billion in 2014. However, this segment of the industry struggles for improving the building maintenance industry in proper way. During the last decades, different quality management concepts, including total quality management (TQM), six sigma, lean management, Lean Six Sigma and International Organisation for Standardization (ISO) series of standards have been applied by many different organisations to improve business performance. Introducing the Quality Management concepts (QMCs) into the Saudi maintenance industry might be a step in the right direction to improve the current situation and resolve its problems. The main purpose of the present study is to evaluate the degree of readiness of Saudi building maintenance industry towards the implementation of QMC and the most effective quality management concept to be used in the industry. Therefore, this study identifies and assesses the available QMCs for BM industry. Several interviews and four focus group sessions were conducted. The perception of managerial about QMC is investigated and analysed. Results show a high degree of misunderstanding of QMC approach, tools and methodology in public sector. The study indicates several barriers impeding the implementation of QMC in the Saudi building maintenance industry.

Index Terms—quality management concepts, building industry, public Sector

I. INTRODUCTION

This paper draws on five Quality Management Concepts (QMCs) (Total Quality Management, Six Sigma, Lean Management, Lean Six Sigma, and ISO 9001) to underpin the research principles, methodology, and implementation. Fundamentally, the concepts of quality management share three principles: customer focus, continuous improvement, and the centrality of people. From the empirical findings showing what are considered the most effective QMCs in the Saudi BM industry.

Different quality management concepts has been increasingly introduced into construction organizations in many countries as an improvement strategy for achieving customer satisfaction and business excellence [1]-[4]. Total Quality Management (TQM) has been embraced in construction industry organizations in Europe, United States, Canada, Australia, Japan and Hong Kong to help raising levels of quality, productivity and customer satisfaction [5]-[8]. TQM is top-down management philosophy focused on monitoring process, employee involvement, and continuous quality improvement in order to meet customer needs. It can also be appreciated that TQM involves all people in all functions, and at all levels [9]. In addition, Six Sigma allows organisations able to understand fluctuations in a process, which then enables them to pinpoint the cause of a problem [10]. The purpose of Six Sigma is to reduce cost by minimising the variability in processes, thus leading ultimately to fewer defects. Six Sigma is also hailed as a method to reduce waste, increase customer satisfaction, and improve financial results [11]. Furthermore, Lean management strives to make organisations more competitive in the market by increasing efficiency and decreasing costs by eliminating the non-value-adding (VA) steps and inefficiencies in the processes [12], [13] as well as by reducing cycle times [14], [15], and increasing profit for the organisation (Claycomb et al., 1999).

Moreover, Lean Six Sigma is an approach focused on improving quality, reducing variation, and eliminating waste in an organisation. It is based on the concept of combining two improvement programmes, Six Sigma, and Lean Enterprise. The majority of Lean Six Sigma applications have been in private industry, focusing mostly on manufacturing applications, although the literature has provided a few cases of Lean Six Sigma programmes applied in the service industry [16]. Further, the purpose of the ISO 9000 standards is to assist organisations in all sectors and sizes to implement and operate an effective QMS. Generally, the implementation of ISO 9000 QMS can be divided into five stages: (plan), (do), (check), (act) and Continuous improvement [17].

Many organisations have had major problems in implementing some of the tools and techniques involved. TQM is clearly a suitable approach where the quality of the products or services is the major concern. The Six Sigma approach places more stress on the achievement of rapid financial results and involved a much more structured change process. Lean is a discipline that
focuses on process speed and efficiency, or the flow, in order to increase the customer value. The various approaches are also very different in the way they are practiced. For example, ISO formalises a guide to be followed, and incorporates an interdependence between the support tools and the core values of the organisation through the quality criteria. The approaches such as TQM, Lean, and ISO outline a desired end state and demand for self-thinking by the organisation. All the approaches can be useful if handled carefully [18].

II. BUILDING MAINTENANCE

Building management is considered as a matter of the larger unit the Facilities Management (FM) [19]. Building maintenance is a collection of a lot of activities. Maintenance projects serves as a challenge in terms of size, quantity of manpower required and requirement. The stringent budget provided for the purpose also serves as a challenge for the maintenance action. In order to carry out the maintenance job we may require some approvals for the work arrangement, which may vary according to size, characteristics of the project, management style, work environment and the cooperation of all parties involved. Due to the dependence of these factors some of the work orders may not be completed. In an ideal maintenance operation, the important parties involved in the execution of the work are the owner or the client, the contractor and the user. The relationship between the key partners and their attitudes towards each other is the main factor which promotes the speed at which the work is completed and also estimated the efficiency of the execution and the maintenance operations [11].

In the country of Saudi Arabia the management procedures currently used by the maintenance contractors do not support the present building scenario as they do not have a scientific back ground. In general there is an absence of understanding of the need for maintenance work. Saudi Arabia is having a diverse set of infrastructural facilities. Elements of this infrastructure need be continually maintained to ensure its optimal value over its lifecycle. The building and construction industry is the fastest growing sector in most of the developing countries amounting to about 10% - 20% of GNP. In the country of Saudi Arabia, the building and construction industry is the second largest sector that participates with 6.9 % of GNP (MEP 2008). Maintenance and operation services for public building is not a core service or business activity in Saudi Arabia. As rustle, maintenance services are usually outsourced to specialty contractors (Assaf, 2011).

According to the Statistical Year Book for 2010 issued by the Ministry of Finance, reports that the Saudi Arabian Government spent £529 billion between 2005 and 2009 on construction projects. Furthermore, in 2009, the Ministry of Economics and Planning reported the total value of capital assets in the building and construction sector as 25.7 billion pounds, and the anticipated cost of maintenance and repair expenditure as approximately 5.14 billion pounds annually. That said, KACST (2009) has reported that the Saudi construction industry suffers from the lack of advanced know-how, high construction costs, lack of commitment to quality, and disregard for the need to improve material properties to satisfy the Saudi Standards and Quality Organization (SASO).

As a developing country with growing facilities and infrastructure, Saudi Arabia has a clear need for efficient and effective maintenance programmes to guarantee the serviceability and safety of its buildings. However, as noted by Assaf et al. (2010), maintenance is frequently viewed negatively in most of the Kingdom’s governmental offices, and to date, the government has issued no standardised guidelines in respect of quality in maintenance. Among local contractors, there is a distinct lack of competitiveness, their performance is poor, they show low levels of efficiency, low productivity, high exaction costs, an inability to change, and conflict among the parties involved is evident [13]. Most of the maintenance work in Saudi Arabian governmental offices is undertaken by independent maintenance contractors [7], working as already indicated, in the absence of official quality standards.

Organisations conduct quality management and improvement programmes to achieve a range of objectives. Specifically, such approaches are known to provide substantial benefits by achieving customer satisfaction, improving employee quality awareness and consciousness, improving organisational performance, and supporting partnership in value chains [19], [20]. These benefits are important for all organisations, especially in developing countries, such as Saudi Arabia, where the general quality level is relatively low and needs to be increased. Many QMCs have been widely discussed and researched; however, much of the literature relating to QMCs has concentrated on the private sector, while little has focused on the public sector. The public sector implements QMCs mainly to improve services rather than for financial benefit [21]-[23].

Introducing QMCs into the Saudi BM industry might be a step in the right direction to resolve the problems mentioned and create overall improvement in performance. Therefore, The Kingdom of Saudi Arabia is a living challenge when it comes to fulfilling the operations and maintenance needs. In order to improve the current state of building maintenance, this improvement can be achieved by implementing the most effective QMCs such as TQM, Six Sigma, ISO 9001 in BM industry.

III. RESEARCH METHOD

Based on the literature review dealing with the question of QMCs implementation in the building maintenance industry, Four focus group sessions, involving twenty six participants, were then conducted to select the most effective and suitable QMCs for implementation in the BM industry. The main purpose of the focus group sessions was to report on the views and experiences of participants regarding QMS implementation as means of quality improvement in building maintenance projects. The focus group
discussion method is a valuable approach in qualitative enquiry as it provides an environment for a homogeneous group of professionals and experts to interact and freely exchange ideas and opinions, and at the end of the discussion, to establish a consensus view on a particular topic [24]. In terms of the ideal number of participants for a focus group session, [24] suggest between six and eight participants as the ideal. As noted by [14] the number of items for discussion should not exceed six or seven.

Four separate focus group sessions were held in Riyadh, Saudi Arabia’s capital city each group was comprised of different participants. Seven participants attended the first focus group session, eight attended the second, five attended the third, and six attended the fourth. It is good practice not to allow focus group sessions to extend beyond two hours since boredom can arise among members, and this advice was followed in the study. The sessions took place in a fully integrated meeting room at the five star Hotel. The reason for holding the events in a hotel was to encourage and motivate participants to attend; the setting was intended to be comfortable and respectful of people in high positions with considerable experience.

Two consultants were invited by the researcher to participate in all focus group sessions, with the purpose of encouraging the proposed members to attend. The researcher’s aim was to ensure that all sessions had adequate numbers of participants, and that all of them would be motivated to contribute. The first consultant was a Master Black Belt Six Sigma with 24 years’ experience of working in the private sector, and an excellent grasp of QMCs through his background in this respect. The second consultant was ISO certified, with 32 years of experience applying the principle of ISO 9001 in both the public and private sector. Both consultants were able to provide the participants with information about each QMC from a practical perspective, in contrast with the researcher’s largely academic and theoretical presentation. The ultimate aim was to configure the groups with individuals capable of providing the highest quality discussion regarding the topic being researched. In the main, the consultants were silent, recording their impressions of the meeting, and only assisting where required in the discussion phase. It was important to minimise any bias which their presence may have introduced and therefore they were asked to avoid any attempt to influence the participants’ views in relation to QMCs.

The process of and selecting the most effective QMCs for the BM industry. In step 1, the participants were asked to introduce themselves and their jobs or responsibilities. The researcher then made a presentation on the QMCs (TQM, ISO 9001, Lean, Six Sigma, and Lean Six Sigma), explaining each one separately, and then encouraged the participants to interact and discuss the questions. In step 2, the key question asked for their overall opinions regarding on which QMCs were believed to be suitable for implementation in the BM sector. In Step 3, the researcher briefly summarised the main points of the discussion. The participants were also asked if they wished to add any comments to the summary. At the end of the focus group sessions, the researcher gave a closing statement summarising the results of the discussion, and thanking the participants for their valuable time and input.

IV. RESULTS AND DISCUSSION

The first FGS was comprised of seven participants, including among them, five heads of maintenance departments in the public sector, each with more than 20 years’ experience. The additional two participants were QM consultants as discussed previously. The group was created as a homogenous one so that members had the same levels of seniority and experience, would be able to understand each other, and would be able to approach the discussion from the viewpoint of heads of department with heavy responsibilities.

The first QMC introduced in the presentation was Total Quality Management (TQM). In their consideration of TQM, members believed this could be applicable if a system of in-house maintenance were adopted because in that situation it would be possible to lead and manage all the maintenance team since that team in its entirety would be reporting to the director of the maintenance department. However, the Saudi government’s policy is to outsource its maintenance requirements, and hence, the majority of participants indicated that in the current BM environment, TQM would not be applicable. Being a comprehensive concept, it requires the ability to control the contractor, which is not possible when outsourcing. Moreover, it was commented that the implementation of TQM was difficult because it is “very tedious, and it wasn’t worth the time”.

The second QMC introduced was Six Sigma. In this respect, the consultants followed the researcher’s overview by presenting more information regarding its implementation from a practical perspective. It was evident that none of the participants had ever heard about Six Sigma, so it was necessary to provide substantial detail to ensure they understood the concept and were able to give informed feedback. Indications were that Six Sigma could be applied in technical areas (mechanical, electrical) but not in general management. In respect of its potential for technical improvement, it was considered that the approach could help to monitor the lifetime of machines, which would be helpful because currently, proper maintenance is not performed as there is no IT tool to measure and analyse the performance of machines. Hence, Six Sigma was believed to be applicable to guarantee the quality of equipment, but not for improving the quality of management Indeed, the members did say that as this was the first time they had heard about the concept, it was hard for them to properly make a judgement, and definitely too early for them to consider applying it.

The third QMC, Lean Management, the majority of members agreed that this was a new concept for them, but nonetheless observed that in practice that methodology is already applied via a weekly BM department meeting. However, whilst it may be applied through these meetings to improve some processes and activities within
the BM department, as a concept Lean Management is not adopted. And for this to happen it is necessary for experts to reduce the non-value adding process and also limit the wastage of money when taking action to replace machines. Focus group members believed that Lean Management would contribute significant additional value to the current situation in maintenance departments.

The integration between Six Sigma and Lean Management was then discussed. In fact the members expressed the view that the application of Lean Six Sigma would deliver an excellent environment, but that it would be difficult to handle two QM concepts at the same time. Nonetheless, they did agree that to start such implementation on a step-by-step basis would help to improve the performance of the BM process.

The last QMC introduced during this session was the ISO 9001 standard, and in this respect all of the members showed some awareness of this concept because of their long experience in the field of BM. One mentioned this as being the easiest and most suitable QM strategy for implementation in BM department currently. It was believed that the ISO 9001 was easier to understand than other QMCs, and could lead to an improvement in BM departments. One participant argued from experience that it was useful in improving BM processes and in distributing duties clearly. Another, however, said that a contractor who was not qualified and had no experience in ISO 9001 would struggle to apply the concept. But it was also suggested that if ISO 9001 provided standards and templates to follow, this would be the most useful quality strategy to adopt since definite instruction was what was required.

At the end of the focus group session, all members (with one exception who preferred Six Sigma) agreed that the ISO 9001 standard represented the best option in the current situation. And the member who preferred the Six Sigma approach nonetheless admitted that the ISO 9001 was more realistic. Hence, this concept was considered by the directors of BM departments to be the most appropriate means of improving the improving the BM process.

A. Second Focus Group Session

A second focus group contained eight members, these six practitioners, and two consultants. Of the practitioners, four were directors of BM departments, and two were assistant managers. Following the same format as the first focus group, the researcher opened the discussion with a presentation on TQM. It was indicated by one member that TQM might be applicable to contractors, because they have tools and human resources but that it would not be effective for the client. And another member expressed the opinion that TQM requires a large supervisory effort to ensure procedures are being followed, and that the BM departments lacked people with supervisory skills. Others argued that TQM would not be suitable just for the maintenance department as the overall philosophy was that the concept should be applied to entire organisations for it to work, and in this respect it was felt that it was difficult to maintain because of the need to education all employees within an organisation, and subsequently control their behavior. Another participant observed that applying TQM is a lengthy process, and yet another added that if there is no clear structure for a department it is not possible to apply and maintain TQM. TQM requires good communication and good relationships with other departments, but it was noted that this would present a genuine difficulty as the current situation did not involve the maintenance department sharing information even within the department itself, let alone, across the organisation. Overwhelmingly, therefore, it was agreed that TQM was not appropriate.

After the second concept - Six Sigma – was introduced by the researcher, one member commented that the implementation of this approach required documentation and software to analyse the data, and that unfortunately, such tools of analysis were not available in most public maintenance departments. Additionally, it was noted that even if the right software tool existed, there were no qualified staff to use it. In fact, it was believed that at present there were no benefits to be gained from Six Sigma because the concept had resource implications and the shortage of staff and software precluded its implementation.

The third QMC, Lean Management was then introduced and discussed, and the feeling was that its application was dependent upon the need of the department. For instance, it could be implemented to solve a particular problem and to reduce time, but it was not believed to make a valuable impact. It was thought that it could be applied to help management in eliminating a large problem but that although it might be easy to do this, senior management had to be interested in it for there to be any real effect. Another participant commented that this concept was already applied in regular meetings as a means of improving the internal processes related to contractors, and to reduce the administration process and maintenance problems. It was also pointed out that Lean management in the engineering sense must be applied daily. Following on from this discussion, Lean Six Sigma was considered for advance stages.

After presenting an overview of the ISO 9001 standard, the approach for implementing this was introduced by the consultant. One of the members commented that an ISO 9001 certificate does not mean that the BM department is well organised or that QMCs are practiced within that department. Another member gave the opinion that the ISO gives a roadmap by which the BM department could achieve step-by-step improvement, and argued that it was suitable for establishing BM maintenance documentation and templates. The members felt that that this method would assist them to improve the BM process inside their departments and allow them to introduce important issues. They believed it would help to begin with the ISO as a baseline, and that other QM concepts could be introduced and integrated with it.

In this second focus group, the majority of the practitioners suggested that the ISO 9001 should be embarked upon as a first step, and that it would help to work towards the TQM (bottom-up approach). Two of
the participants supported the idea of implementing Six Sigma, and one believed TQM was the most appropriate. One said “we need to standardize our process and develop effective forms to improve the performance and to overcome the current problems”, and this was a sentiments shared by all members. Moreover, it was claimed that it would be beneficial to have a quality manual to set out clear instructions and templates for engineers and technicians.

B. Third Focus Group Session

The researcher arranged the third focus group session because it was not yet felt that the data had become saturated since there were new and different opinions being expressed in the first two group discussions. The number of members was smaller than the first two groups, however, there being five in total, consisting of two managers, one assistant manager, and two consultants. The participants emerged as a result of the purposive and snowball sampling mentioned in Chapter Four, with all of them being recommended by people who had taken part in either the first or second focus group sessions.

Regarding TQM, it was agreed that it this was difficult to apply because in reality its success depends upon people’s interest and behavior. For example, in a maintenance department, one section may work hard while the other sections do not. Consequently, changing the culture inside these maintenance departments would be a challenge and that would have to be overcome prior to any attempt to implement TQM.

In respect of Six Sigma, the comments indicated that there was no system of regular and technical maintenance reporting, and consequently it would be hard to implement it as the data required for analysis would be difficult to collect. One of the common barriers affecting the maintenance environment is the registration of job orders, and without proper registration it would be impossible to measure performance. Hence Six Sigma was believed to be inappropriate to the BM environment.

In terms of Lean Management, this was new to the members, and hence, no opinions were expressed. On other hand, the ISO 9001 standard was supported because the focus group members firmly believed in the need for a fully documented system to improve the workflow inside BM departments, and they considered that the ISO 90001 standard could facilitate the smooth operation of maintenance work. Moreover, it was observed that the ISO 9001 standard reduces individual effort by enforcing the creation of a documented process in a proper manner.

C. Fourth Focus Group Session

Morgan (1996) has suggested that diversity in either the participants or the range of topics covered in focus group sessions increases the number of groups necessary to achieve saturation, and for this reason the researcher conducted the fourth and final group discussion. From one to ten sessions are generally suitable for most studies (Powell and Single, 1996). Hence, given the emergence of the data, four were believed to be sufficient. At the fourth focus group session, there were six participants, including one consultant.

In regard to TQM, members raised the difficulty of implementing this in the public sector because of the lack of awareness and commitment from top management. The problems of the need for training among the entire workforce and of raising workforce awareness of the TQM culture were also discussed, as was the issue of such training not being part of the maintenance departments’ strategic plans.

Concerning the potential for implementing Six Sigma, the members believed it would be difficult to reduce maintenance costs through this concept because in the current situation, preventive maintenance is either neglected or not performed properly. Furthermore, the last of an IT software application within the departments was felt to be a large obstacle to the introduction of Six Sigma.

Lean Management, it was claimed, is in fact already implemented but on a random, ad hoc basis, resulting from individual efforts and certainly with no planning. Members stated that it was easy to apply but had no effect upon the quality of work. Nonetheless, it could be practiced at any stage in the maintenance process to reduce non-added value. It was agreed that neither Six Sigma, nor Lean Six Sigma were suitable candidates for implementation in BM departments.

In the discussion concerning ISO 9001, it was strongly agreed that the ISO 90001 was the best method to use as a means of developing a quality culture within BM departments as it provided forms, with firm instructions on how to perform. In addition, it was generally agreed that through this provision of a standardised system, the ISO 9001 could solve problems because guidance was in place to help clients to follow up and monitor contractors’ duties. The ISO 9001 standard was considered easier to implement than others and it was favoured because it represents a guideline from which to build a QM system. This final session illustrated that the ISO 9000 is eminently suited to the requirements of public BM departments as it allows them to apply specified standards to bring improvements to their processes.

V. Summary

This paper has discussed the outcomes of four focus group sessions, which assisted in determining the most effective QMC for BM in public organisations in Saudi Arabia. The focus group sessions included 19 BM practitioners, and two QM consultants. It was seen how the five QMCs that were discussed within the four focus groups in terms of their principles, tools, methodology, and approaches, all differed in the way in which the improvement process should be handled. It has also been shown that the point of saturation had been reached with the fourth focus group session and that no further discussions were necessary. A comprehensive debate had concluded that the ISO 9001 standard was the most suitable approach to use as an initial move to improve the BM process. The next chapter discusses the development of the quality manual based on ISO 9001.
REFERENCES


Ayman, R. Alshehri Author was born in Saudi Arabia on 6th April 1981. He is a mechanical engineer as a bachelor degree from king Saud University in Saudi Arabia and a master degree in project management (construction management) from heriot Watt University from United Kingdom. Currently he is a PhD student at Heriot Watt University in the field of Construction Management. Mr. Alshehri has more than nine years of experience in field of construction and facilities management. He worked on Saudi National Guard with the project management department as project manager assistance. He participated in OMAENITC conference in 2013 Ind 2014 as note speaker and published scientific paper in ARCOM in 2014. Eng. Ayman Alshehri is a member in PMI, CIOB and RICS.