



Case studies on the implementation of TQM in the UK automotive SMEs

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Abstract *Describes the methodology and findings of four industrial case studies conducted on the implementation of TQM in automotive small and medium-sized enterprises (SMEs). Interviews were conducted to answer key issues which were felt to be crucial to this study. In addition, the case studies also explored the feasibility of the authors' conceptual framework, and subsequently its validation. The companies were categorised as "TQM" and "lesser TQM" companies, and the analysis was performed on this basis. Results from the case studies indicated that the SMEs used in the study had approached TQM without the help of any specific framework, but they had implemented the numerous quality initiatives or programmes on a "slice by slice" approach. It was found that three common aspects were emphasised in each case when adopting TQM. Culminates with the conclusions drawn from the studies and future research directions.*

Introduction

Total quality management (TQM) is a philosophy and presents a business system that companies should adopt to achieve organisational excellence. The adoption and implementation of quality initiatives have, in the main, been spearheaded by large companies; the smaller ones always being followers and have lagged behind. Various suggestions have been made to help small to medium-sized enterprises (SMEs) implement TQM (see, for example, Ghobadian and Gallea (1996), Brown (1993), Lee and Oakes (1995), Husband and Mandal (1999)). However, the development of TQM implementation frameworks for SMEs is found lacking and those implementation frameworks developed have primarily focused on the characteristics of large companies (Yusof and Aspinwall, 2000a). This paper concentrates on the results of four case studies performed as part of a research project in developing a framework for TQM implementation in SMEs. It is envisioned that an appropriate and simple implementation framework could be derived from these case studies. It proved difficult at times since the whole process involved seeking information, some of which was confidential and companies may not be willing to part with it. However, despite the numerous difficulties faced, the case studies were successfully completed during the early part of 1999.

The paper begins with a description of the methodology employed in eliciting relevant information concerning the companies studied, which was largely based on a case study protocol (Yusof, 2000). The presentation of the case studies centres around three main areas:

- (1) the background of the case company;
- (2) major aspects of TQM implementation; and
- (3) the implementation framework employed by the company.

Following this, a summary of the various quality initiatives implemented by the companies will be presented. Validation of the conceptual implementation framework for SMEs will then be described. Finally, the case studies are discussed and summarised with particular reference to the overall findings that emerged. The paper culminates with conclusions and vital lessons learned which provided some future research directions.

Methodology

Introduction

A case study is a research strategy used when attempting to understand complex organisation problems; in essence allowing one to focus on something which is sufficiently manageable and can be understood in all its complexity (Moore, 1987). Many examples exist which have employed this method when conducting TQM research (see for example, Kanji (1996), MacDuffie (1997), Sohal and Lu (1998), Choi *et al.* (1997), Longenecker and Scazzero (1993), Thiagarajan (1995), Meegan (1997) and Ridgeway (1997)).

Yin (1994) suggested that the case study strategy was especially appropriate when trying to answer the “how” and “why” questions of research. Eisenhardt (1989) indicated that one could build theories using the case study approach and has developed a roadmap for this purpose. As the main aim of this research was to answer some of the “how” questions in TQM implementation, the case study methodology was believed to be the most suitable one to use.

Case study design

Yin (1994) described the four basic types of case study design. The selection between single case and multiple case design depends on the nature of the research questions and objectives, and the amount of resources available. Evidence from multiple cases is often more compelling, and the overall study can therefore be regarded as being more robust (Herriot and Firestone (1983) as quoted in Yin (1994)). Conducting multiple case studies is described as being similar to replication or executing multiple experiments. The holistic approach (single unit of analysis) is more suitable in examining the global nature of a problem, programme or an organisation. In the case of this research, the design employed was a holistic multiple-case one which involved examining a particular company’s approach towards TQM implementation on a global basis. Since the focus was the company (an SME) as a whole, replicating the study meant that the strategies, plans, approaches, etc. could be scrutinised, analysed, and developed into an approach which would hopefully be sufficiently general for implementation purposes.

The main issues which it was felt crucial to address in this study were:

- How had the company implemented TQM?
- Why had the company chosen the particular approach?

In addition to these questions, the case study also investigated the feasibility of the proposed implementation framework in terms of its strengths, weaknesses, simplicity, practicality, etc. The question was “Can the proposed framework be used as a planning tool, or a guide for TQM implementation?”

Ten companies were contacted from among the respondents of an earlier survey (conducted by the authors) who had indicated their willingness to participate in the case study stage of the research. Although they had expressed an interest, in the event, the task of convincing them to participate was not easy. Many reasons for not being able to take part were proffered, but eventually, four companies did agree to provide information. Their details are shown in Table I (note that they have been referred to as A to D to preserve their anonymity). Interviews with key personnel who were responsible for quality initiatives implementation were conducted which lasted between four to six hours. Relevant documents were also referred to and when possible copies provided by the case companies. Further clarification were sought, if necessary, through telephone calls to the related companies.

Each of the companies was treated as one unit of analysis and it was hoped that through this approach, the final framework developed would be generic, rather than one that was limited to one specific manufacturing activity. The case companies included electrical, metal, rubber and plastic based components with different production technologies being employed such as presswork, assembly, and plastic moulding, ultrasonic welding, etc.

Following the analysis, the companies were classified as either “TQM” or “lesser TQM” companies. A TQM company was defined as one which had achieved an advanced level of TQM adoption whereby many of the different quality initiatives are implemented and the number of years for implementing these initiatives are longer. “Lesser TQM” companies were those which had much fewer initiatives implemented, and were still at an early stage in their quality journey. The basis on which they were judged was on the case study results, observations at the premises, and on their actual progress after implementing these activities, especially with regard to the outcome of the

Case company	Main products	Number of employees	Year started TQM	Certifications
A	Wire harness	90	1990	ISO 9002, Iip, QS 9000
B	Interior trim	160	1992	ISO 9002, Ford Q1
C	Metal pressed – seat belt components	150	1995	ISO 9002, QS 9000
D	Different types of springs	112	1990	ISO 9002, IIP, QS 9000, Ford Q1

Table I.
Case companies' main characteristics

quality initiatives, such as reduction in rejects (e.g. parts per million). Their financial performance, such as sales or profits, was not considered when classifying the companies since this would have required them to disclose confidential information, which some were not willing to do.

Case study protocol

In order to facilitate data collection, it was necessary to construct a case study protocol, the interview instrument for conducting the case study (Yin, 1994). It contains all the pertinent questions to be asked when investigating the companies' experiences of and when adopting TQM. It is a major tool for increasing the reliability of case study research and is intended as a guide for the investigator in carrying out the study. The schematic in Figure 1 outlines its main sections.

The initial section in the protocol concentrated on general information about the company, such as the types of product manufactured, the number of employees, the year in which the first quality initiative was started, etc. The main sections which followed dealt with implementation issues. In the first one, the questions were designed to encompass four major implementation factors – co-ordination and management leadership, continuous improvement, systems and businesses, and actual implementation.

The aim of the second section was to determine the type of implementation framework used by the company. The first part of section three was intended to investigate which of the various quality initiatives had been implemented,

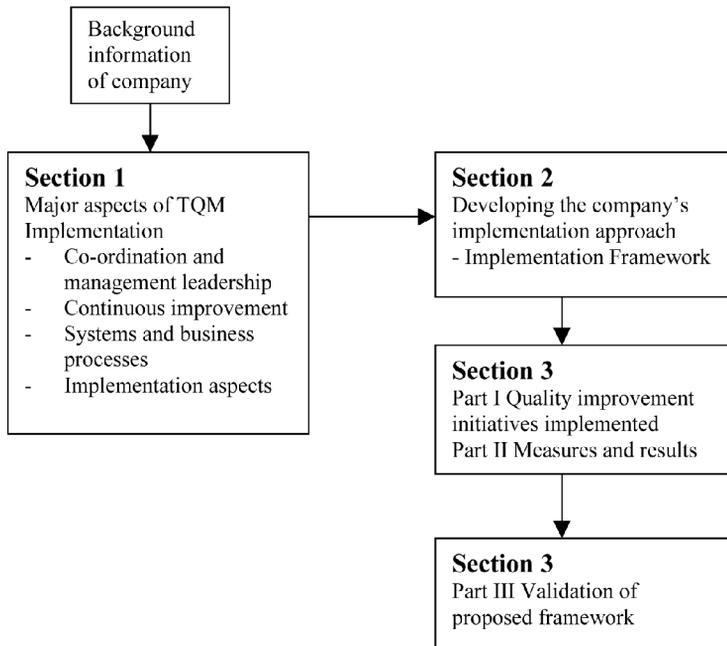


Figure 1.
Schematic diagram of case study protocol

including both technical and soft/motivational aspects. Quality improvements are not only concerned with hardware but they also include the soft human aspects such as better communication links, employee's recognition scheme, etc. To ascertain how well the company had progressed towards TQM, part two of section three was concerned with the measures developed for quality performance together with some indicative results achieved thus far. The measures and results gained, together with the range of quality improvement initiatives embarked upon by the company, provided a good indicator of "how TQM" the company was. The analysis was primarily conducted through cross-case examination between the companies to look for differences and similarities, thus ensuring that important lessons were learned.

The final part of the case study was a description of the conceptual implementation framework for SMEs (see Yusof and Aspinwall, 2000b). The company was then asked to give their comments on the feasibility, the ease of implementation, the overall structure of the framework. The intention was to validate the concepts presented in the framework through open-ended questions without restriction to the above criteria only.

Results from case study A

Company background

The first case company was located in the West Midlands. It produces wiring harnesses for both the automotive sector and the white goods industry and interior lamps for cars. It is a small family business with 31 years' experience in the sector. The company is a first-tier supplier to Honda and a second-tier supplier to Nissan, Rover and Jaguar. The first impression of the company, from the visit, was that it was well maintained with clear signs for visitors and an overall pleasant atmosphere. The company has 90 employees, 45 of whom are in the manufacturing function, and eight in the quality department. With such a small number engaged in the quality function, it suggests that much of the inspection work has been empowered to the production operators. Even though the company's quality department was formed in 1978, the emphasis towards continuous improvement, team involvement and adopting modern quality management concepts only started some six to seven years ago. QS 9000 certification was gained in 1998 and "The Pursuit of Excellence" award from the local Business Link in both 1998 and 1999; the company is certified as an Investors in People (IiP) organisation, clearly demonstrating the maturity that has been achieved in terms of quality implementation.

Major aspects of TQM implementation

The board of directors of the company is involved in making policies, creating visions, and planning for quality to be the company's business style. The core group consists of the managing director, quality manager/director, and the production and sales managers. Their main responsibility is to make policies for running the business smoothly and to ensure continuous business improvement. There is certainly total commitment by management on quality

matters, especially when one thinks about the demands of being a first-tier supplier.

The structure for conducting continuous improvement is by way of having an improvement facilitator who reviews quality problems together with related teams to find improvement opportunities. Examples cited by the quality manager were improving the efficiency of production processes and procedures using method study techniques, parts and workplace layout, and incorporating standard minute values (or standard times) for processes. Improvement activities are not only production-related, but also non-production areas such as purchasing and sales. One example given was the reduction in turnaround time for quotations sent out to customers; this was formerly a manual exercise but had now been computerised. Even though the solution appeared to be simplistic and obvious, the involvement of employees and management in investing in technology for better job execution led to higher employee satisfaction.

Implementation framework at the company

The company had not actually devised a framework as such when implementing TQM, although quality had been part of its philosophy from the outset. Its clear vision is specified in their QS 9000 quality systems manual, which states that its aim is:

To achieve *preferred supplier* status with our customers, and to satisfy the requirements of *all* of our business partners.

It had also included a total quality policy within the quality policy requirements (Clause 4.1.1) of the QS 9000 standard. Obviously, this shows the commitment and understanding of this company's management of TQM. In addition, it has progressively incorporated and implemented numerous quality methodologies and tools such as a continuous improvement system, statistical tools, advanced quality planning, and a quality assurance system. The pace at which TQM was being absorbed had been even more rigorous over the last six to seven years. The quality manager mentioned that they had adopted a kind of "salami approach", cutting and consuming the tools, techniques and programmes of TQM "slice by slice". This is analogous to implementing a little at the time, i.e. choosing one or more initiatives/techniques at any one time from the many tools available until a particular state is reached.

With reference to what implementation framework this company had adopted, the overall structure of QS 9000 implementation was taken as a basis for the mechanisms involved. The major activities embarked upon are summarised in Figure 2. The decision to adopt QS 9000 seemed to be externally driven by its customers. Once accepted, discussions were made in defining the requirements, the policies and the methods to progress towards certification. Its current system was assessed to determine any deficiencies since the company was already certified to ISO 9000; it needed to develop some new areas which were additional requirements of the QS 9000 standard. Results from this initial

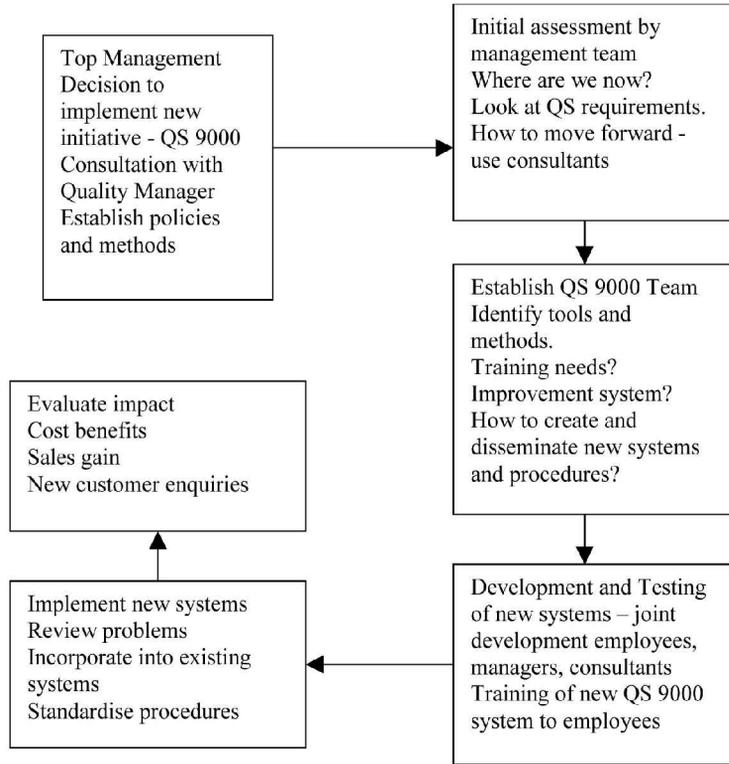


Figure 2.
QS 9000 implementation
framework at A

assessment were used to plan ahead for training needs, consultancy support, writing new procedures, etc.

A larger committee was formed to execute the finer details such as the necessary training for employees, procedure development, additional tools and methods to be implemented, etc. The committee had to shoulder the responsibility for implementing and developing the system until certification was achieved. The next stage was the actual development of procedures for the new areas. This involved implementing the new systems and a continuous review of the procedures to determine whether they were adequate or not. Once it was satisfied that everything was in place, it became a standard and certification was sought.

The final stage, which the company conducted as a separate activity, was an evaluation of the overall success and impact of the new initiative. The company mentioned the difficulty in evaluating costs against the benefits gained, however, one improvement indicated after gaining certification in May 1998 was the increase in the number of enquiries it received from new non-traditional businesses (non-automotive). The company is hoping that this will result in increased sales. Having implemented a TQM initiative a little while ago, the impact on its business is still being continuously evaluated and it is hoped that other quality activities will be incorporated in the near future.

Case study B

Company background

The second case company, located in Staffordshire, is a small subsidiary of a larger group. The company manufactures automotive interior trim parts such as door trims and headlinings and is a first-tier supplier to Jaguar, Rolls Royce, and Aston Martin. It manufactures these components to customer requirements since it is not involved in design. Of its 160 employees, 120 are involved in production and only five are in the quality department, again showing that much of the inspection work is already delegated to the operatives on the shopfloor. The company has embarked on various quality initiatives including ISO 9002 certification which it attained in 1990, the Ford Q1 award, won in 1995, and its next initiative on QS 9000 which started in 1998.

Major aspects of TQM implementation

The company has a quality steering committee at company level, which comprises senior management, and a few selected members from the shopfloor including supervisors and team leaders. The committee was focusing on QS 9000 implementation and was working towards accreditation before the end of 1999. Its main responsibilities are annual reviews of the quality policy, monthly reviews of procedures, review of work instructions, examining audit results, and QS 9000 training of employees.

A continuous improvement structure exists in the company since it is a requirement of QS 9000. It centres mainly on a cell manufacturing system in which there are related process and quality engineers in each team. Other forms of improvement activities are the product improvement groups who hold weekly meetings to resolve problems and find better ways of performing tasks. Improvements to the process layout have been carried out through work-study methods to achieve a lean manufacturing environment. The business systems manager (when asked about the involvement of non-production related departments) mentioned that even the logistics personnel were involved in some improvement activities.

In moving towards a quality organisation, various systems have been implemented by the company. Examples include installing a quality assurance (QA) system, a training system, and an information and data collection system (mainly computerised now). The company believes that a major business process is the development of its business plan, which is very comprehensive and contains the company's vision and mission. It also outlines its continuous improvement strategies, its people (human resource development) and its customer aspects, as well as its action plans to achieve both in the short (one year) and long (five year) term. The way in which the company identified customer needs was through a detailed customer satisfaction index (CSI), measuring areas such as quality performance, logistics, delivery, etc.

The main focus for the new way of managing quality was on people. The key to its business excellence goal was through a cultural transformation process. Managing quality in the old way was focused on management making

all the decisions and empowering workers without the necessary responsibilities and authority accorded to them. There were also no proper systems in place to complement these. The main elements that have effected this cultural change were through an organisational re-structure programme, an open communication system (mostly through team briefing) and also a training and skills development package. The company was also in the throes of gaining IiP certification where it saw the need for a training and skills development system. One particular example given was when it started conducting QS 9000 audits. It found that many of those initially planned to be carried out by managers, were not, because of the managers' limited availability. It has overcome this problem by upgrading the team leaders' skills, thus enabling the leaders to conduct internal audits and free the managers to perform other jobs. This team leaders' training initiative was supported by the local Training and Enterprise Council (TEC). The company has a variety of initiatives in place but, at the time of carrying out this research, had yet to reach its goals of achieving QS 9000 and IiP certification.

Implementation framework at the company

The business systems manager indicated that its action plan for TQM implementation was contained within its business plan, as mentioned earlier. Elements of TQM could be found in this document, which detailed the policies, objectives, and approaches on continuous improvement, customers, and the human resource aspects of the organisation. Since it was confidential and not made available to the authors, they inquired on how the company had embarked on their QS 9000 project, even though the company had not yet been certified. It should be mentioned here that the company is also in the process of developing a new project management system, which looks in great detail at new jobs (new businesses) and products from concept to mass production. It is a comprehensive system for planning, monitoring all the necessary processes, equipment and tooling preparation, material requirements, etc. and is co-ordinated and updated by the business systems manager himself.

The major steps taken in its effort to implement QS 9000 is best explained through a series of steps as given in Table II. The awareness stage was mainly to ensure that everyone in the organisation realised the need for certification. This was followed by an assessment of its current systems against the requirements of the QS 9000 standard. It developed new procedures through a matrix of responsibility and by assigning the development of procedures to the respective functions, or production teams. It had reached Stage V of the process at the time of the authors' visit, reviewing all the developed procedures, most of which had been documented. The certification audit should have been completed before the end of 1999.

Even though the example cited was on QS 9000 adoption, other initiatives have been implemented based on a progression of activities or adopting new techniques required by the company or the customers. A supplier development

Stage	Main activities conducted
I Awareness	Presentations to management and shopfloor employees on the need for QS 9000 by business systems manager
II Assessment	Investigating current system deficiencies against QS 9000 requirements
III Establish action plans and areas of responsibility	Draw up matrix of responsibility for quality policy manual and respective procedures and working instructions
IV Development of systems	Writing up, establishing procedures
V Review of quality system	Review meetings
VI Certification and standardisation	Third party audit and approval

Table II.
Steps towards QS 9000 certification

programme had not, to date, been conducted but was to be its next major project. Its overall approach to building quality seemed to focus on the systems approach (ISO 9000, QS 9000, and project management), as well as restructuring and teamworking to change the work culture in the company. Through this approach, the responsibility for quality had been transferred from the quality department to everyone from the shopfloor workers through middle managers to top management.

Case study C

Company background

The third company to be visited was a small company situated on the south coast; it was a subsidiary of a group, the headquarters of which was situated close by. The major product of the group is seat belt assemblies, but it also makes a number of air bag systems for Honda, Rover, Jaguar, etc. The company produces components for seat belts, such as the tongue; these are mainly pressed parts, which are then moulded. Its main customer is the group headquarters, which carries out all the assembly work.

The first impressions of the company were quite displeasing, there was no evidence of a visitor's car park, and reception was poorly marked. The meeting and interview with the QA manager was held in the quality engineering office, on the shopfloor, which was not really conducive. The company has around 160 employees, 90 of whom are production operatives and five quality personnel, an additional member was to soon join the quality department, making six in total. Again, the structure of the quality function was similar to the other companies studied. Quality was no longer the responsibility of the quality department but of the people actually involved in production or manufacturing. The company obtained certification to ISO 9002 in 1996, QS 9000 in 1997 and the environmental management standard, ISO 14001 in 1998. Quite an achievement for a company of this size.

Major aspects of TQM implementation

In terms of the existence of a quality committee, the company indicated that it did have a quality system committee. The members comprised managers from all departments including quality, finance and engineering. There were no representatives from the team leader or supervisor levels. Its main responsibilities were in designing systems, making decisions on quality matters, and reviewing systems generally in the company.

The company has a continuous improvement system outlined in its QS 9000 manual. The structure in which it operates is through cell manufacturing, which was established a year earlier. It re-structured its production department into product manufacturing cells, pressed products and moulded products. These cellular arrangements double as improvement teams. In fact, sales personnel are also represented, thus involving non-production-related people into improvement activities.

In addition to their QS 9000 and ISO 14001 systems it has developed a training system and an information and data collection system. It believes that the key business process is manufacturing. It has conducted detailed process FMEAs and implemented *poka yoke* to ensure that parts are produced as per the customer specification. This is especially so when the component in question is safety-related. On the question of identifying customer needs, it has a customer complaints and customer concern system in place. As has been stated before its main customer is headquarters and so all the requirements come from there.

The implementation of the various quality initiatives has led to changes in the way in which the company is managed. The focus has moved from a rigid structure without process ownership to an organisational structure which is primarily people focused, empowering employees to make decisions on matters pertaining to quality. As mentioned earlier, the new structure into product manufacturing cells had been in place for only a year. The QA manager feels that "it will take the company another two or more years to see the true benefits" of the re-structuring exercise. He also pointed out that customer expectations were ever demanding and this was particularly evident within the automotive industry. Zero defects today means virtually no defects. The customers expect none. A small company always has the dilemma of balancing costs against sales price, and concern was expressed about having to shoulder faults that did not originate from its site. Since the company does not have a design department, any "poor designs" from the customer will affect the manufacturability of the component, which in turn affects the quality of the pressed or moulded components it produces. The authors believe that this company faces similar problems to many SMEs whereby it has to bear the costs of inspecting parts produced from components that were poorly designed by the customer about which it can do very little. However, it is believed that this company is in a much better position than those which are not conducting any continuous improvement activities.

Implementation framework at the company

When asked about whether the company had any kind of action plan or strategy for TQM implementation, the answer was negative. However, the company does have a management business plan, which is reviewed for progress achieved on a monthly basis. As with the other case companies, there was little evidence of an implementation framework being used to progress the TQM initiative. The basis on which TQM was implemented was through a progression of quality initiatives such as ISO 9000, team meetings for improvement, and people empowerment through cell production (re-structuring). There was no “global” perspective with regard to TQM implementation.

Case study D*Company background*

The final case study was conducted at the company in which an exploratory study was carried out. The company is a major producer of various types of springs used in the automotive industry. Its major customers are Ford, Rover and Lucas HDBS (heavy duty braking system). It is quite advanced in its TQM implementation and some changes were apparent following the initial visit which was made a year earlier. Especially important was the fact that the company had been certified to the third edition of QS 9000 in March 1999. It was also in its second year of the Society of Motor Manufacturers and Traders (SMMT) Masters Improvement project, which had produced good results in terms of improved quality and productivity in its organisation. In addition, it had submitted an application to the Midlands Quality Award for SMEs in 1998, and although it did not win it, it had taken on board all the recommendations from the assessment, which has brought about new improvement opportunities.

Major aspects of TQM implementation

The company has been implementing a total quality programme since the early 1990s and has gained a lot of benefits in terms of both improved product quality and employee satisfaction. It has reached a stage in which customers demand “perfect quality” and this forces it to work even harder. Most of the necessary systems are already in place, such as training, quality assurance, data collection and measurement. Its data collection system, in particular, is very comprehensive and is linked with both business and departmental objectives. Its measurement system, under the quality operating system (QOS), outlines the three major performance indicators monitored. They are parts per million (ppm), failure to meet customer demand, and due date performance (DDP). All these are being co-ordinated by the improvement manager. This is the only case company studied which has an improvement function in its organisation, and it reflects its commitment to TQM.

The key to the new way of managing its business is people focus. Operatives have been empowered to carry out improvements throughout the cell manufacturing set up, already established in certain manufacturing areas such as the compression spring cell. The adoption of numerous quality tools has

helped mould the culture of quality consciousness amongst the employees in the organisation.

Implementation framework at the company

Even though the company does not have an implementation framework as such, an analysis of its TQM adoption was carried out. There were three main components:

- (1) the organisational elements which are affected by TQM implementation;
- (2) the quality initiatives which when implemented will improve the organisational elements;
- (3) the goal or aim of the whole process.

The adoption of QS 9000, for example, will ensure that products meet all customer specifications, and also allows continuous improvement to be carried out. A quality assurance system must be supported by continuous improvement projects. The company has brought about continuous improvement through committing itself to the SMMT project and from constant customers' feedback. Continuous improvement has helped the company to move beyond QS 9000, and to embark on a self-assessment initiative and a quality award scheme.

The quality initiatives can be broken down into those related to:

- systems such as ISO 9000, QS 9000, IiP;
- quality techniques including statistical tools;
- organisational re-structuring such as cell manufacturing;
- motivational, people-oriented and cultural aspects such as newsletters, communication, monthly meetings, reward scheme, multi-skilling, etc.

Some of the reasons that have helped ensure success at the company were a high level of management commitment, tangible improvement projects, a continuous improvement strategy, and not being complacent at one level (e.g. moving on from ISO 9000 to QS 9000). The company believed in getting people involved early in the process so as to gain their support. Employees must be informed of the company's way forward and should also understand the improvement process with the benefits to be gained. The QC manager mentioned that it was important to make the workers feel, early in the journey, that good things are going to happen. In a way, involvement is not enough; the need to gain people's support is crucial for success.

Cross case examination and critical analysis

Initiatives implemented

In trying to determine the quality initiatives that were implemented by the case companies, two main areas were focused upon. The first related to the technical or hard aspects of TQM, including the various quality tools and techniques.

The other related more to the soft/motivational or human issues that could help transform the company towards a TQM organisation.

The various quality initiatives implemented by the companies are summarised in Tables III and IV. Table III shows the so-called “technical quality activities”, which have been undertaken together with the number of years that the particular initiative has been implemented. The “soft aspects of quality” implementation are shown in Table IV. A wide range of initiatives has been implemented and the number of years varies from company to company. Some initiatives are quite new, i.e. one year, while others have been applied for up to 20 years. This indicated the diverse experiences that each company possessed.

From the tables, it can be observed that both companies A and D are quite advanced in their application of advanced quality planning tools, statistical process control (SPC), and a QA system, compared to the other two. Case company D, in particular, has implemented almost all the initiatives listed. Case company B has not really implemented SPC, probably due to the nature of its processes and products, and neither has it embarked on a supplier development programme. Self-assessment has only been performed by companies A and D. It is believed by the authors that self-assessment is an important tool for advanced or mature organisations. So, both of these companies can be considered “TQM” while the other two are “lesser TQM” companies.

With regard to the measures and results achieved, company B stated that it had achieved a 20 per cent ppm reduction, while company C had managed to reduce its defective parts from 5,000ppm to less than 500ppm. Company A did not provide any figures. Case company D had managed to reduce its defectives from 5,661ppm in January 1998 to 1,082ppm in January 1999 and finally to 478ppm in April 1999. It can be seen that the effect toward quality improvement has produced varying results.

Validation of proposed implementation framework

The final section of the case study was designed to validate and evaluate the proposed implementation framework (see Figure 3). The discussion will be centred around the perceptions, comments, criticisms, and suggestions made by the respondents in the case companies.

Case company A

The first observation was on the overall acceptability of the conceptual implementation framework for SMEs. The company agreed that it was in general a fair, sensible approach towards building quality into a company. The approach was feasible, it had ease of implementation in mind, together with being a simple and practical methodology. It also indicated that it was comprehensive and uncomplicated even to a company that was still new to TQM.

In spite of these commendations, some constructive suggestions were made to enhance the framework. The first was to include a “training system” in the

Table III.
Quality initiatives
implemented by the
case companies –
technical aspects

Activity	A	Number of years B	Number of years C	Number of years D	Number of years			
Advanced quality planning	Yes	10	FMEA, Taguchi methods, <i>poka yoke</i>	1	Yes	4-5	Yes	8
3M (<i>mura, muda, muri</i>) and 5S	Yes	7	Not yet, but training in progress				Informal	6-7
Simple techniques 7 tools	Yes	4-5	Yes	> 5	Yes	4-5	Yes	12
Statistical process control	Yes	10	No		Yes	5	Yes	12
Quality costs system	Not formal	3	Yes, computerised percentage of overall manufacturing costs	1	Yes	5	Yes	7-8
Customers needs identification system	Yes	10-15	Yes	1	No		Yes	5
Customer satisfaction measures	Yes	4	Yes	1	Yes	5	Yes	7-8
Supplier development and partnership programme	Yes	6	Not yet, next major project		Yes	2	Yes	2
QA system	Yes	20	Yes, ISO 9000 and now QS 9000	> 10	Yes	5	Yes	15
Systematic training and education system	Yes, IIP	5	Yes, now developing IIP	1	Yes	5	Yes, IIP	5
Self-assessment	Yes	2	No		No		Yes	2
Data collection and measurement system	Yes, computer-based	4-5	Yes	2	Yes	3.5	Yes	7-8
Benchmarking	Not indicated		Yes	> 1	Not indicated		Not indicated	

Activity	A	B	C	D
Establish communication links management and employees	Yes, about 5-6 years	Yes, already several years	Yes, daily production meeting	Yes, about 10 years
Suggestion schemes	Not formalised	No	Not formal	Yes, about 8 years
Job rotation	Yes, about 5 years	Yes, but limited	Yes, operator level	Yes
Company newsletter	Monthly, now in 4th year	No	Yes	Monthly, now in 10th year
Regular meeting with employees	Monthly, already 5 years	Monthly	3 monthly	Monthly, 6 years
Internal promotion	Yes	Yes	Yes	Yes, has always been the practice
Time-off for hospital appointments	Yes	Yes	Yes	Yes
Multi-skilling	Yes	Yes	Yes	Yes
Team problem solving	Yes	Yes	Yes	Yes, 8 years
Reward and recognition	Not formalised	No	Not formalised	Yes, 12 years
Non-designated parking space	No	No	No	No

Table IV.
Soft/motivational aspects implemented by the case companies

quality initiatives toolbox since it was required before any training could be carried out. Training is actually included in the general methodology (GM) toolbox, i.e. the actual execution of the training, so this suggestion will be taken into consideration when the implementation framework is finalised.

The second suggestion was to include “evaluate” as a step in the GM toolbox, since financial evaluation, (e.g. cost-benefit analysis), tangible and intangible benefits, improvement to work culture and work environment could also be assessed. The quality manager believes that it is difficult to evaluate and quantify intangible benefits of a programme. He expressed the need to sometimes have “gut feelings” regarding the success of an initiative in transforming the organisation. For example, QS 9000 certification had resulted in increasing the number of enquiries from non-automotive businesses, which hopefully would increase sales in the future. Finally, his overall perception of the framework was that it was a sensible approach and covered all the major aspects of TQM implementation.

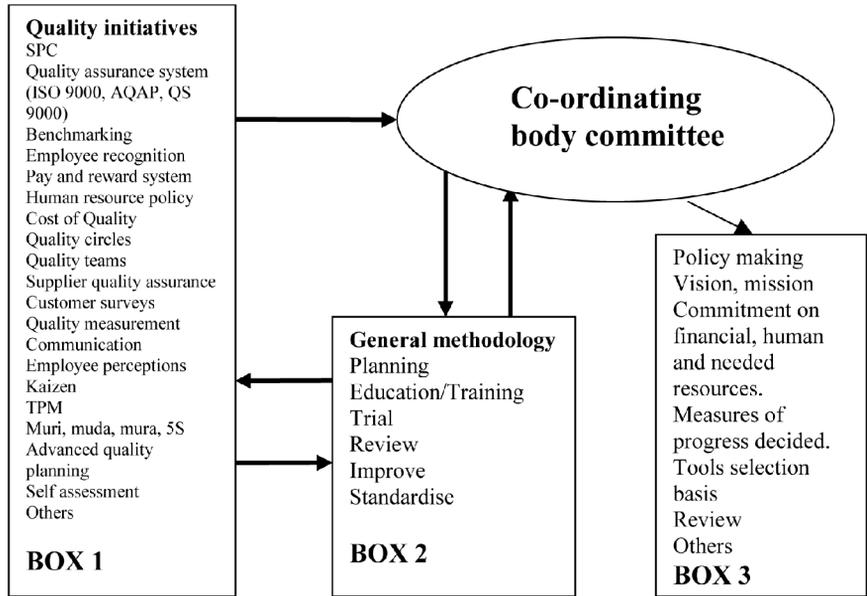


Figure 3.
TQM conceptual
implementation
framework for small
businesses

Case company B

The main criticism made by the company about the framework was regarding the required resources; there were no time elements included, nor other necessary resources. The manager mentioned that small businesses were constrained by limited resources, especially human and financial, and should be considered during implementation. Since this framework does not intend to address an actual implementation plan, the question will require a separate study. However, the researchers are fully aware that resources are crucial in SMEs and thus, have suggested that a framework for SMEs must be at least simple in structure and easily implementable. Another aspect highlighted by the company was in regard to quality being a cultural transformation. He said that management had a key role to play in getting the best out of people through coaching and coaxing during this transformation process. He agreed that the process comprised a series of activities or initiatives which could be implemented, according to resource availability.

On the positive side, he commended the simplicity built into the framework. The general methodology was acceptable and he pointed out that the “trial” stage would be easier with the cellular set-up within his company. It has been proven that SMEs do not have to do “all at once”, but could progress from one initiative to another. There is a need to include “re-structuring” as an initiative and it is believed that it can be one of the first to be undertaken when implementing TQM, particularly in the cultural transformation process.

Case company C

The company’s opinion with respect to the proposed conceptual implementation framework was very positive, in the sense that it presented a

simple approach for incorporating a quality programme into a small company. The QA manager recommended that the items about the roles and responsibilities of top management and the steering body should be the key areas before implementation. In particular, developing policies, vision and mission for quality should form an integral part of the business plan of an organisation. He agreed that management must not only give its full commitment to providing sufficient financial resources, but also human and other relevant resources such as technical knowledge and material. A suggestion was made to change Box 3 of the framework to Box 1 in order to indicate the level of importance placed on the activities in both. This was felt to be a good suggestion and will be considered for inclusion in a modified framework discussed in a future paper.

With regard to the general methodology and the quality initiative toolbox, there were really no negative comments about them. The QA manager agreed to the steps suggested in the general methodology for adopting a particular initiative, and no suggestion was made to add any other tools or techniques. Overall, he seemed satisfied with the simplicity that was built into the framework.

Case company D

The first point raised by the company was again regarding the amount of time and money that would be required to implement the proposed initiatives within the framework. Although time and money are an important feature of TQM implementation, it was not considered in this piece of research, which was concerned with the practicality and simplicity of capturing the necessary ingredients and a simplified approach towards building a quality organisation. Having been certified to the third edition of QS 9000, the company knows that commitment to TQM demands an unswerving effort to reach the ultimate goal of being a quality organisation.

There were two recommendations made with regard to the quality initiative toolbox. The quality manager suggested that a training system be included, similar to A's recommendation, and also supplier development. She also suggested including some form of "targets" when conducting the review step in the general methodology box. The quality manager considered that the overall structure of the quality improvement approach provided in the framework was acceptable for small companies.

In summary, this analysis is an attempt to investigate the UK's automotive suppliers in regard to using and having a TQM implementation framework. As discovered, none have approached TQM using any kind of framework. Despite the non-availability of a framework, some of them have, however, managed to achieve astonishing results. The next section will discuss in detail the common issues addressed during TQM implementation by these companies and their implications to management.

Discussions and implications to management

In critically analysing the case study results, it can be observed that there are some similarities in the approaches adopted by the companies. It can be looked at from three main areas, namely:

- (1) people focus as the vehicle for cultural transformation;
- (2) QS 9000 as the major system for achieving quality improvement; and
- (3) continuous and progressive implementation of initiatives based upon resource availability.

People focus as the vehicle for cultural transformation

The first piece of common ground for all four companies was their focus on people to transform to a quality culture. Different methods were used to achieve this. Re-structuring the production department into work teams or cells seemed to be the de facto standard for all the companies studied. Within the teams, personnel from different functions had been included such as process engineer and quality engineer (case company B) or sales (case company C). With this new structure, employees have been empowered to conduct their jobs efficiently, thus ensuring a smoother flow of information and speedier actions to be taken. Most importantly, this kind of set-up supports and helps build an improvement culture through teamwork and empowerment, especially for a manufacturing organisation in which the old functional organisation has failed to produce results. A cell manufacturing structure creates teamwork and fosters continuous improvement efforts. The quality circle concept was nowhere to be found within these companies. The implication for management is that focusing on people will require that various communication channels between “shopfloor workers” and “middle and top management” be established. Those TQM companies were found to be advanced in the application of newsletters, monthly meetings, open communication, etc., having implemented these for more than five years.

QS 9000 as the major system for achieving quality improvement

The second common point observed was that all the companies were certified or are in the process of being certified to QS 9000. This is a much more stringent version of ISO 9000 and the requirement for continuous improvement has made it difficult to attain, unless the company is committed to this aspect. It is believed that QS 9000 could form the basis for setting up systems for TQM to prosper. QS 9000 companies have a higher level of practice with regard to continuous improvement systems and improvement tools and techniques (Yusof and Aspinwall, 2000b). Many SMEs are reluctant to go beyond ISO 9000 because they do not see the need to do so. But, with QS 9000, companies will need to demonstrate their continuous improvement efforts and this can help sustain their TQM implementation. It can be argued that QS 9000 should be the TQM model of the future, and according to the latest developments, the new ISO 9000-2000 standard (Conti, 1999) will incorporate most of the continuous

improvement elements necessary for successful TQM adoption. Management must realize that to stay ahead in business means adopting the latest available standards in the field and to build continuous improvement as a working culture in one's organization.

Continuous and progressive implementation of initiatives based upon resources availability

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The other major point was that the implementation of TQM was conducted through a series of quality initiatives and business improvements geared towards better ways of managing the business. In the case of A, for example, one of its initiatives was implemented some 20 years ago. The range of time over which the different initiatives had been implemented also indicates that the approaches were staggered. Company B for example, has yet to start on initiatives such as 5S (*Seiri, Seiton, Seiso, Seiketsu, Shitsuke*) or 3M (*Mudi, Mura, Muda*), while both companies A and D have already implemented them. Company B is still in the throes of QS 9000 implementation, while the other three have all been certified. They all have continuous improvement on their agenda, which makes the TQM effort much easier.

TQM implementation in all cases started with the simpler techniques or initiatives and then moved on to the more difficult ones. These initiatives can be visualised as being a series of activities (total quality spectrum) to be implemented, and the adoption of a particular tool/technique depends very much on the success of the previous activities. Company A called it the "salami" approach, similar to a cylinder ready to be sliced piece by piece (which represents each initiative or tool) until the whole thing has been "consumed" or adopted into the organisation. This is especially important for SMEs, where TQM adoption must fit their characteristics and their constraints. The initiatives which form the soft aspects for cultural transformation must not be forgotten. It is believed that the implementation of the various systems including training, QA, data collection, etc., can and will help transform the culture.

Finally, it is felt appropriate at this point to evaluate the level of TQM adoption as evidenced by the case studies conducted and the quality initiative data. It is not the purpose here to conduct performance appraisals but merely to show the differences that exist between them. "TQM companies" are those which have implemented a broad range of quality initiatives tools with longer years in implementation, while "lesser TQM companies" are the ones which have shorter experience and have adopted fewer initiatives.

Using this classification, it is believed that both companies A and D have reached a level that would designate them as "TQM companies" while companies B and C are "lesser TQM companies". Both A and D are QS 9000 and IIP certified. Company B is neither QS 9000 nor IIP certified and neither has it embarked on important activities such as supplier development. Finally, company C has some way to go before it is at the same level as companies A and D. Company C's working conditions may prove difficult to ensure a clean,

quality environment due to the nature of its processes, but it is still an important criterion for a quality organisation that cannot be overlooked. A comparative summary of the case companies is shown in Table V. Management can use this table as a guidance and baseline to gauge the level achieved thus far, and then formulate strategies to move forward towards TQM.

Conclusions and future research

This paper has presented the case studies conducted in four companies, all of which have implemented TQM. A wide range of quality initiatives had been implemented by all of them. Some similarities were observed between the case companies with regard to their approaches towards building business excellence. People focus was one of the key drivers for changing the culture, besides adopting the QS 9000 standard and other initiatives such as the restructuring process and the application of the necessary advanced quality planning and statistical techniques. Continuous improvement should be focused on harnessing the potential of all available human resources within an organisation and initiating new techniques without waiting for customers' demand. The analysis performed was able to differentiate between the case companies as to the level of TQM adoption, called "TQM companies" and "lesser TQM companies". Having this differentiation will be beneficial when attempting to finalise an implementation framework suitable for SMEs. However, the manner in which these companies have implemented TQM was primarily customer-driven, e.g. ISO 9000 and QS 9000 adoption. It was also observed that implementing TQM was actually a progression or a sequence of relevant quality initiatives within the overall "spectrum of quality initiatives" that enhances business performance and in helping produce high quality products in meeting the ever changing demands and needs of the customers.

Criteria	TQM		Lesser TQM	
	D	A	C	B
QS 9000	Yes, 3rd edition	Yes	Yes	No
IIP	Yes	Yes	Yes	No
Longest initiative	15 years (QA)	20 years (QA)	5 years (QA)	10 years (QA) but no QS 9000
Environment and factory condition	Very good 5S	Very good 5S	Poor 5S	Fair 5S
Advanced quality planning	10 years	8 years	4-5 years	1 year
SPC	10 years	12 years	5 years	None
Self-assessment	Yes	Yes	No	No
Company newsletter	10th year	4th year	Yes, duration unknown	No

Table V.
Comparison between "TQM" and "lesser TQM" companies

The results and analysis from this paper will be used as the basis for the formulation of the implementation framework for SMEs, which will be the subject of a future paper.

References

- Brown, A. (1993), "Quality management in the smaller company", *Asia Pacific Journal of Quality Management*, Vol. 2 No. 3, pp. 67-76.
- Choi, T.Y., Rungtusanathan, M. and Kim, J.S. (1997), "Continuous improvement on the shopfloor: lessons from small to midsize firms", *Business Horizons*, November-December, pp. 45-50.
- Conti, T. (1999), "Vision 2000: positioning the new ISO 9000 standards with respect to total quality management models", *Total Quality Management*, Vol. 10 Nos. 4 and 5, pp. S454-64.
- Eisenhardt, K.M. (1989), "Building theories from case study research", *Academy of Management Review*, Vol. 14 No. 4, pp. 532-50.
- Ghobadian, A. and Gallea, D.N. (1996), "Total quality management in SMEs", *OMEGA*, Vol. 24 No. 2, pp. 83-106.
- Husband, S. and Mandal, P. (1999), "A conceptual model for quality integrated management in small and medium size enterprises", *International Journal of Quality & Reliability Management*, Vol. 16 No. 7, pp. 699-713.
- Kanji, G.K. (1996), "Implementation and pitfalls of total quality management", *Total Quality Management*, Vol. 7 No. 3, pp. 331-43.
- Lee, G.L. and Oakes, I. (1995), "The 'pros' and 'cons' of total quality management for small firms in manufacturing: some experiences down the supply chain", *Total Quality Management*, Vol. 6 No. 4, pp. 413-26.
- Longenecker, C.O. and Scazzero, J.A. (1993), "Total quality management from theory to practice", *International Journal of Quality & Reliability Management*, Vol. 10 No. 5, pp. 24-31.
- MacDuffie, J.P. (1997), "The road to 'root cause': shopfloor problem solving at three auto assembly plants", *Management Science*, Vol. 43 No. 4, April, pp. 479-502.
- Meegan, S.T. (1997), "Organisational transitions from ISO 9000 to total quality management", unpublished PhD thesis, Queens University of Belfast, Northern Ireland.
- Moore, N. (1987), *How to do Research*, 2nd ed., Library Association, London.
- Ridgeway, G.M. (1997), "Introducing total quality management: a change in management ideology", unpublished PhD thesis, Sheffield Hallam University.
- Sohal, A.S. and Lu, E. (1998), "Continuous quality improvements in a high-technology manufacturing environment", *International Journal of Technology Management*, Vol. 16 Nos 4/5/6, pp. 336-57.
- Thiagarajan, T. (1995), "An empirical study of total quality management (TQM) in Malaysia: a proposed framework and generic application", unpublished PhD Thesis, University of Bradford.
- Yin, R.K. (1994), *Case Study Research: Design and Methods*, 2nd ed., Sage Publications, London.
- Yusof, S.M. (2000), "Development of a framework for TQM implementation in small businesses", unpublished PhD Thesis, University of Birmingham, Birmingham.
- Yusof, S.M. and Aspinwall, E. (2000a), "Total quality management implementation frameworks: comparison and review", *Total Quality Management*, Vol. 11 No. 4, pp. 281-94.
- Yusof, S.M. and Aspinwall, E. (2000b), "A conceptual framework for TQM implementation for SMEs", *TQM Magazine*, Vol. 12 No. 1, pp. 31-6.