Total Quality Environmental Management: Enablers and Barriers

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Abstract

The environment has been a significant concern for practitioners in recent years, so the goals related to environmental sustainability encouraged industries to adapt the green practices. This paper explores green operational practices associated with environmental standards and their comparative impacts on Indian organisations. A major reason for this study is to gain awareness and understanding of environmental sustainability. The green practices are majorly based on environment management, and we have selected a great philosophy related to environment management, i.e., Total Quality Environmental Management (TQEM). This leads us to perform a short literature review for Quality Management and Environmental Management to identify the critical barriers and enablers of Total Quality Environmental Management (TQEM) for its sustainability. The findings of this paper will lead the managers and practitioners to carry organisations towards more environmental sustainability.

Keywords- Total Quality Environmental Management, Total Quality Management, Environmental Management System.

1. Introduction

Manufacturing firms are the main economic driver of different countries such as China, Thailand, and Vietnam, and it also helps to develop these countries. Similarly, these firms, in India have become the main driving force of economic development. Despite its contribution to economic growth, it is also criticised for being a major cause of environmental degradation, climate change, and natural resource insufficiency. Organisations in today's scenario are facing pressures to establish their environmental responsiveness. Such pressures come from trades, investors, and customers. TQEM is structured around two management concepts of Total Quality Environmental Management (TQEM) and Environmental Management System (EMS). These two sub-systems are brought together through their management approaches to constitute TQEM. TQEM could be the solution for more effective interaction between these two tiers of management. The early human generations recognised the need to carefully use natural resources and that everything on this planet is equally dependent but with the revolution of science and technology, this thinking changed towards an unsustainable approach to exploit nature with the perspective that nature's services will always available (Opoku et al., 2019).

1.1 Introduction to Quality

A definition of quality stated that quality is the state of conformity of the previously set requirements within the product Sweis (2019). This definition highlights the indication of conformity, which is related to the process of testing, trying, and focusing on the results of the product before it reaches the customer.

1.2 Introduction to Total Quality Management (TQM)

Quality Management is a collection of principles and techniques. The Organisation is engaged in limited improvements in particular aspects of the business which are no longer satisfactory. Therefore strategy is needed to bring competitive advantage in the market which can only be achieved by adaptation of total quality management. Along with the aspects mentioned earlier, it has concern with relationships with suppliers, customers, and managerial processes (Shan et al., 2013). Total quality management (TQM) is one of the most popular and resilient management concepts (Benavides Velasco et al., 2014).

2. Quality Management and Environmental Management: A short review

The market needs to be changed in terms of technological evolutions. Organisation needs to review their strategies and should implement new and innovative management tools. During the 1980s, Total quality management (TQM) become a worldwide management topic. The most emphasise concepts in TQM include continuous improvement, customer focus, human resources management, and process management. Total Quality Management is the integration of all functions and processes within an organisation to achieve continuous improvement Total quality management (TQM) is a constant effort to fulfil the customer needs and expectations at the lowest cost, by continuous improvement, to which all involved are committed, focusing on the processes in the organisation (Isaksson, R. 2006).

The applicability of TQM has been extended to manage environmental processes due to its wide applicability to management systems, which have become very important both for industry and the surrounding world (Garza-Reyes et al., 2018). TQEM was developed in 1992/1993 by the group of then 21 companies called Global Environmental Management Initiative (GEMI) which was formed in 1990, including IBM, AT&T, and Kodak to foster environmental excellence in businesses (GEMI, 2017; Love et al., 2000). Within this frame of reference, TQEM was born for applying TQM principles and approaches to commercial environmental strategies. Consequently, TQEM integrates quality and environmental management principles to reduce or eliminate waste and pollutants for better environmental performance (Sarkis et al., 2010). Moreover the adoption of TQEM practices linked with cost-saving by recycling and conserving energy (Curkovic et al., 2008).

Table 1. Examined the impact of QM on EM

Conclusions	References
Quality Management and Environmental Management practices are similar intentions. Implementation QM practices assist acceptance of Environmental Management	Molina-Azorín et al., 2015
The benefits obtained from the Implementation of Environmental Management practices are more relevant to Quality Management	Molina-Azorín et al., 2009
Environmental aspects might play an appropriate role among aspects of QM	Giancarlo, 2005
Correlation Exist between QM and EM systems	Allur, 2018
QM principles tools & practices can be Implement to support EM	Siva et al., 2016

Curkovic et al., 2000 and Rusinko 2005 highlighted some more similarities between QM and EM practices. Whereas Hunt and Auster 1990 discussed that one of the long-term objectives of EM is to take an active approach considering environmental aspects in an integrated manner in product design, production process, marketing, product delivery, and customer service.

2.1 Total Quality Environmental Management Approaches

The following is a collection of approaches for environmental management which should be practiced by a variety of organisations. The mentioned range of practices that may be considered for environmental objectives could be truly useful to a particular organisation.

2.1.1 Design for Environment

Design for Environment (DFE) is defined as an organised consideration of design performance concerning safety, health, and environmental objectives over the product and process life cycles. The common approach to Design for Environment is Environmentally Responsible Manufacturing (ERM). ERM has been defined as an economically

driven and integrated approach for the reduction and elimination of all waste streams linked to the design, manufacturing, use, and disposal of products and materials. (Curkovic and Landeros, 2000).

2.1.2 Design for Disassembly

The design for assembly brings economic and environmental benefits. The Design for Assembly principle aims to reduce the number of parts for minimising the assembly time, fasteners, parts inventory, and overall cost of the products. It is helpful in the recovery of valuable materials and parts from discarded products which else proceed to landfills and pollute the water bodies and air (Battaïa et.al (2018). Design for disassembly enables maintenance; enhance serviceability and effects end-of-life intentions, such as product reuse, remanufacturing, and recycling (Desai, A., & Mital, A., 2005).

2.1.3 Design for Waste Minimization

Design for waste minimisation is commonly identified as a key strategy for effectively minimising waste and prevents unnecessary material waste. Waste minimisation is one of the most effective and efficient methods concerning environmental objectives. These methods not only minimise waste generation, eliminates waste disposal, reduces environmental problems, but also reduces the cost of waste sorting, transportation, and disposal.

2.1.4 Design for Energy Conservation

Technical innovation in Organisation is an important concern for evaluating sustainable growth in the future. Electronic components automated transport systems, communication technology advancement will lead to green initiative practices and optimised resource utilisation while consuming less energy. Adequate energy management will result in improved sustainable environmental performance.

2.1.5 Design for Material Conservation

The effective design methodology permits a reduction in resource utilisation and waste generation in manufacturing industries. Consequently, the implementation of resources through the application of systematic design methodologies can be enhanced and resource conservation can be achieved (Tan et al., 2008).

3. Literature Review

Manufacturing organisations have been traditionally driven by fundamental objectives like efficiency, profitability, customer satisfaction, responsiveness, and quality (Garza-Reyes, 2015). Quality has been considered as a determinant factor for the success and competitiveness of manufacturing organisations (O' Neill et al., 2016). However, TQEM did not receive the same level of acceptance in the industry as other approaches like just-in-time (JIT) and TQM (Curkovic et al. (2008). This was the main motivational driver to conduct the research presented in this paper.

Research related to TQEM in Indian organisations is still in its early stages. The studies aim to have highlighted environmental issues relating to process quality and new product development by examining the different cases in different countries all over the world to relate the different aspects with Indian organisations. The TQEM is the organisational approach to formalising the means of achieving environmental policy, aims, and objectives Watson (2004). The Strategic TQEM approach has been highlighted in Table-2 with a set of programs, techniques, and systems (Etzion, 2007), enhancing these programs depends on the nature and the scope of the environmental problem.

Table 2. TQEM Programs

Programs	Description	References
Pollution Prevention	A program that targets to reduce or eliminate pollution before creation and Provides understanding of the environmental benefits of pollution reduction	Daily and Huang (2001).
Design for Environment (DFE)	A programme for designing more environmentally sustainable product systems. It provides input while designing processes to improve the environmental performance of the product.	(Curkovic and Landeros, 2000).

The environmental programs mentioned are the core mechanism for transferring organisational environmental policy into actions and working practices. These highlighted programs are a set of parameters for industries to propose an

implementation of the environmental quality and sustainability issues. Therefore the highlighted programs should be implemented with the discovery of cost savings and market opportunities from reducing environmental impacts to turn environmental management into an integral, profitable part of their organisation.

4. Methodology

The literature searches are limited to studies published in journals between 2000 and 2020. The observed review focused on analysing the linkage between the main practices and programs associated with the TQEM, TQM, and EM. Keywords associated with QM—such as 'Total Quality Environmental Management', 'Total Quality Management', 'Quality management', 'Environmental Management Systems', and sustainability were used to find relevant papers. The relevant electronic databases (e.g., Emerald Insight, Taylor and Francis, and Science Direct) as well as Google Scholar were used for these searches. Articles that fit with the objectives of the search were used and explored that how Environmental Management combined with Quality Management can have a significant impact on performance related to organisational innovations.

To reflect the research a survey questionnaire with formulated questions was considered as the most suitable method for the collection of data to gauge the acceptance of TQEM and its sustainability (Garza-Reyes et al., 2018). This enabled the respondents to access the questionnaire via mobile devices and web browsers as well as the easy transfer of the collected data to an Excel spread sheet (Binti Aminuddin et al., 2016). The prepared questionnaire includes aspects like Organisations and participants' profiles, TQEM awareness, TQEM adoption, Company's size, and implementation of TQEM. The results of the study reflected the relatively low popularity and acceptance of TQEM in the manufacturing sector as the respondents suggested a "lack of awareness" as the main impeding factors for not implementing TQEM.

Other researchers focus on TQEM implementation with a human and operational focus. The numerous researchers worked on the role of human dimensions for TQEM and considered several human dimensions such as work culture, motivation, and role of top management, innovation, coordination, and attitude to change, therefore the only route to achieve TQEM in any organisation is through the involvement of people (Kumar et al., 2020).

According to (Saad et al., 2014) qualitative approach (interviews) was adopted as an appropriate method, to collect the data, for studying the current situation relating to environmental quality and to investigate motivations and current barriers to implement TQEM.

4. Results and Discussion

According to the literature, it is significantly easier to implement an Environmental Management System if the company has already implemented a Quality Management System to approach TQEM. It has been found that the organisations were confident that certified environmental management has a good future in the industry.

5.1 Barriers and drivers for TQEM implementation

The possible barriers experienced by the industries that can occur during the implementation of an Environmental Management were observed based on the outcomes of the literature review. The results show that lack of knowledge, lack of trained staff and expertise, an Increase in management and operational costs, Lack of governmental pressure, complicated documentation process has been major concerns (Abdullah 2005).

The listed barriers in the table faced by most managers are based on their knowledge of implementing TQEM initiatives in their companies. Almost the majority of managers do not fully understand TQEM. However, some managers have little understanding of TQEM. This indicated that the miss understanding for implementing TQEM & Sustainability is one of the most important barriers for implementing TQEM in Industries (Saad et al., 2014).

To evaluate possible drivers / Benefits for TQEM, the benefits experienced had to be assessed by the Industries. A list of benefits has been mentioned in Table-3, observed based on the literature review.

It should be noted that the proportion of certified organisations has a positive influence on TQEM comparing with the non-certified organisations. Hence it will be easier for organisations to implement environmental management past to Quality Management System.

Table 3. Barriers experienced by Industries

Barriers	**Brief description**
Regulation and policies	Regulatory policy is formulated by governments to impose controls and restrictions on certain specific activities.
Increase in documentation workload / Complicated documentation process	document control is an essential part of the quality system for all aspects
Increase in management and operational costs	A common barriers that connects all the input and output barriers
Difficult coordination of environmental performance with suppliers	Managers need to address external pressures by adopting green practices and firms should undertake initiatives in collaboration with their suppliers and customers to achieve a holistic impact which leads to betterment in overall sustainability performance.
Lack of trained staff and expertise	The training will give the employee a greater understanding of their responsibilities within their role.
Lack of consultants helping to introduce EMS	Consultants can be very good since they bring previous experience, some advanced tools, and can even train people on your team in technical aspects.
Lack of environmentally sound materials and technologies	Environmentally sound technologies are technologies that protect the environment, are less polluting, use all resources more sustainably, recycle more of their wastes and products, and handle residual wastes in an environmentally-friendly manner.
Change of existing practice of company structure and policy	Structural changes include things such as the organisation's hierarchy, chain of command, management systems, and administrative procedures.

Table 4. Benefits expected /experienced by Industries

Benefits	**Brief description**
Increased productivity by improved processes	Environmental Management can improve the productivity of an organisation by improving the collaboration, communication of team members.
Increased overall business competitiveness	Business competitiveness is the ability of organisations to produce goods with a favourable quality-price ratio while achieving customer preference over other competitors.
Improved cooperation with authorities	Cooperation with authorities can be improved by Programs designed for environmental management, with increased importance on the natural environment by organisational stakeholders including governments.
Reduction, reuse, and recycling of waste products	Reduce means to minimise the amount of waste we create. Reuse refers to using items more than once. Recycle means putting a product to a new use instead of throwing it away.
Improvement of quality	Quality improvement is a systematic approach to the elimination or reduction of rework, waste, and losses in the production process.
Improvement of safety and health protection	The purpose of health and safety is to protect your workers, sub-contractors, customers, and members of the organisation.
Solving environmental issues and problems	Raw material utilisation and processing always had an impact on the environment, as they affect the environment
Legal certainty	Legal certainty is a principle in national and international law which holds that the law must provide those subject to it with the ability to regulate their conduct.
Improving corporate environmental image	The use of the environmental management concept has a positive effect on corporate image and organisation significance. Corporate image influences organisation significance positively and plays an interposition role in the relationship of green business on firm value.

6. Conclusion and Further Research

The outcome of the study is strongly influenced by practitioners of TQEM and suggests that QM can be particularly suitable as a frame of reference to help company managers to adopt corporate TQEM and other related environmentally sustainable practices. In this regards the present study suggests possible future research on various standards and government policies for TQEM. This can help to enhance awareness of organisations, as regulation and policies has been mentioned as a barrier in the implementation of environmental practices.

Lastly, the present study suggests possible future research that analyses the impact of TQEM and its sustainability on energy sectors highlighting Energy Efficiency and Renewable Energy majorly on power plant sectors for using coal as a conventional method of combustion, as the coal waste products and CO2 emission can affect the environment on large scale.

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