

## Potential Drivers, Limitations, and Benefits in Implementing ISO 14001 Environmental Management Systems for Organizations in Sri Lanka

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### Abstract

The rate of complying for ISO 14001 Environmental Management Systems (EMS) certification has been generally slow in Sri Lankan Organizations compared to the adoption of other popular management systems certifications like ISO 9001 Quality Management System and ISO 22000 Food Safety Management System. Further, the awareness on the benefits of having this certification for an organization is also at very low level. The present study is focusing to get some research data on the potential drivers that could be used to adopt ISO 14001. At the same time the benefits gained by implementing the ISO 14001 and limitations faced by the organizations in implementing and maintaining this certification were also evaluated to get a better understanding on this problem.

A questionnaire based survey was carried out among seventy nine organizations certified for ISO 14001 Environmental Management System by Sri Lanka Standards Institution which is a member body of International Organization for Standardization (ISO). The data were analyzed using Friedman test, Wilcoxon signed rank test and Spearman's rank correlation and Cronbach's alpha test specifically for internal consistency of data. Most of the organizations certified are in large and medium scale business ventures. The results clearly indicated that the most significant potential driver to implement ISO 14001 EMS, is to improve the image of the organization. Results further showed that ISO 14001 could be used as a marketing tool that intends to reduce environmental impacts while enhancing regulatory compliance. The greatest limitation that the organizations faced was to change the attitudes and practices of workers. High design cost is ranked as the next highest limitation.

**Keywords:** *Environmental management system; Environmental performance; Compliance*

### Introduction

ISO 14001 International standard specifies the requirements for an environmental management system that an organization can use to enhance its environmental performance [1].

Growing environmental concerns beginning from the 1960s to the 1970s saw many governments tightening regulations for protecting the environment [2]. In recent years, there has been significant awareness of global environmental problems like ozone depletion, global warming, and climate change [3].

According to National Disaster Management Authority of India, in May 2015, India was hit by its second deadliest heat wave on record, and fifth deadliest in world history, with more than 2500 killed [4].

In Sri Lanka, the atmospheric temperature is expected to rise from 1.1°C to 2.4°C by 2100, depending on the emission scenario. Rainfall is projected to increase by 48% for the southwest monsoon by 2050, which affects the wetter southern part of the country, while the northeast monsoon, which occurs in the drier northern region, is expected to decrease by 27% to 29%. Therefore, the wet zone is expected to become wetter and the dry zone drier with climate change [5].

The main purpose of an EMS is to systematically control adverse environmental impacts and ensure that established objectives and target are met. An environmental management system (EMS) is one of the tools which firms can use to voluntarily implement environmental policy. EMS is a formal management system aimed at continual environmental improvement [6].

ISO 14001 is designed for any organization wishing to demonstrate to customers, insurers, regulators, and the public and financial institutions, that the organization is committed to effective environmental management. It consists of a number of interrelated elements that function together to help a firm manage, measure and improves the environmental aspects of its operation. These elements include creating environmental policies, setting objectives and targets, implementing programs to achieve those objectives and targets, monitoring and measuring the effectiveness of the programs, correcting problems if any and reviewing the programs and their overall improvement thereof [7].

There are several unanswered questions regarding what drives organizations to adopt ISO 14001 EMS. Other questions include whether these drivers differ according to the type of business sector i.e. manufacturers, service providers or others (neither manufacturing nor service providers); whether there is any relation between the potential drivers and benefits for ISO 14001 EMS and also whether there is any relation between the potential drivers and limitations in implementing ISO 14001 EMS. In order to answer these questions a questionnaire survey was used to collect data from ISO 14001 certified organizations covering sectors categorized as manufacturing, service and other in Sri Lanka.

### **Organizations and ISO 14001 environmental management system**

International organization for standardization (ISO) describes ISO 14001 is an internationally agreed standard that sets out the requirements for an environmental management system. It helps organizations improve their environmental performance through more efficient use of resources and reduction of waste, gaining a competitive advantage and the trust of stakeholders. The revised version of ISO 14001 is ISO 14001: 2015 [8]. It requires environment management to be more prominent within the organization's strategic direction, a greater commitment from leadership, the implementation of proactive initiatives to protect the environment from harm and degradation, such as sustainable resource use and climate change mitigation, a focus on life cycle thinking to ensure consideration of environmental aspects from development to end of life and a stakeholder focused communication strategy [1].

When organizations aim to implement ISO 14001 EMS many different aspects have to be considered. According to Hale [9] an EMS is a framework established by the top scale of the management with the objective of gaining and maintaining control over the company's activities.

### **Potential drivers for organizations in adopting ISO 14001 EMS**

Fryxell and Szeto [10] clearly state that decisions to develop and implement EMSs are also a response to external forces influencing operation of firms. Some of these external drivers suggested by Morrow and Rondinelli [11] are increased investor confidence and giving company international competitive advantage; customer pressure for environmental stewardship; peer pressure among companies who are involved in the same business sector; and the growing interest of corporate stakeholders outside of a firm such as regulatory agencies, insurance companies and financial institutions. Fryxell and Szeto [10] cited improved regulatory compliance; increased market share; response to customer pressure and access to markets; and cost reductions from improved efficiencies. Sohal and Prajogo [12] cited reasons/drivers for implementing ISO14001 in Australian and New Zealand organizations as, Natural continuation from a previous standard (i.e. ISO 9001); to build synergies among management systems; to build competitive advantage; to improve efficiency and control in the operations; to match competitor's actions; to comply with government policy or regulations; to meet customer demands; to improve image and social impact and to improve environmental performance. Top management have a critical role in making sure that EMS is successfully implemented and are the main drivers of EMS implementation [1].

### **Limitations that organizations face in implementing ISO 14001 EMS**

Benefits are important in promoting EMS but the limitations to implementation must be acknowledged and addressed in order to minimize them. The adoption of an EMS is a complicated procedure where difficulties can appear in the different stages, acting as barriers for implementation [13].

### **Benefits for organizations in implementing ISO 14001 EMS**

Hillary [14] identified there were two sets of benefits differentiated as internal and external benefits. The internal benefits, internal positive outcomes from the implementation of an EMS, presented by Hillary [14] are classified into three main groups of organizational, financial and people benefits. Organizational benefits include improved environmental performance as a result of enhanced environmental information, sense of environmental responsibility and strategic overview of environmental issues. Financial benefits such as cost savings through efficient use of material, energy and waste reductions were also reported. The people benefits included better company image and improved dialogue between staff and management.

The external benefits described as external positive outcomes from the implementation of an EMS were classified as commercial, environmental and communication benefits.

The commercial benefits were gaining new customers, satisfying existing customers and developing more environmental friendly products. Hillary's [14] study (Cited in Dladla, [15]) reported that the external environmental benefits were the improved environmental performance, assured legal compliance and increased recycling as well as reduced pollution. Lastly

the communication benefits were that of creating a positive public image, developing a better customer relationship, and developing a better cooperation and relationship with regulators.

Sohal and Prajogo [12] cited the most improvements/benefits on implementing ISO14001 in Australian and New Zealand organizations as, reducing environmental hazards; improving environmental performance and waste management.

Studies on the benefits of implementing ISO 14001 EMS have been researched by many researchers [1]. Study conducted in Australia claimed that the most significant benefit that an organization gained through the implementation of ISO 14001 EMS is cost reduction [16]. On the other hand, a study in Sweden reported that the most significant benefit for organizations in Sweden is improved corporate image [17]. There is also another study conducted in Australia and New Zealand which showed that the most significant benefits experienced by organizations are morale building within the organization and fulfilling of the customer expectations [18]. The different findings in these studies showed that organizations in different countries experience different types of benefits and this could be due to the different culture in each country and organizational expectations [1].

Top management may have to identify critical success factors that suites their organization because each organization are unique having their very own organizational behaviors [1].

## **Objectives of the Study**

### **General objectives**

- To identify the potential drivers and benefits that could be influenced the non-certified organizations to obtain ISO 14001 certification
- To identify limitations that organizations face in implementing ISO 14001 in order to find ways to improve ISO 14001 EMS implementation.

### **Specific objectives**

1. To Identify the potential drivers that influence Sri Lankan Organizations for the voluntary adoption of ISO 14001 EMS.
2. To determine the benefits gained by Sri Lankan Organizations through ISO 14001 Certification.
3. To find out the limitations that Sri Lankan Organizations face in implementing ISO 14001 EMS.

## **Methodology**

Questionnaire survey was carried out with a pre-tested questionnaire designed using existing literature.

The questionnaire had four (4) parts of closed questions format, designed to gather information aimed at achieving the aims and objectives of the research. In part 1, respondents were expected to indicate their preferred answer by using a tick mark. Part 2 to part 4 was designed in a form of closed questions with a horizontal format scoring system, which used a Likert scale. Part 2 on Potential drivers, had five possible responses namely Not effective, slightly effective, Effective, Very effective and Unable to answer. Part 3 on limitations was designed in the Likert scale format presented as statements where respondents were expected to indicate slight, Moderate, Serious, very serious, and Unable to answer. Part 4 on Benefits the

Likert scale format had five possible responses namely, strongly agree, Agree, neither agree nor disagree, Disagree, and Strongly disagree.

Likert scale was used to convert the respondents’ views into meaningful numeric.

**Sampling criteria**

Organizations are certified for ISO 14001 by different certification bodies in Sri Lanka. Sample was selected as ISO 14001 certified organizations by Sri Lanka standards institution (SLSI) by sector wise i.e. manufacturing/service provider/other. 79 organizations (51 Manufacturers, 18 Service providers and 10 Other) have obtained ISO 14001, having at least one year maturity of the system as per the data of SLSI as at 2016-01-01.

The research questionnaire with the covering letter was e-mailed /was delivered by hand to all 79 organizations. One completed questionnaire from each organization was expected to return. Targeted individuals were EMS team leaders, quality managers or environmental management representative since they are the key agents in environmental issues in an organization.

**Data analysis and presentation**

All responses of 79 organizations were collected. Telephone surveys were also done with the difficulty of travelling and as requested by some respondents.

Friedman test and Wilcoxon signed rank test were used to determine the significance and Spearman’s rank order correlation was used to determine the relationships using SPSS-16 (statistical package for the social sciences).

Internal consistency (“reliability”) was determined by using Cronbach’s alpha test.

**Results and Discussion**

Detailed results for the research survey are presented and all the key trends from the findings are discussed by linking them to possible reasons and implications in the context of existing literature. The sectorial findings on the potential drivers, benefits and limitations are discussed. In each instance, possible correlation between the key potential drivers and benefits, and the key potential drivers and limitations are also discussed. Potential drivers function as independent variable and limitations and benefits function as dependent variables.

Identified most influential Potential drivers, limitations and benefits based on the previous studies carried out by other researchers in different countries and through a thorough review.

FIG. 1-3 represent the overall rank of potential drivers, limitations, and benefits among identified three sectors.

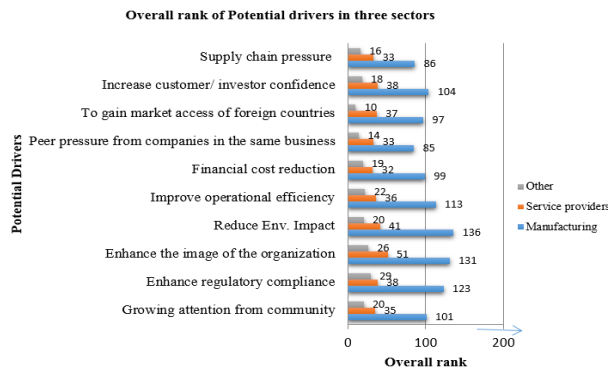


FIG. 1. Overall rank of Potential drivers sector wise.

## **Potential drivers**

### **Manufacturing sector**

Friedman test result, Chi-square ( $\chi^2$ )=156.230,  $p < 0.05$ , shows that there is overall statistically significant difference on potential drivers in the manufacturing sector in implementing ISO 14001 EMS.

The first three highest ranked potential drivers-manufacturing sector

1. Reduce environmental impact (overall rank=136)
2. Enhance the image of the organization (overall rank=131)
3. Enhance regulatory compliance (overall rank=123).

But this result does not pinpoint which drivers in particular differ from each other. In order to determine it.

*Post hoc* analysis with Wilcoxon signed-rank tests was carried out for multiple comparison with a Bonferroni correction applied, resulting the new significance level which is,  $p = 0.05/10 = 0.005$ .

Results statistically shows that the manufacturing sector considers the highest ranked three drivers are equally important in implementing ISO 14001 EMS.

### **Sector of service providers**

Friedman test result, Chi-square ( $\chi^2$ )=65.257,  $p < 0.05$ , shows that there is overall statistically significant difference on potential drivers in the sector of service providers in implementing ISO 14001 EMS.

The first three highest ranked potential drivers-service providers.

1. Enhance the image of the organization (overall rank=51)
2. Reduce environmental impact (overall rank=41)
3. Enhance regulatory compliance and increase customer/investor confidence (overall rank=38).

*Post hoc* analysis with Wilcoxon signed-rank tests was carried out for multiple comparison with a Bonferroni correction applied, resulting the new significance level which is,  $p = 0.05/10 = 0.005$ .

Results statistically show that the sector of service providers considers enhance the image of the organization as the highest ranked driver in implementing ISO 14001 EMS. This is in line with the findings of Gonzalez [19] and also Sohal and Prajogo [12]. They cited to improve the image as one of the reasons for implementing ISO 14001 in Australian and New Zealand organizations.

### **“Other” sectors**

Friedman test result, Chi-square ( $\chi^2$ )=60.048,  $p < 0.05$ , shows that there is overall statistically significant difference on potential drivers in the other sectors other than manufacturers and service providers in implementing ISO 14001 EMS.

The first three highest ranked potential drivers-“other” sectors

1. Enhance regulatory compliance (overall rank=29)
2. Enhance the image of the organization (overall rank=26)

3. Improve operational efficiency (overall rank=22).

Post hoc analysis with Wilcoxon signed-rank tests was carried out for multiple comparison with a Bonferroni correction applied, resulting the new significance level which is,  $p=0.05/10=0.005$ .

Results statistically shows that the “other” sectors other than manufacturers and service providers considers the highest ranked three drivers are equally important in implementing ISO 14001 EMS.

In all three sectors enhance the image of the organization is a significant driver to implement ISO 14001 EMS.

In a study carried out by Sohal and Prajogo [12] among selected Australian and New Zealand business organizations, cited that the improving environmental performance, enhancing social image and meeting customer demands are the primary drivers for firms in adopting ISO 14001. Although the finding has a similarity with the findings of this local study meeting customer demand is not significant in most of the local organizations unless they have business connections with developed countries. The reason can be the lack of awareness on environmental implication of products or services among local customers.

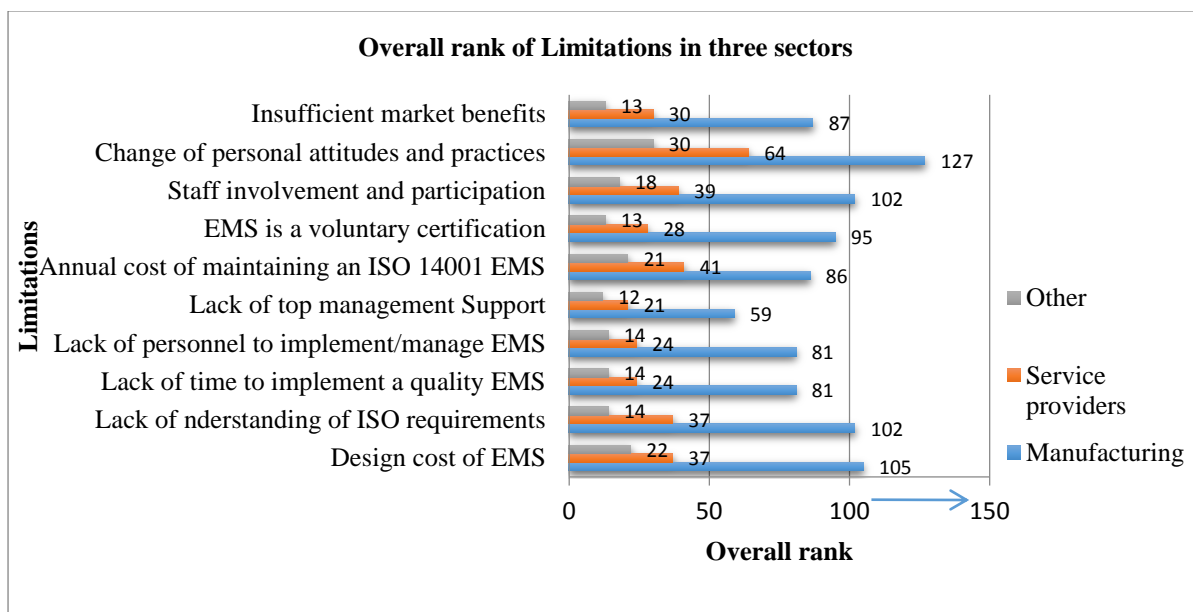


FIG. 2. Overall rank of limitations sector wise.

**Limitations**

**Manufacturing sector**

Friedman test result, Chi-square ( $\chi^2$ )=134.753,  $p<0.05$ , shows that there is overall statistically significant difference on identified limitations in the manufacturing sector in implementing ISO 14001 EMS.

The first three highest ranked limitations-manufacturing sector

1. Change of personal attitudes and practices (overall rank=127)
2. Design cost f EMS (overall rank=105)

3. Lack of understanding and practices and the staff involvement and participation (overall rank=102).

*Post hoc* analysis with Wilcoxon signed-rank tests was carried out for multiple comparison with a Bonferroni correction applied, resulting the new significance level which is,  $p=0.05/10=0.005$ .

Results statistically show that the manufacturing sector considers the change of personal attitudes and practices as the highest ranked limitation in implementing ISO 14001 EMS.

### **Sector of service providers**

Friedman test result, Chi-square ( $\chi^2$ )=101.761,  $p<0.05$ , shows that there is overall statistically significant difference on identified limitations in the manufacturing sector in implementing ISO 14001 EMS.

The first three highest ranked limitations-service providers

1. Change of personal attitudes and practices (overall rank=64)
2. Annual cost of maintaining an ISO 14001 EMS (overall rank=41)
3. Staff involvement and participation (overall rank=39).

*Post hoc* analysis with Wilcoxon signed-rank tests was carried out for multiple comparison with a Bonferroni correction applied, resulting the new significance level which is  $p=0.05/10=0.005$ .

Results statistically show that the sector of service providers considers the change of personal attitudes and practices as the highest ranked limitation in implementing ISO 14001 EMS.

### **“Other” sectors**

Friedman test result, Chi-square ( $\chi^2$ )=52.126,  $p<0.05$ , shows that there is overall statistically significant difference on identified limitations in the other sectors other than manufacturers and service providers in implementing ISO 14001 EMS.

The first three highest ranked limitations-“other” sectors

1. Change of personal attitudes and practices (overall rank=30)
2. Design cost of EMS (overall rank=22)
3. Annual cost of maintaining an ISO 14001 EMS (overall rank=21).

*Post hoc* analysis with Wilcoxon signed-rank tests was carried out for multiple comparison with a Bonferroni correction applied, resulting the new significance level which is  $p=0.05/10=0.005$ .

The results do not show that the highest ranked three limitations are statistically significance ( $p<0.005$ ) to each other in implementing ISO 14001 EMS in “other” sectors other than manufacturers and service providers and the three limitations are equally important in limiting the implementation of ISO 14001 EMS.

In all three sectors the change of personal attitudes ranked as a main limitation. Similar finding was cited by Abdulla and Fuong [1] in their study on implementing ISO 14001 EMS in manufacturing firms in Malaysia. Massoud et al. [20] cited in addition to the above constraint the lack of environmental policies and environmental education, weak implementation and



enforcement of well drafted available regulations, low levels of fines are also limiting the implementation of ISO14001 in developing countries.

In this study, all the organizations in the sample have already implemented ISO 14001 and the different result highlights that their main concern is to overcome their internal limitations.

**Benefits**

**Manufacturing sector**

Friedman test result, Chi-square ( $\chi^2$ )=135.711,  $p < 0.05$ , shows that there is overall statistically significant difference on benefits in the manufacturing sector in implementing ISO 14001 EMS.

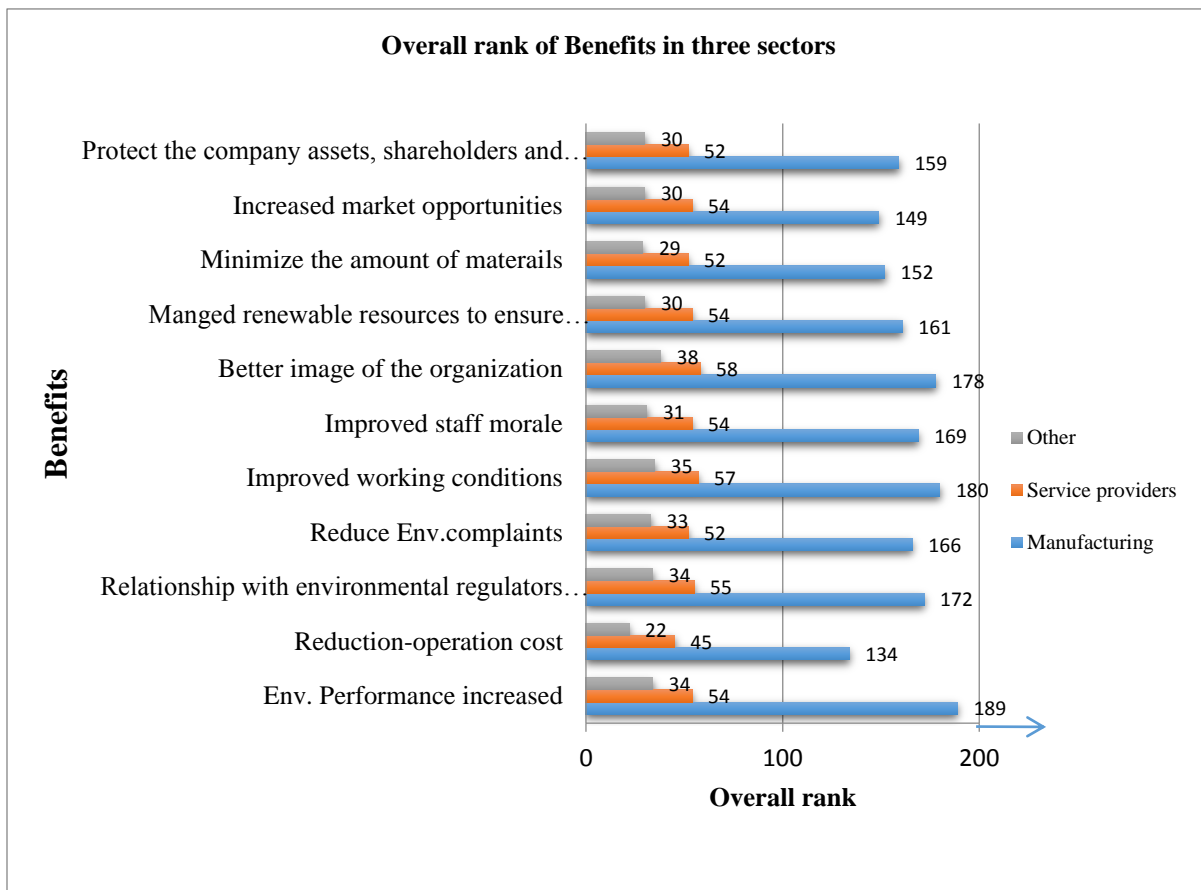


FIG. 3. Overall rank of benefits sector wise.

The first three highest ranked benefits–manufacturing sector

1. Environmental performance increased (overall rank=189)
2. Improved working conditions (overall rank=180)
3. Better image of the organization (overall rank=178).

*Post hoc* analysis with Wilcoxon signed-rank tests was carried out for multiple comparison with a Bonferroni correction applied, resulting the new significance level which is  $p=0.05/11=0.0045$ .

Results statistically show that above mentioned highest ranked three benefits are equally benefitted to the manufacturing sector by implementing ISO 14001 EMS.

### **Sector of service providers**

Friedman test result, Chi-square ( $\chi^2$ )=45.766,  $p<0.05$ , shows that there is overall statistically significant difference on benefits in the sector of service providers in implementing ISO 14001 EMS.

The first three highest ranked benefits–service providers

1. Better image of the organization (overall rank=58)
2. Improved working conditions (overall rank=57)
3. The relationship between the company with environmental regulators has improved (overall rank=55).

*Post hoc* analysis with Wilcoxon signed-rank tests was carried out for multiple comparison with a Bonferroni correction applied, resulting the new significance level which is  $p=0.05/11=0.0045$ .

Results statistically show that above mentioned highest ranked three benefits are equally benefitted to the sector of service providers by implementing ISO 14001 EMS.

### **“Other” sectors**

Friedman test result, Chi-square ( $\chi^2$ )=48.523,  $p<0.05$ , shows that there is overall statistically significant difference on benefits in the other sector other than manufacturers and service providers in implementing ISO 14001 EMS.

The first three highest ranked benefits–“other” sectors

1. Better image of the organization (overall rank=38)
2. Improved working conditions (overall rank=35)
3. Increased environmental performances and the relationship with the environmental regulators and the company have improved (overall rank=34).

The relationship with the environmental regulators and the company have improved (overall rank=34).

*Post hoc* analysis with Wilcoxon signed-rank tests was carried out for multiple comparison with a Bonferroni correction applied, resulting the new significance level which is  $p=0.05/11=0.0045$ .

Results statistically show that above mentioned higher ranked four benefits are equally benefitted to the “other” sectors other than manufacturers and service providers by implementing ISO 14001 EMS.

In all these three sectors, better image of the organization in public was ranked as one of the highest benefits in addition to other benefits. This result has been cited by other researchers in their studies.

A study in Sweden showed that the most significant benefit for organizations in Sweden is to improve corporate image [16]. Study on benefits of implementing ISO 14001EMS have been carried out by many researches.

A Study conducted in Australia that the most significant benefit that an organization gained through the implementing of ISO 14001 EMS is cost reduction [16].

Although the cost reduction is also a benefit to local organizations through improved operational efficiencies it has not become significant in this study due to high cost of production process alterations and associated technological.

### **Correlation between potential drivers for ISO adoption and limitations faced by organizations**

**Manufacturing sector:** The result revealed that there was no statistically significant correlation between key potential drivers and limitations in the manufacturing sector.

**Sector of service providers:** The result revealed that there was a statistically significant negative correlation ( $r_s=-0.587$ ,  $p=0.010$ ) between potential driver-increase customer and investor confidence and limitation-design cost of EMS.

This result shows that the design cost is not considered here as a limitation by organizations when there are requirements of investors and the customers for EMS of these organizations. They are driven to implement the EMS considering the demand.

The result also revealed that there was a statistically significant positive correlation ( $r_s=0.500$ ,  $p=0.035$ ) between potential driver-increase customer and investor confidence and limitation-lack of time to implement quality EMS.

This shows the time need to spend to implement EMS is high and it has become a limitation although the organizations are driven to implement EMS by the investors and customers. This has become significant because mostly hotels belong to this sector and mainly single person like the maintenance engineer is involved in EMS activities in addition to the other maintenance activities of the organization.

The result also revealed that there was a statistically significant positive correlation ( $r_s=0.500$ ,  $p=0.035$ ) between potential driver-increase customer and investor confidence and limitation-lack of personnel to implement and manage EMS.

The need of contribution from the staff to implement and manage EMS is high and it has become a limitation although the organizations are driven to implement EMS by the investors and customers. Massaud et al. [20] had also cited the human resource constraint as a major challenge in developing countries to implement ISO 14001 EMS. But Bosse, et al. [21] cited that some employees take it as a golden opportunity to improve their management skills and climb up the corporate ladder.

The different result in this study shows that attitudinal change of the local employees is also a requirement.

### **Other sectors other than manufacturers and service providers**

In the results of “other” sectors, there was a statistically significant positive correlation ( $r_s=0.667$ ,  $p=0.025$ ) between potential driver-improve operational efficiency and limitation-design cost of EMS.

The result can be interpreted as when necessary improvements are carried out to enhance the operational efficiencies there is a high design cost associated with improvements. The design cost is a limitation and this limitation has also been cited by

Massaud et al. [20]. They address this limitation as the high cost of production process alterations and technological investment as a disadvantage to industries in developing countries.

However, a study conducted in Australia claimed that most significant benefit that an organization gained through the implementation of ISO 14001 EMS is cost reduction [16].

The different result of this study can be the associated cost to overcome the national infrastructure deficiencies like solid waste management and waste water treatment by individual organizations in Sri Lanka in addition to their design cost of EMS.

### **Correlation between potential drivers for ISO adoption and benefits for organizations**

**Manufacturing sector:** Statistically significant positive correlation observed in results ( $r_s=0.410$ ,  $p=0.003$ ) between Potential Driver-enhance regulatory compliance and benefit-the relationship between the company and environmental regulators has improved. This is obvious when enhance regulatory compliance the relationship between the company and environmental regulators is improved.

Results also showed a statistically significant positive correlation ( $r_s=0.402$ ,  $p=0.003$ ) on Potential Driver-enhance the image of the organization and benefit-reduction in the operation cost of the organization.

This may be the reason when operational efficiency is increased the cost of operation will be reduced and environmental impacts will also be mitigated. This situation will enhance the image of the organization.

### **Sector of service providers**

Result showed a statistically significant positive correlation ( $r_s=0.292$ ,  $p=0.03$ ) between Potential Driver-reduce environmental impact and Benefit-improved staff morale.

The possible reason can be when there is a reduction in environmental impacts the working conditions of workers will be improved and the morale of the staff is also improved.

The reduction of environmental impacts is an expectation of any human being. The result has a similarity with the findings of Ambika and Amrik [18]. They cited that in a study conducted in Australia and New Zealand a one of the significant benefit gained through the implementation of ISO 14001 is morale building within the organization.

Results revealed that there was a statistically significant negative correlation ( $r_s=-0.570$ ,  $p=0.014$ ) between the potential driver-reduce environmental impact and benefit-protect the company assets, shareholders, and directors.

The above-mentioned correlation is difficult to interpret but actually there should be a positive correlation ship. The reason would have been for a negative correlation ship is that most of the respondents could have not realized how ISO 14001 EMS

benefitted to protect the company assets, shareholders, and directors. The reason can be the lack of proper awareness on benefits of ISO 14001.

According to Joussineau [22] and Steger [23] reduce the risk of liabilities is a benefit through ISO 14001 EMS implementation. It will protect the company assets, shareholders, and directors.

### **Other sectors other than manufacturers and service providers**

The result revealed that there was no statistically significant correlation between key potential drivers and benefits in the sector categorized as “other”.

### **Conclusions**

1. The results show that in all three sectors manufacturing, service providers and the sector categorized as “other” to improve the company image has become the most influential driver to implement the ISO 14001 EMS. The organizations use ISO 14001 as a marketing tool to attract customers as most of these organizations are doing business or have business connections with countries mainly in Europe and in Japan.
2. ISO 14001 EMS is a voluntary certification. In addition to enhance the image of the organizations they are driven by a genuine effort to reduce the environmental impacts and to improve the regulatory compliance.
3. In spite of the genuine effort taken to implement ISO 14001 by these organizations, to change the personnel attitudes and practices has become the major limitation in all three sectors. As per the remarks stated in the questionnaire, the organizations had to take extra effort in conducting sufficient awareness training on the objectives and benefits of ISO 14001 EMS and to get employees from all levels to participate the implementation of EMS.
4. The design cost has been rated as a limitation. The organizations require considerable investment in implementing ISO 14001 EMS and also for maintaining it. This involves the production process alterations and technological investments. This can be the reason for more small and medium scale organizations are not driven to implement ISO 14001 EMS.
5. The cost for solid waste management and waste treatment is added to the design cost. Infrastructure facilities provided by the government for waste management are not sufficient and at present one private organization is purchasing solid waste at a considerable cost from these organizations for energy generation.
6. All three sectors are benefitted by ISO 14001 EMS. Results revealed that following benefits have been achieved by those organizations;
  - The better image of the organization in public
  - Improvement in the relationship between the company and environmental regulators
  - Improved environmental performances
  - Improved working conditions
  - Increased market opportunities
  - Improved staff morale
  - Managed renewable resources to ensure sustainability
  - Reduction of complaints from the surrounding community and public

7. Organizations express their satisfaction with ISO 14001 EMS implementation and certification and consider it as an important part of the organization.
8. However, there is a limitation in this study. The conclusions were based on the overall result. Since the number of ISO 14001 certified organizations are less in this country, it is difficult to go for detailed sector wise conclusions. Therefore, further studies are needed before making any formal conclusions to be implemented.

## **Recommendations**

1. Conducting training and awareness programmes on ISO 14001 EMS certifications for organizations, as well as for consumer education in ISO 14001 and environmental implication of products is very important.
2. There is a need for supportive know-how for implementing ISO14001 standard requirements by certification organizations.
3. In order to overcome the design cost of EMS, the government can impose a reduction or exemptions of tariff on importation of pollution control and pollution preventive equipments. For example, water treatment equipment, low energy saving equipment, imported high-technology goods having pollution control equipment. At the same time government support is a need to encourage local manufacturers to manufacture such equipment.
4. ISO 14001 companies shall be favored within the public procurement process and in service contracts.
5. Environmental protection should not be viewed in isolation and needs to be associated with development and economic growth. Financial support from the government will be a motivation for organizations to go for ISO 14001 EMS.
6. ISO 14001 EMS is based on the participation and involvement of all staff members. This however implies various problems. Especially in developing countries like Sri Lanka there is a severe lack of environmental consciousness among workers. Resistance to change is often experienced. Educational campaigns targeting them, gradual change of their behaviors, motivate them to actively participate in implementing EMS and divide monetary benefits or rewards, derived through improved operational efficiency of EMS will help full to overcome the major limitation identified by this study.
7. A more detailed repeat of this type of future study on ISO 14001 EMS in Sri Lankan Organizations will be helpful for identifying more ways to improve the implementation by selecting a larger sample when more organizations implement this system.

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