Volume 9, Issue 3, July 2022 ISSN: 2348-8565 (Online)
International Journal of Modern Engineering and Research Technology
Website: http://www.ijmert.org Email: editor.ijmert@gmail.com

Barriers Analysis to Certification of 'ISO 14001' in PVC Garden Tube Manufacturing Industry Using Interpretive Structural Modeling

Vijay Singh
M.Tech.. Research Scholar
Industrial Engineering
Takshshila Institute of Engineering & Technology
Jabalpur (M.P.) India
Email: singh2005vijay@yahoo.co.in

Dheeraj Dave
Assistant Professor
Department of Mechanical Engineering
Takshshila Institute of Engineering & Technology,
Jabalpur (M.P.) India
Email: dheerajdave@takshshila.org

ABSTRACT

The purpose of this thesis is to find out the barriers in the certification of "ISO 14001' in small scale industry and the data related to the research work is gathered from Utkarsh Polyworld Water Tank manufacturing industry. Basically, today environmental concern is increasing very rapidly in customer and also in most of the developed country legally. In India small scale industries are growing very rapidly and today's they also need to focus on present scenario of the environmental concerns. Therefore "ISO 14001" is a very effective certificate for this purpose but most of the SME's are not take interest to get this certificate because they have so many issues in the certification process of it. Therefore, in this research work the barriers are find out that affect the certification of the "ISO 14001" and at same time to get the weight age of the barriers those are helpful for the industrialist and have ease to the process of certification. For this purpose, in this thesis with the help of the literature survey barriers are collected and shortlisted by the owner and experts as per the industry nature. After that an interpretive structure modeling tool is used for the prioritization of the barriers and also get the MICMAC analysis by which owner of the industry can get the nature of the barriers.

Design/methodology/approach-

The design of this thesis is prepared with the help of literature survey, experts and guide. In this thesis first study the benefits of the "ISO 14001" and then understand the low interest of the small industry owner in the certification of "ISO 14001". To solve the above issues ISM methodology is used, in which brainstorming and literature study will provide the barriers and with the help of this researcher get the weight age of the barriers. Therefore, in this thesis with the help of literature survey 14 barriers are received and after the brain storming session of the industry owner and expert's final 11 barriers are selected for the further analysis. This barrier analysis of certification of "ISO 14001" was implementing in Utkarsh Polyworld Water Tank manufacturing industry situated in Maneri district Mandla.

Practical implications

This research work is very useful for owner because this will make the implementation process easy and no need of special resources required selecting important barriers in the implementation process. ISM provide a very simple block diagram by which every person from top to bottom in industry can easily understand the most and less important barriers.

Keywords:— *Small Scale industry, ISO 14001, Environment Management System, Interpretive Structure Modeling tool, Iteration and MICMAC analysis.*

II. Overview of EMS

ISO defined the environment as - the surroundings in which an organization operates, including air, water, land, natural resources, flora fauna, humans and their interrelation (ISO, 1996). Environmental Management (EM) defined it as - management of an organization's or company's impact on the environment. Therefore, in this research work is mainly focused on the small, medium enterprise adoption of EM that will reducing the environmental impact of an organization or people's activities through the control of all aspects of their operation that can cause or lead to an impact on the environment. The ISO 14001 standard defines EMS as - that part of the overall management system which includes the organizational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing implementing, achieving, reviewing and maintaining the environmental policy (ISO, 1996).

The implementation and establishment of environmental management system (EMS) was first introduced following Rio de Janeiro Environment and Development Conference that resulted implementation of Agenda 21 (ANSI, 1999). International Standard Organization (ISO) developed the environmental management standard series (ISO 14000) which expanded worldwide (ISO, 1996). Due to the rapid growth of SMEs in recent years, human activities on growth and development have adverse impacts on the environment. Environment management system is the key that will solve the adverse effect of the close correlation between issues of the environment and development.

II. Introduction of ISO 14001

ISO stands for International Standards Organization which is based in Geneva, Switzerland. The short form "ISO" is not an acronym, but instead is derived from the Greek "isos", meaning "equal" (implying "standard"). ISO was founded in 1947. It promotes the international harmonization and development of manufacturing, product and communications standards. ISO has laid down more than 8000 standards ranging from paper sizes to film speeds. More than 120 countries are full ISO voting members, while several other countries serve as observer members. India is a founder and a full voting member of ISO and is officially represented by the Bureau of Indian Standards (BIS). ISO produces internationally harmonized standards through various Technical Committees.

The first environmental management system standard, BS 7750, was published in 1992 by the BSI group. In 1996, the International Organization for Standardization (ISO) created the ISO 14000 family of standards. ISO 14001 underwent revision in 2004. The current revision of ISO 14001 was published in September 2015.

In the Years 2007, ISO has celebrated its 70 Years completion from the years 1947 and now in 2017 ISO have 165 members and total of 21584 standards. From the years 1947 and now in 2020 ISO have 165 members and total of 21584 standards.

ISO 14001 requires an organization to commit to the prevention of pollution and continual improvement as part of the normal management cycle (Ammenberg, 2003). According to Hillary (2001) it can be used for all types and sizes of organizations and accommodates diverse

geographical, cultural and social conditions. The Environmental Management System (EMS) is a continuous cycle that follows the model "Plan, Do, Check, Act"- the Deming circle (figure 1):

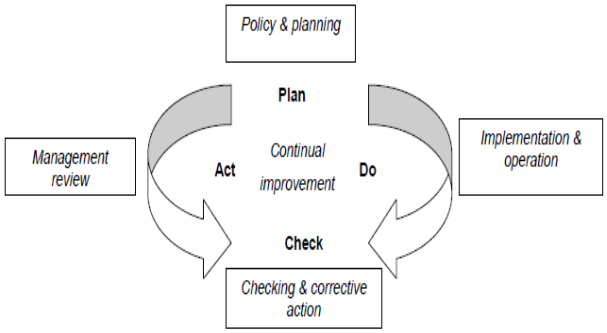

Figure 1: "Plan, Do, Check, Act" model (1).

According to Hillary (2004), the benefits of an EMS are as follows:

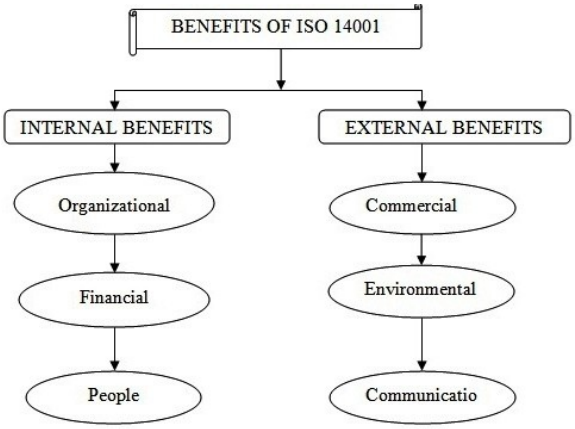

Figure 2: Benefits of ISO 14001 "Hillary 2004"

III. Initiative of the Research

Literature studies and government policies in current scenario clearly indicate the importance of the environment concern of every business. At present government also focused in the growth of the SMEs because SMEs growth will solve the unemployment problems of the country. But in present business trend companies are focusing on the customer environment concern demand due to the customer environment concern is increasing day by day. Therefore, to fulfill the customer green product requirement SMEs must have to follow up ISO environment standard. Above point clearly indicates that to increase profitability and customer retention an industry must have to reduce its carbon foot print and enhance environment safety. For that purpose, every SMEs should have keen interest in ISO 14001.Following are the initiative of the research:

- To identify the barriers that become problem in the certification of ISO 14001 in SME's (Utkarsh Polyworld PVC Garden Tube Manufacturing industry).
- Find out the priority and weightage of the barriers. To get the driving and driven power of the barriers that affect the certification of international organization for standardization 14001 in SMEs at Jabalpur, Madhya Pradesh.
- Arrange the barriers as per their nature.
- Find out the interrelation between the barriers in the certification of ISO 14001.

IV. Problem Statement

The main idea of this thesis work is started from the increasing role of SMEs in Madhya Pradesh. But after the literature survey and discussion with SMEs owner, it's found that SMEs are suffering from so many issues after demonetization and Covid -19. From the two major issues it's also observe that the SMEs are also lacking in competition with other big brand in different matters. The main matter is green approach adopt by big brands as per the increasing environmental awareness of the customers. In today's scenario customers

want green products in which no harmful and artificial chemicals are used.

The big brands justify their green approach in their product by advertising having green norms printed in their product like "ISO 14001" and by marketing green raw material used in manufacturing. But SMEs don't have big budget to marketing and also very poor awareness about green norms.

Hence the main problem of the SMEs can be explained from the following questions:-

- What is the green approach and environment management system?
- How to get "ISO 14001" certification.
- What are the benefits of "ISO 14001"?
- What are the main hurdles in the implementation and certification of "ISO 14001"?

Above four questions clearly stated the problem of the work. Hence after getting the answers of the above questions SMEs are very well aware about the green approach and this solution will lead them entry in global market also.

V. Research Structure

After getting the clear problem statement, it's found out that the research work should be focused towards the certification of "ISO 14001". For that purpose, in this research work a research proposal is shown in block diagram form for easy understanding.

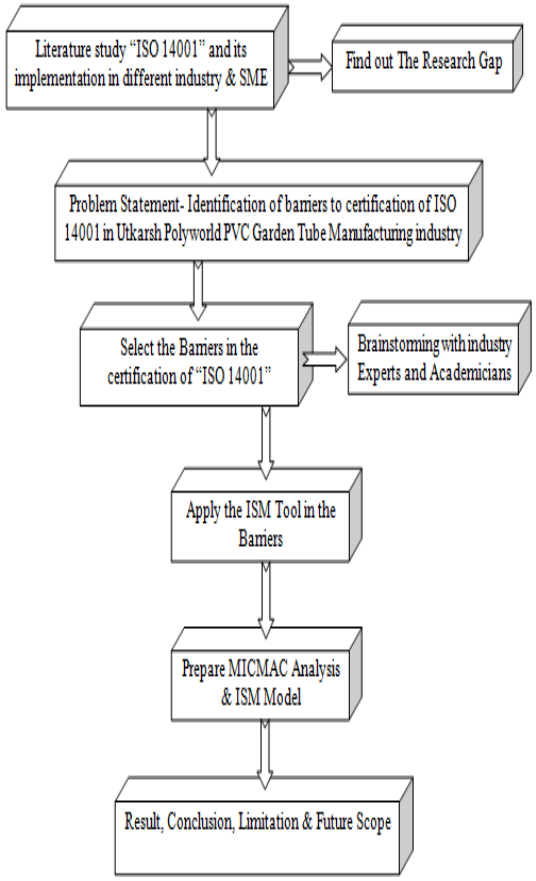

Figure 3: Research Proposal

VI. Barriers to Execution "'ISO14001" in PVC Garden Tube Manuf. Industry

With the help of literature analysis and discussion with various expert from industries and academicians following 11 barriers were find out for implementation of "ISO 14001" in small scale plastic water tank and tube manufacturing industry. All The barriers are given clarification in the following paragraphs: -

- Inadequacy of Resources.
- Consultant Support & fees
- Less awareness and understanding
- Less interest in Implementation
- Rigid to change in working culture
- Insufficient time
- Lack of men & machine

- Focused towards short term goals of the leadership
- No Government incentive
- Customer low-cost demand
- ISO 14001 is not a legal compulsion

VII. Data for Selecting Barriers in the Execution of "ISO 14001"

For collecting the data number of meetings and interview were arrange with the owner of Utkarsh Polyworld PVC garden tube Manufacturer, expert from industry and academician of relevant areas. To collect the data for this research work following procedure has been adopt:

- Analysis and study the research journal germane to SME's, EMS and ISO 14001 implementation.
- Select the Base paper from research journals and thesis work done by previous research scholars.
- With the help of the expert from industry, academic and research paper most appropriate barriers have selected.
- After the completion of brainstorming process 11 barriers from the most appropriate barriers have selected. All the 11 barriers are described in 4.2-chapter point.

VII. Calculation of Data Collected from Brainstorming

After the selection of appropriate 11 barriers next step is to apply the Interpretive structure modeling method in which a matrix is prepared which represent the interrelation between the barriers with the help of that interrelation is converted into binary matrix and after that iteration is followed and finally the level of all barriers is receive. Further MICMAC analysis and ISM model will be prepared those are described in later chapter in details.

IX. Development of SSIM

All the experts are having barriers list in the form of structural self intersection matrix and to fill the relationship between the all matrixes they are provided with the VAXO sheet which represent the following full form:

SSIM table form is given below:

Table 1: Structural Self Intersection Matrix (SSIM)

Barrier Number	Barrier Description	Barrier Numbers								
		11	10	9	8	7	6	5	4	3	2
1	Inadequacy of Resources	O	O	A	A	X	V	O	A	A	O
2	Consultant Support & fees	A	V	A	A	O	A	O	A	A	
3	Less awareness and understanding	X	O	A	A	X	A	A	X		
4	Less interest in Implementation	A	A	A	A	O	A	A			
5	Rigid to change in working culture	V	O	A	X	O	X				
6	Insufficient time	X	O	A	X	A					
7	Lack of men & machine	X	A	A	X						
8	Focused towards short term goals of the leadership	V	X	V							
9	No Government incentive	X	X								
10	Customer low cost demand	O									
11	ISO 14001 is not a legal compulsion										

In this above given SSIM four symbols are used V, A, X and O, these symbols notations are given below:

Table 2: VAXO Analysis

Symbols	Meaning
V	Barrier i will drive to Barrier j;
A	Barrier j will drive to Barrier i;
X	Barrier i and j will drive to each other;
O	Barrier i and j will not drive to each other;

SSIM is prepare with the help of brainstorming and the barriers interrelation is received and this relation is very useful to find out the driving and driven power of the barriers. With the help of VAXO analysis

the inter relation received of all barriers that is "barrier 1" will not drive to each other with barriers 11,10,5 and 2. At the same time barriers 9,8,4 and 3 will drive barriers 1. As per the meaning shown of the "VAXO" analysis anybody can easily understand the relation between the all barriers.

X. Development of IRM

The above given instruction will convert the SSIM into initial reachability matrix which is shown below:

Table 3: Initial Reachability Matrix

Barrier Number	Barrier Number											Driving Power
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	
D1	1	0	0	0	0	1	1	0	0	0	0	3
D2	0	1	0	0	0	0	0	0	0	1	0	2
D3	1	1	1	1	0	0	1	0	0	0	1	6
D4	1	1	1	1	0	0	0	0	0	0	0	4
D5	0	0	1	1	1	1	0	1	0	0	1	6
D6	0	1	1	1	1	1	0	1	0	0	1	7
D7	1	0	1	0	0	1	1	1	0	0	1	6
D8	1	1	1	1	1	1	1	1	1	1	1	11
D9	1	1	1	1	1	1	1	0	1	1	1	10
D10	0	0	0	1	0	0	1	1	1	1	0	5
D11	0	1	1	1	0	1	1	0	1	0	1	7
Dependence Power	6	7	8	8	4	7	7	5	4	4	7	67

XI. Iteration Summary

In this research work iteration summary is prepared because this is very useful for industry owner as well as other those want to understand the barriers behavior in one view. To divide the barriers as per there level it is preferred to take more numbers of barriers in most important level and then less number in medium and less important.

Table 4: Iteration Summary

Criterion Number	Level	Barriers Number	Level of Importance
2	I	Consultant high fees	Less Important
1	II	Inadequacy of Resources	Less Important
4	III	Less interest in Implementation	Less Important
10	IV	Customer low cast demand	Medium Important
3	V	Less awareness and understanding	Medium Important
5	V	Rigid to change in working culture	Most Important
7	V	Lack of men and machine	Most Important
6	VI	Insufficient time	Most Important
11	VI	ISO is not a legal compulsion	Most Important
9	VII	No Government incentive	Most Important
8	VIII	Focused towards short team goals of the leadership	Most Important

XII. Development of ISM Model

The ISM is a very useful block diagram because this will provide the level and weightage of the barriers in at a glance. This research work interpretive structure model is divided in 6 levels. The arrows direction are towards the upward side it means the model is going from most important to less important side of the barriers. It means barriers importance and weightage will increase from bottom to top. Continuous arrow with both side head is shows the interrelation between the barriers, it means both will drive to each other.

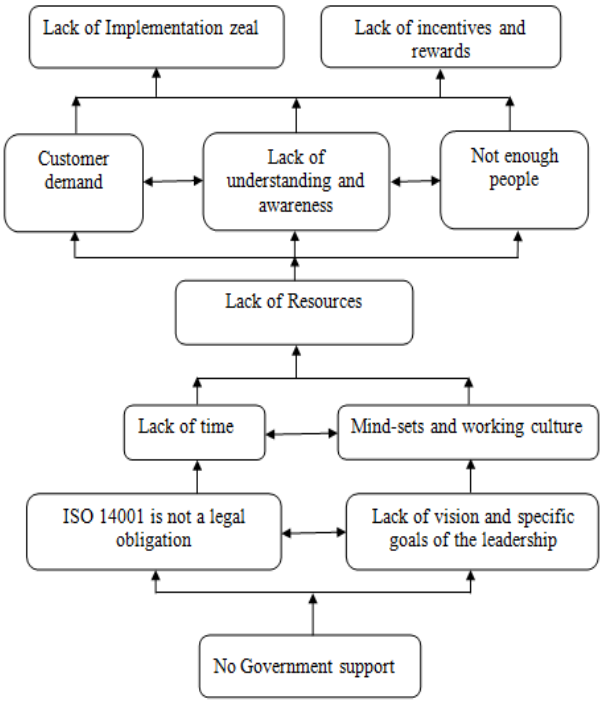

Figure 4: ISM

XIII. RESULTS

The main agenda of this thesis is to find out the barriers that affect the implementation process of the "ISO 14001" at "Utkarsh Polyworld garden tube manufacturing industry. Hence, we conducted the brainstorming and interview according to the small scale industry like Utkarsh Polyworld garden tube manufacturing industry. With the help of ISM tool 11 barriers are arranged as per there importance and following results are received:

A literature review, brainstorming and interview have identified 11 appropriate barriers that affect the implementation of ISO 14001 at Utkarsh Polyworld garden tube manufacturing industry.

Interpretive structural model is prepared as per the level partition and give the level of all barriers and also give the interrelation, priority and weightage of the barriers.

According to MICMAC, all barriers can be divided into four different categories, namely autonomous variables, linkage variables, dependent variables, and independent variables.

Table 5: According to MICMAC Barriers Categories Variables

Independent Variables	Linkage Variables	Dependent Variables	Autonomous Variables
D5	D3	D1	D10
D8	D6	D2	
D9	D7	D4	
	D11		

XIV. CONCLUSIONS

This thesis work is very valuable to most of the relevant SME's because by this research work SME's knows the priority and importance of the barriers in the implementation process of" ISO 14001' in their organization.

Table 6: Barriers Level of Importance

Level	Barriers Number	Level of Importance
I	Consultant high fees	Less Important
I	Lack Implementation zeal	Less Important
II	Lack of understanding and awareness	Less Important
II	Not enough people	Medium Important
II	Customer demand	Medium Important
III	Lack of Resources	Most Important
IV	Mind-sets and working culture	Most Important
IV	Lack of time	Most Important
V	Lack of vision and specific goals of the leadership	Most Important
V	ISO 14001 is not a legal obligation	Most Important
VI	No Government support	Most Important

XV. LIMITATION

This thesis work methodology is basically based on the brainstorming and interview with the academician and industry owner; hence the data collected is totally based on the working experience of the persons and also depends on the local area issues. Therefore some of the barriers are not appropriate for all the SME's or may be some extra barriers must be involved as per the case requirement. The above limitation is not much serious because nature of approach will not change for other SME's.

REFERENCES:

[1] Assessment of the ISO 14001 Implementation Process in Estonian Certified Construction Companies Master's Thesis in the International Master's Programme Applied Environmental Measurement Techniques; Department of Civil and Environmental Engineering Water Environment Technology Chalmers University of Technology Göteborg, Sweden 2005.

[2] Bansal. B., Bogner. C. W., 2002, Deciding on ISO 14001: Economics, Institutions, and Context, Long range Planning 35, 269-290.

[3] Berliner, D. and Prakash, A. (2013). Signaling Environmental Stewardship in the Shadow of Weak Governance: The Global Diffusion of ISO 14001. Law & Society Review, 47(2), 345-373

[4] Blackman, A. (2012). Does eco-certification boost regulatory compliance in developing countries? ISO 14001 in Mexico. Journal of Regulatory Economics, 42, 242-263.

[5] Characterization of ISO 14001 implementation Shahryar Sorooshian Lim Cai Qi Lee Li Fei, Faculty of Industrial Management, Centre for Earth Resources Research and Management,

[6] Earnhart, D.H., Khanna, M., and Lyon, T.P. (2014). Corporate environmental strategies in emerging economies. Review of Environmental Economics and Policy, 8(2), 164-185.

[7] Environmental Management System (EMS) Practices in India Industries: An Introduction S. Partha Sarathi A. Aswini L. Mounika National Conference on Marketing and Sustainable Development October 13-14, 2017.

[8] Eric S.W. Chan "Barriers to EMS in the hotel industry" (2008).

[9] Hillary. R., 1999, Evaluation of Study Reports on the Barriers, Opportunities and Drivers for Small and Medium Sized Enterprises in the Adoption of Environmental Management Systems. London.

[10] Hillary. R., 2001, Environmental management handbook: challenges for business, Earthscan Publication LTD, London.

[11] Irene Voukkali, Pantelitsa Loizia, Diana Mihaela Pociovalisteanu, Antonis A. Zorpas "Barriers and Difficulties Concerning the Implementation of an Environmental Management System in a Bakery-Confectionary Industry" in Cyprus for 8 Years (2017).

[12] Johan J. Graafland Ecological impacts of the ISO 14001 certification of small

and medium sized enterprises in Europe and the mediating role of networks (2018).

[13] Jonas Ammenbarg 2005, Products in environmental management systems: drivers, barriers and experiences Journal of Cleaner Production Volume 13, Issue, March 2005, Pages 405-415.

[14] Jos Frijns, Bas Van Vliet, "Small-Scale Industry and Cleaner Production Strategies" World Development Vol. 27, No. 6, pp. 967±983, 1999 Elsevier Science Ltd.

[15] Leanne Johnstone, Peter Hallberg; 2020 ISO 14001 adoption and environmental performance in small to medium sized enterprises (2020).

[16] May A. Massoud A, Rabih Fayad B, Mutasem El-Fadel B, Rabih Kamleh A Drivers, barriers and incentives to implementing environmental management systems in the food industry: A case of Lebanon (2010).

[17] Mergit Inno Assessment of the ISO 14001 implementation process in Estonian certified construction companies (2005).

[18] Negotiating International Standards for Environmental Management Systems: The ISO 14001 Standards, Virginia Haufler University of Maryland 1999.

[19] Nonxubaadminicarntombekaya, "The application of total quality management within small and medium enterprises by" Cape Peninsula University of Technology Bellville September 2010.

[20] Pheng, L.S. and Khoo, S.D. (2001), "Towards TQM-integrating Japanese 5-S principles with ISO 9001:2000 requirements", The TQM Magazine, Vol. 13, No. 5, pp. 334-341.

* * * * *