Evaluation of Total Quality Management Implementation in Small and Medium Manufacturing Companies

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Abstract—Total Quality Management can improve the competitiveness, effectiveness and flexibility of an organisation. Literature suggests that many organisations have realised both savings and growth through implementing Total Quality Management. Some organisations have failed to realise the same benefits. The failure of Total Quality Management implementation has been blamed on barriers such as lack of resources, lack of top management support and weak employee involvement just to mention a few. However very few papers have focussed on cultural dynamics such as effective training and education strategy; organisation transformation and communication as barriers in implementing Total Quality Management. Multiple case study research was carried out to evaluate how three small and medium manufacturing companies have implemented their Total Quality Management programmes. The paper established that benefits such as improved staff motivation, reduction in costs, improved product quality and improved administrative procedures were achieved. Areas that were noted as lacking include training in technical skills to support continuous quality improvement efforts, and weak team building.

Keywords—Total Quality Management, competitiveness, training, education and organisation.

I. INTRODUCTION

Total Quality Management (TQM), is a broad-based approach used by world class companies to achieve organisational excellence [1] and satisfying ever changing customer needs [2]. Most researchers agree that TQM is a useful philosophy for management, if it is properly planned and implemented [3] it can help management to deliver on organisational goals, targets and strategy [1] including worker empowerment, improved teamwork and continuous improvement [4]. However, TQM, literature suggests mixed success stories across the business world, with some authors recording failure rates of between 60% and 67% and this has left some companies to believe that TQM has not delivered according to its promise [5]. The TQM success rate of 33% to 40% may not appear substantial, but literature indicates that many organisations have used the TQM approach successfully. This supports the proposition that the failure of TQM in any organisation can not be subjectively linked to deficient principles of TQM. Rather it is likely to be linked to possible flaws in implementation plans that have not considered the impact of TQM implementation barriers and underlying cultural dynamics during the implementation process. This serves as the motivation of this study.

Implementation of TQM brings about organisational transformation [6]. If the process is not well managed it can result in mistrust between management and employees leading to demotivated employees [7], [2]. Employee working practices and attitudes can be changed through sound training, open communication and top management support [1], [8]. Organisations that have successfully implemented TQM have done so through a well planned and resourced training and education strategy [7].

Through training, top management commitment and good communication, employees can focus on quality objectives [9] enabling a smooth implementation of TQM. Critical TQM implementation factors are shown in figure 1. Common features contributing to improved performance are; quality efforts, customer focus, management leadership, employee involvement, open culture, fact based decision making, partnership with suppliers and continuous improvement, [2], [4], [10]. This paper will evaluate how three small and medium, (SME) manufacturing companies managed their quality training efforts, how they communicated the TQM philosophy to all employees and what strategies have been put in place to sustain the gains of TQM implementation. All the three SMEs have implemented their TQM programmes based on the ISO 9000:2008, but so far none of them has applied for certification. However it is worth to note that their TQM implementation would be different due to varying organisational structures, different leadership styles and cultures [11], [12].

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Fig. 1 Critical factors for TQM implementation
II. BACKGROUND OF CASE STUDIED COMPANIES

A. Case Study A

The study concerned a manufacturing engineering company which is into manufacturing of agricultural implements that include ox-drawn and tractor drawn transport equipment, wide range of tanks, ploughs and harrow discs. The company is also into assembly and servicing of tractors. It runs a foundry where casting of agricultural equipment components is done.

B. Case Study B

A second case study covered the implementation of total quality in a medium sized manufacturing company. The company is into casting and maniching of various products ranging from valve and pump bodies, sewer and water reticulation pipes and joints, ball mills and some agriculture components. This company had also introduced TQM.

C. Case Study C

A manufacturing company was examined in the third case study. The company is into casting and extrusion of plastic components for both domestic and industrial use as well as for manufacturing electrical gadgets. The study showed that it aimed to develop its quality culture in similar ways as the medium-size company.

III. RESEARCH OBJECTIVES

a) To evaluate success factors of training and communication experienced by three SMEs in implementing their TQM programmes from 2008 to 2012

b) To evaluate how TQM programmes were monitored from 2008 to 2012 in the three SMEs.

IV. LITERATURE REVIEW

A. Total Quality Management

TQM is a way of managing the whole business or organisation to ensure that customer expectations can be met and if possible exceeded at every stage, internally and externally, [2][6]. TQM is a philosophy with guiding principles of working with and through people to achieve organisational change, [1], [3]. “Reference [6] reported that changes in attitude and values of employees and managers towards their responsibility for quality”. TQM implies issues such as leadership, continuous improvement, team work and communication [13]. TQM organisations use techniques of process management in developing cost and effective processes that are stable and capable of meeting customer expectations [14]. TQM concepts of process improvement enable companies to achieve either breakthrough gains or incremental continuous improvement. Companies implement TQM in-order to meet competition, increase productivity and achieve customer satisfaction [4], [15].

B. Organisational Transformation

TQM implementation, as a dynamic process [1] brings about organisational change [8]. During the implementation phase of TQM, various factors must be monitored in-order to reduce fears of the unknown and to help avoid staff resistance [16] and bring in a new culture. “References [17], [18], [19] classified organisational changes into four categories: changes in organisational processes; changes in organisational function (structural change); changes in values, beliefs and human behaviour (cultural change) and changes in power distributions within the organisation. However this paper does not look into these four categories as individual change dimensions, but a holistic view of the changes brought about by TQM implementation will be looked into. For any organisation to succeed in the transformation process, top management must take full responsibility in implementing, nurturing and empowering all employees in TQM activities [18].

TQM emphasises cultural change through commitment of employees to the ideas of quality and teamwork. Barriers to culture change are norms and values that are focussed on short term production and quick fixes [15] and pursuing departmental goals instead of company wide goals [19]. TQM philosophy encourages team-based performance management system [20] as opposed to the traditional one which focusses on individuals. However TQM does not cover organisational politics, which might lead to other groups being favoured in getting more resources [21], with consequences of mistrust among workers [15].

C. Training

Training helps subordinates to better understand their responsibilities, authority and accountability [22] as they contribute to achieving the objectives and goals of the organisation. The aim of training is to impart new knowledge, skills and attitudes (KSA), on employees for the sole purpose of performance improvement [22]. “Reference [23] argued that training is enhanced by the application of KSA through factors such as goal setting, workload, peer support, coaching, supervisor feedback, individual motivation and job design. Modern and competitive organisations enhance their capabilities by setting up structures that foster a culture of continuous learning and information sharing [24] and such structures supports TQM implementation [1].

Training must enable workers to adapt to the fast changing global competitive environment, since this is one of the key organisational capabilities, [25]. Other key factors that help organisational superior performance is attained through sound knowledge management and proper organisational learning [26], this is supported by [27] who reported that learning capacity and knowledge capability factors can be sources of an organisation’s competitive advantage. The impact of training will be evaluated through tangible and intangible factors, [28]. Tangible factors include reduced errors and improved quality while intangible factors will include improved employee motivation and self esteem [28]. The research will also look into barriers to job-related training pertaining to TQM.

D. Communication

Communication involves the process of transmitting meaningful information. At managerial level communication
occurs in three levels intrapersonal, interpersonal and organisational, [21]. Of interest in this paper is how an organisation systematically gathers, analysed and communicates data for quality problem solving activities, often called Quality Management Information (QMI) [29]. QMI provides a wide range of data from purchasing, marketing, manufacturing, design, customers and suppliers [30]. Communication has also been enhanced by use of software packages such as Enterprise Resource Planning (ERP) and use of Intranets within a company’s different departments. Intranets with the support of relevant software such as Enterprise Performance Management (EPM) help employees including management to have a clear understanding of a company’s strategy through the display of important information [31]. EPM collects data from other applications such as customer relationship management and ERP.

V. RESEARCH METHODOLOGY

The research methodology of this study includes relevant literature review, and detailed case study on five medium sized engineering companies. Case studies [32] can be used to explore, describe, explain and compare while [33] stated that case studies focus on one instance’s relationships and processes in a natural setting with the possibility of using multiple sources and methods for both data gathering and analysis. The triangulation method was used for data gathering as suggested by [34]. The method included extensive literature review, a survey with well prepared questionnaires and in depth interviews. The questionnaire focussed on training and education, communication and monitoring of TQM progress; which included quality of products, productivity levels, returns, scrap and reworks.

VI. RESEARCH FINDINGS

A total of 47 respondents were received from the survey, Company A had 15, B had 16 and C had 16. The response from the questionnaire will be analysed in the following sections.

A. Types of Training

On job training, external short courses and in-house lectures [6] were the outstanding methods used for staff training. Training was provided both from within and outside through short meetings of managers/ supervisors with their staff and short courses presented by managers [35] and outsiders at the company’s expense. Training influences the process that can help to improve quality [36]. From training some of the non-technical skills that were observed were supervisors improved leadership skills, and moderate teamwork skills [9].

B. Soft Skills Training

Company C was doing well in conducting training in soft skills such as communication skills, teamwork building and facilitation as compared to companies A and B. Soft skills are necessary as they support quality improvement efforts [6], [36]. In company B the research team observed that efforts were made to ensure that managers and supervisors communicated with their staff on both formal and informal basis [37] which included answering questions and obtaining views on how the company was operating [37]. Team briefings were held monthly and allowed members of teams to ask questions, this supports TQM implementation as suggested by [38], [36]. Questions and answers were published on notice boards. The works Chief Executive regularly visited the shop floor and discussed any relevant matters with any employee [35]. He welcomed comments, supported practical ideas and clearly explained why other ideas could not be executed. In company A consultative meetings allowed employees to ask questions, which were answered. However the consultation had not developed as far as in the other companies by end of the case study period.

In the early days practical training was provided in all aspects of total quality, including solving problems by quality teams and the use of quality tools such as brainstorming, cause and effect diagrams, histograms, Pareto analysis and scatter diagrams., p-chart and np-charts, as shown in figure 4. Companies A and B had improved on their process management, quality performance data such as defect rate, scrap and rework were effectively collected, analysed and shared this showed an improvement in their quality. This agreed with the work of [39] who established that quality metrics when calculated from reliable and valid data can be used for quality improvement purposes.
C. Training in Statistical Quality Tools

Company C exhibited a committed approach to quality training followed by Company B. The research established that Company A was not performing well hence management did not allocate sufficient resources for training as was done in Companies A and B. Barriers to effective training were lack of resources, weak project management structures, lack of expertise within the companies concerned, expensive consultation rates charged by quality experts and high levels of labour turnover that impacted negatively on the companies’ ability to sustain quality efforts.

In all the three companies, training included understanding and commitment, quality management systems, improvement teams, process improvement but advanced quantitative methods was not done [11] Barriers that were noticed in all the three SMEs were negative attitudes by senior management towards further employee training [40] majority of them cited the need for business survival rather than long-term investments in staff development [41]. This has a detrimental effect of missing on staff’s ability to come up with breakthrough improvements [41] that can be used to sustain competitive advantage of the company. Advanced training in quality issues such as Design of Experiments, Six Sigma and Quality Function Deployment were not done. This was attributed to lack of resources.

D. Monitoring of TQM

All three case studied companies had some records of TQM monitoring. TQM has brought in some improvements in the way the three companies are managed. These benefits are shown in the respective graphs.

Fig. 4 Use of Quality Tools, Adapted from Anoop Pate, 1994, [6]

Fig. 5 Company A-Reduction in Casting Costs.
Casting cost data was obtained for the years 2010 to 2011. According to management these costs include labour, material and energy utilisation. The research established that casting costs have been reduced due to TQM efforts [42]. Costs reduction has been made possible due to improved working methods [9] due to TQM training, reduction in overtime and better utilisation of resources.

Fig. 6 Company B-Reduction in Casting Defects
Production data of casting defects, from the foundry of Company B, was analysed. The graph shows that there has been marked reduction in defects from 2010 to 2011. The positive effect of this reduction is that the foundry now experiences less reworks and scrap thereby reducing costs. The morale of the workers had also improved due to reduced completion of non-conformance reports. Employee involvement [16] played an important part in identifying and rectifying problems that were associated with high defects rates.

Fig. 7 Company C-Reduction in Cycle Times and Delays
Data obtained from Company C indicated that there was a reduction in the cycle times and delays experienced in the foundry. Cycle times were recorded on the actual casting process and delays from the preparation done before casting commences. This was attributed to improve working methods that resulted from joint problem solving [16] that was done by both management and employees. This shows the benefits of participation [1] of all employees in TQM efforts.

E. Organisational Transformation
Organisational transformation is an ongoing process [15] which can not be achieved in a short period of time [18]. In all the three companies the transformation process was being spearheaded by facilitators, first line managers and supervisors who were first trained in quality improvement. Company C and B had facilitators who were not involved with...
production [15] and they acted as quality experts [2]. These facilitators were responsible for overseeing education and training and getting TQM off the ground, [4], TQM was being used as an agent for change [16] and the focus was on improving quality culture [1]. However it was noticed that some supervisors were not happy to have been replaced by working team leaders [25]. The reason for replacing supervisor was to emphasize team work approach [15] in solving day to day problems [3].

Overall it was noticed that successful implementation of TQM requires sufficient time, normally two to three years before results can be seen. TQM must be introduced so that it maximises all employees enthusiasm in order to minimise staff resistance [2]. The ability of the leaders to lead [7] and top management commitment [10] helps to speed up the change process necessary for TQM implementation [15]. Top management must be consistent in their TQM planning activities and must involve employees when making decisions [1], [4]. Effective communication will help to allay fears of employees. Communication must be two way in nature, allowing employees to express their views on issues pertaining to quality [16].

F. Summary of Findings

All three companies understood that successful implementation of TQM is through people [16] management addressed the issue of training [43] communication [21] and participated in achieving organisational goals. TQM benefits that were noticed include improved employee motivation, better communication and improved organisational commitment [17]. Managers in all the three companies indicated that they now understand the value of customer focus, continuous improvement and teamwork [2], [13],18.

The concept of continuous process improvement [2], [4], [10] was found lacking in all three SMEs. There is need to improve training methods to enhance standardisation of processes [35] and to achieve breakthrough process improvements [30]. In all the three companies, teams had not reached a developed stage where they could decide on their daily tasks as well as work assignments. Supervisors of all three companies indicated that there were not flexible to delagate responsibility, authority and accountability to team members, [9]. However their actions weaken employee decision-making and problem solving capability [4]. All teams still look to management for guidance. Most workers exhibited poor problem solving capabilities.

The research noted that there was limited training on customer service including limited customer involvement. Data from interviews revealed that teamwork participation is by conscription rather than voluntary and this hinders creativity of employees [14]. All companies did not do well in holding of cross-functional meetings. The major reason highlighted by workers was insufficient time. Other barriers that were notice include the difficulty to change behaviour and attitudes, barriers between departments [2] and general lack of resources [8] for the further development of TQM.

VII. Recommendation

The most difficult part of implementing ISO 9000 was the growth of the quality culture, which needs to involve everyone in the organisation. Strong management structures as suggested by [47] were not put in place thereby weakening team building efforts. This culture can not be established or enhanced if the chief executive is not totally committed to quality. This commitment is necessary from employees of all levels including their union representatives in addressing issues of employee training, empowerment and teamwork [7], [9]. Continuous education and training are required to ensure that everyone understands quality and is committed. Training also ensures that people working in quality teams know how to use quality tools and techniques and how teamwork becomes successful. TQM facilitators must understand that any change or problem affects the social system of the organisation. Since employees are involved in effecting the change, this calls for collective behavioral changes, [4]

Leadership is necessary by management, quality team leaders and others involved in quality matters and the development of the quality culture to be achieved. Finally the company needs a suitable organisation for the quality systems to work. A military type structure is definitely out of consideration. TQM structures are still developing due to limited employee numbers. Successful implementation of TQM requires an organisation to have a stable funding base, strong administrative systems and good managerial skill.

VIII. Limitation

No survey on business results of the three companies was also done. Linking rewards to training obtained was not done as well. Fewer SMEs were investigated making generalisation of the results impossible. The research did not look into supplier development. The research did not look into new technology that was acquired by these companies to support their quality efforts.

REFERENCES


