A quality system assessment of an electrical contracting company based on BS 5750

Sha’ri M. Yusof
Universiti Teknologi Malaysia, Johor Bahru, Malaysia

Introduction
Quality assurance
Quality has become an important feature in any products manufactured by companies. Traditionally the manufacturing industry has always been in the forefront in providing quality products to the market. It is now evident that more and more of the services related industries have come forward in the pursuit of service excellence. Quality is seen to be an important strategic tool that must be built into products and service and not just be tagged on to it. This implies that organizations must organize all their available resources in the best possible manner in order to provide the confidence to customers that their system is and will be able to produce according to requirements. Companies must plan out their human, administrative and technical resources to meet stated and implied needs of customers and society[1].

Quality assurance has the target of getting things right all the time. The objective can be achieved first by having a documented management system, checking that the system operates accordingly and also recording facts after execution of jobs. This is the core concept that has been put together into the BS 5750/ISO 9000 series of quality systems standards which outlines system specifications to show fidelity of the system in operation.

BS 5750[2] is a quality system specification developed by the British Standards Institution which provides guidelines and the requirements that must be fulfilled in order to prove that the total system in operation has quality in mind. It is a management system specification and not a product specification which many people confuse. A quality system will outline the organizational structure, the responsibilities, procedures, processes and also resources needed to implement quality management. The prime purpose of the quality system is to communicate all policies and procedures which relate to the assurance of quality in the organization so that everyone knows what and how to execute tasks that affect quality. By providing clear procedures and responsibilities, the job would become easier and unambiguous, and employees...
are able to perform jobs efficiently. A carefully thought out QA system does not produce a strict code of practice but a practicable code of executing the jobs.

Four main reasons[3] why some organizations fail in establishing a sound system are:

1. the company's only objective is to obtain a registered certificate;
2. consultants or management produce a system and impose it on employees;
3. poor communication in the organization, resulting in employees not understanding what it is, how it works, and why the system operated;
4. QA system operating in parallel with existing management system rather than being integrated with existing system.

BS 5750 in the contracting environment

BS 5750 was initially developed with the manufacturing industry in mind. Many of the vocabularies used in the standard are of manufacturing origin, for example non-conforming product, design review, quality in production and many more. Other industries which try to interpret the meaning of the requirements will initially face difficulty due to this reason. This is one of the problems when we deal with a service industry; for example in the contracting business, the nature of each project is different.

In the contracting environment, individual installations differ in terms of the materials used, time taken to complete a job, the specification and the client's requirements, etc. as compared to a manufacturing company, for example a car manufacturer, having almost identical products being mass produced with fixed production time and the same specification. In this case the quality system would be relatively much easier to be implemented and established as compared to the contracting type of business.

Quality assurance is important in the contracting industry because of the risk involved in any installation work. Any fatal failures can result in legal action being taken by the clients. The risk involved in not completing the project on time is high since many external factors will affect the performance of the project. One example is when the project involves many subcontractors each having to complete a small part of the project. Any delays in one of them will have a knock-on effect of probably a late completion.

Since the nature of a contracting business is so complex, then it is vital that a built in quality assured system is developed to avoid any inefficiencies which could result in poor quality of products and service being delivered to the customer. By having this in mind, the BS 5750 provides a basis in developing a sound quality management system which will achieve the objective of being in business and staying in business for as long as it is viable.

Background to the project

The company in this project is involved in a service-oriented business dealing with electrical installation for the industrial, public as well as commercial
sector. The company has embarked on a quality improvement programme with the implementation of a quality management system based on the BS 5750 standard as its first project. As a first step towards this direction, the management of this company has attempted to evaluate its existing systems to pinpoint areas which need to be improved or new systems introduced in order to comply with the standard.

The project has concentrated on the current quality management systems and specific recommendations have been given on improvements needed to comply with BS 5750. An outline of the strategy in implementing the system was also suggested at the end of the study as to how the company can proceed with its quality improvement project.

Introduction to the company
DL group of companies is made up of four companies, namely TR plc, DE Ltd, DCS Ltd and HKIS Ltd, located in the heart of Birmingham, England. The company started off as a backyard company dealing with motor repairing, rewinding, and gauge making in the late 1960s and it now employs more than 100 people, with the largest being DE which employs 60 operators. Electrical and installation work is handled by DCS Ltd for the industrial and the commercial sector. DCS employs a group of highly skilled electricians in providing the services which it offers. Its customers consist of a mixture of small as well as large companies and its suppliers base is quite large in terms of number of companies. The suppliers are a mixture of small and large companies with the majority being small. The materials used in electrical installation are mostly standard materials, including cables, lighting fixtures, switches and some specialized equipment like the alarm equipment.

Existing operations at DCS Ltd
The company is headed by a director and assisted by two engineers who deal a lot with planning, executing and controlling of all projects. The administration of the operations is shared with the DL group's staff. DCS has in total 12 full-time electricians who work on site or on loan to other organizations requiring an electrician to work on their own project. Usually a foreman will be appointed on site who will have overall responsibility on the project.

The work flow for a certain job starts with an enquiry from a customer. Enquiries come in various forms, including letters, fax and telephone or even verbally from clients on site. After receiving an enquiry, the engineers will log the enquiry into a log book and a number will be allocated to it. The enquiry will then be processed into an estimation for the project using a tender analysis form. A tender analysis is a process whereby all materials and jobs needed to accomplish the whole job is estimated. Quotations for materials to be used are also obtained from the suppliers. For large jobs, all the information necessary to complete a tender analysis is contained in the job specifications given by customers, including all related drawings. Materials which are supplied by the customer are usually specified in the specification. For smaller jobs enquired on
site, the foreman will usually do the estimation on a site estimate form and work will be carried out immediately on approval. This same form will also be used to invoice the client for the cost of work carried out on site for these small jobs.

Once the company receives confirmation that the tender has been accepted and the price agreed, the order is logged in a job log book and job number allocated to the project. The next step is to purchase all the material needed from the suppliers. Detailed programme, manpower requirements, material and equipment needed for the project are carefully planned before commencement of work. In some instances there will be shortages or unavailable items, in which case an immediate order is placed by the foreman.

Daily progress will then be made to ensure that the project is completed on time, and at the same time fulfilling all the specifications prescribed by the customer. Before a job is considered to be completed, DCS has to conduct all the tests specified in the IEE Wiring Regulations (currently the sixteenth edition) and submit handover documents including an Installation Record Manual. A completion and inspection certificate will be issued after all necessary tests have been completed. Once everything has been agreed on and approved, the customer will then pay the required fees for the job and hand over the project to the client. A simple flowchart illustrating the job flow is shown in Figure 1.

**Method of assessment and analysis**
The BS 7229/ISO 10011[4] defines quality audit as "a systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve the quality objectives". The objective of conducting an audit is to determine the extent of conformance
of BS 5750 by the company so as to provide a means for improvement and to determine areas in which a new system needs to be established, and ultimately certification of the system to BS 5750.

In conducting the quality system audit, the ISO 10011 was used as a guideline. The standard outlines items which need to be done before, during and after the audit. The scope of the audit which was conducted covers all the quality systems elements outlined in BS 5750 Part 2. Since this company does not engage in any design activities BS 5750 Part 2 was used as the basis for audit. The quality elements which were audited included management responsibility, quality system, contract review, document control, purchasing, process control, inspection and testing, inspection, measuring and test equipment, inspection and test status, control of non-forming product, corrective action, quality records, internal quality audits and training.

The first item which was prepared in order to conduct the assessment was to develop questions relating to each of the clauses in BS 5750 Part 2. The questions were then used as a basis for interview and discussions with the company’s management. Information was obtained mainly through interviews with the director of DCS and the two engineers. Relevant documents made available during the audits were also examined and obtained to support the audit process. Observations of activities and conditions during work were also made in order to obtain as much information as possible to support the analysis.

Results of assessment
Management responsibility
Quality policy. It was observed that the company does not have any documented quality policy that would support the commitment for quality as required by the standard. However the need to have one was highly recognized by the management as expressed in the company’s leaflet which mentioned “providing our customers with the very best of service”. After discussion, the company agreed on the need to establish a formal quality policy in order to show commitment for quality in the company and to comply with the standard.

Responsibility and authority. With regard to this particular clause, there was no clear responsibility and authority being outlined in executing the jobs. In some instances, the director was not aware of current projects which the engineers are working on, for example, preparation of estimation for work requested by the customers. Enquiries that come from within DL group directors were also being processed by the three staff which were not monitored by the director. There is a need to review the job order process and designate clear job functions to everyone involved in order to comply with the standard.

Verification resources and personnel. Verification activities, for example, inspection and test of installed work, are currently being conducted according to IEE Wiring Regulations by an assigned electrician. The verification of the quality system’s audit and process audit are currently not being conducted. The company must establish a quality audit system and train its personnel to ensure that verification activities are carried out.
Management review. There is no system in reviewing the quality management system because an internal quality audit system has yet to be established which would assess the results of the quality audits carried out.

Quality system. The two important points emphasized by BS 5750 are first to establish documented quality system procedures and instructions in accordance with the requirements of the standard and, second, to ensure the effective implementation of the documented quality system as a means of ensuring that the service conforms to specified requirements. It was observed that the company does not have any of them in compliance with the standard's requirements. The current working system which exists is largely based on past experience with no documented procedures. Thus it is necessary to introduce such a system for compliance with the BS 5750 standard.

Contract review. A review of the contract awarded to the company is being carried out for almost all jobs. This is especially so for the large jobs which require close scrutiny of the drawings and specifications provided by the customer. Visits to the sites are also conducted to confirm the type of work involved. In cases where there are unclear instructions, the company will contact the customer to confirm and check a particular problem. The contract review documents used include the tender analysis form, drawings, specification and other forms of communication between the company and clients. The existing system seems to comply with the standard but procedures need to be established which will also provide efficient information flow with the customer during any contract review.

Document control. All the documents and data for one particular job are filed in an individual contract file with the customer's name and the job name. The file contains specifications, drawings, tender analysis, purchase orders, material quotation, changes requested by customer, deviation of material and all correspondence/communication with parties involved in the project. It was observed that there is a lack of control on the documents which are kept after a job is completed. Another problem observed was that everyone had their own filing system with no standard index of items to be kept. However, site instructions are made available on site to ensure that the work being carried out complies to the customer's specification. A proper system for document control with clear procedures is therefore needed in order to comply with the standard.

Purchasing. It was found that most of the items purchased are standard items like cables, switches, light fittings, etc. from electrical component dealers and they are being produced by manufacturers approved to BS 5750. Almost all the parts and materials have an approved product certification based on the British Standards. Confirmation is done visually on the correct quantity as well as required quality and using the purchase order (PO) as a basis to confirm quantity and correct items being delivered. Information which is written down in the PO does provide a clear description of the items ordered but it can be further improved by indicating the delivery date and other relevant instructions or special requirements.

The selection of suppliers is based primarily on the price and deliverability of the material. It was observed that there is no approved supplier list drawn up by
the company and also no identification system to differentiate the different suppliers of the materials and parts used for traceability purposes. The company will need to come up with procedures for purchasing-related activities so that it complies with the standard.

Process control. As far as the installation work is concerned, almost all the jobs involve skilled labour. At the same time, the installation work must also comply with the IEE Wiring Regulations and for certain customers it must also comply with additional customer requirements. It was observed that all the necessary drawings, specifications and information are available to carry out the work. Again, a system for process control outlining procedures, responsibilities and work instruction must be developed for BS 5750 compliance.

Inspection and testing
Receiving inspection. Since most of the parts bought are standard items, inspections conducted are based on the correct item and quantity being delivered. There is no formal system for inspection of goods received by the company. Therefore a formal receiving inspection of goods needs to be established with details of items to be checked, inspection method and recording method. All supplier inspections and test results must also be made available to support the receiving inspection system.

In-process inspection and testing. Currently selected tests are being carried out as the installation work progresses. No procedure on recording tests performed is available and what action to take when there is rejection or non-compliance is not specified. It is therefore necessary to identify and document all tests which must be conducted during the installation on every contract.

Final inspection and test. The final test, pre-delivery inspection, and commissioning work are part of the IEE regulation requirements in which the customer is provided with installation details, test results and a completion certificate. All these are bound together to form the Installation Record Manual. DCS is currently compiling this for large projects, however a formal procedure would be necessary to comply with BS 5750.

Inspection and test record. Inspection and test records for large projects are available since these are again part of the IEE regulations. The records for small jobs are sometimes not available and in certain cases no tests are conducted. A system for maintaining inspection and test records needs to be established.

Inspection, measuring and test equipment. Currently, there are no formal calibration systems in operation and only some equipment is calibrated as and when necessary, usually by sending it to the manufacturer. Examples of testing equipment include loop-impedance tester, insulation-resistance tester and ammeters. BS 5750 requires a system for calibration and therefore the company needs to establish one.

Control of non-conforming product. There are no systems for the identification, documentation, and evaluation of non-conformance during the receiving or installation stage, or after final installation. A system to identify
non-conformance at all stages, together with the actions to be taken (for example, segregation, repair, or disposal of material) needs to be established. A feedback mechanism from different stages of the installation process is important so as to avoid recurrence of the same non-conformance.

**Corrective action.** Currently the company has no procedures for investigating causes of non-conforming work to prevent recurrence. There are no procedures in analysing work operations, records or customer complaints to detect and eliminate potential causes of non-conforming products. A system for continuous improvement needs to be established. A customer feedback procedure needs to be established as a means of continuously trying to improve and initiate preventive measures for future contracts.

**Quality records**
Records are maintained for items required by the IEE regulations and also the installation manual for large projects. However, records for smaller jobs were found not to be maintained properly. It was also observed that the filing for different projects is maintained individually based on individual experience and work practices. A standard procedure for the maintenance of all records for a period of, say, three years, pertinent to each project including drawings, specifications, design changes, test records, etc. needs to be established for future reference in case of any claims made by the customers. A company-wide system for maintaining small job records will also be necessary to comply with the requirements of the standard.

**Internal quality audits.** An internal quality system is currently non-existent. A system of planned and documented internal quality needs to be established to review the quality system and to take corrective action if any non-conformance with the standard is found detected.

**Training.** Training is done on an ad hoc basis. There is no assessment of long-term needs especially on the personnel whose work affects quality. The training area now is largely concentrated on the electrical installation trade both for the workers and the staff. The company will have to look into its long-term training needs especially in the area of quality for its employees and a record is to be maintained for all training undergone by each employee.

**Plan of action**
**Strategy for implementing BS 5750**
The most important prerequisite in implementing a quality system which will finally support a total quality culture is top management commitment. Management must be totally committed to providing all the necessary material, personnel and financial resources in order to be successful in starting up a quality system in the organization[5]. Training is the next most important area which needs to be conducted company-wide. The first group of people who need to be trained are the management staff. It was observed that the usual training given to the employees is limited to the trade they are doing. Training on quality issues, for example training in quality systems, must be
incorporated together with the electrical trade practices. The second group of people to be trained is the workers. In implementing the BS 5750 standard, workers must be trained in the importance of conforming to procedures in order to ensure quality and safety in this industry as well as to satisfy customer requirements. Basic quality concepts and philosophy must be learned by every employee in the organization so that quality becomes a way of life in the company. Everyone should be involved and be responsible for what they do; only then can a quality culture be built into the organization for it to be more efficient and effective and ultimately to satisfy customer needs and requirements.

The next important thing in implementing a quality system is to develop and introduce documented procedures for all the operations in the organization. There are several ways in which this can be achieved. The first method is to appoint a consultant to prepare the quality manual and employees made to follow whatever is prepared for them. The main disadvantage here is that the increased amount of new procedures which need to be adhered to will result in massive paperwork with little understanding of the true purpose of carrying it out. This method is not advisable since there is no employee involvement.

The second method is to appoint a consultant as an adviser in drawing up the quality manual. Selected employees will sit together with the consultant acting as a team in preparing the manual and related procedures. This method is preferred since there is involvement from employees in drawing up the system.

The third suggested method is for the employees to prepare the quality manual by themselves. In this case, a project team will have to be formed and the team will have to go through all the requirements in BS 5750 and interpret them, understand them thoroughly and draw up a quality manual including all the necessary procedures. A staggered introduction of the procedures will also be beneficial with a certain target dateline for a full implementation of all the procedures necessary to comply to BS 5750 requirements. By doing so, a continuous assessment could be done on the effectiveness of using the procedures prepared.

Once the first stage of preparing a quality manual has been completed, the next stage is to test run the procedures for a period of five or six months to find out the weaknesses, and have a monthly review on the established system. Effort for continuous improvement must be made to reduce problems resulting from the newly introduced system. It is suggested that any effort to obtain certification to BS 5750 be done after the trial period so that employees are already familiar with the new system.

In the previous assessment results section, the deficiencies and the problems were outlined with some suggestions given for compliance with the standard. It is, however, felt that there are certain areas in the operations which can be prioritized and also act as the initial starting point for introducing the system.

The first area of priority for such procedures to be introduced should be at the office system rather than starting at the site, since the staff and the engineers must first be well acquainted with a quality system before
instructing the workers to observe certain procedures applicable to the site (for example, process control). Instead of process control, the quality elements which must be introduced first are the management responsibility, contract review, purchasing procedures, document control, quality records and receiving inspection. All these clauses mainly involve the people at the office, so it will be much easier to develop, implement and monitor such systems.

The next priority area involves introducing procedures at the site, for example, process control, final inspection, handling and delivery, corrective action, calibration system, etc. It is important that the workers thoroughly understand the procedures before they are fully implemented. Of course, there will be cases whereby procedures having linkage between office and site must be developed jointly between the two areas. It is important to stress that this is not an attempt to separate and segregate the two but merely is a way of simplifying the introduction of a new system which is different from the usual routine ways of doing things.

Conclusion
The project has attempted to review and evaluate the existing management system at DCS and has pinpointed areas which were found lacking and not in compliance with BS 5750. The report has outlined deficiencies found on the items audited during the assessment and has provided suggestions for improvement in order to comply with BS 5750 requirements. A plan of action is also supplied. The author has great faith that DCS has the potential to implement the system successfully looking at the commitment of the staff and co-operation given during this study. Quality is the tool and weapon which will hopefully create much success for this organization and must not be left out by any person in the effort to achieve excellence. Implementing BS 5750 in this company will set the stage for future continuous improvement projects and will set the foundation for an efficient and effective organization.

References