Investigating the benefits and challenges of the implementation of ISO 9001 and ISO 14001 in the aerospace industry

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Abstract

Aerospace companies implement certain quality management and environmental standards, e.g. ISO 9001 and ISO 14001 requirements specific to the aerospace industry. The big question is whether the implementation of the ISO standards has provided its hope for returns. The aim of this research is therefore to analyze the benefits and challenges of the implementation of ISO 9001 and ISO 14001 in the aerospace industry. This study aims to investigate two underlying subjects – quality management and environmental management, and explore how they influence firm performance and how they are implemented in the aerospace industry. Nine participants from different aerospace companies were interviewed. The results suggest that these companies were put under pressure internally and externally by the customers for pursuing the certification. Major factors that affect the implementation include size of company, employee participation, and company commitment. It also discovered that ISO 14001 seems to mainly impact the managers and employees related to environmental work. This study found that the larger the company size, the more sensitive it becomes toward customer pressure on commitment to sustainability.

Keywords
ISO 9001, ISO 14001, benefits, challenges, aerospace industry

1. Introduction

According to Bansal & Hunter (2003), one of the strategic explanations for why firms get certified is because they may seek to 'reinforce' their present strategies thus further enhancing their competitive advantage. Another explanation can be due to marketing motivations or customer pressure (Buttle, 1997). This study seeks to explore the actual benefits and challenges the aerospace companies get from these certifications.

Aerospace companies implement certain quality management and environmental standards, e.g. ISO 9001 and ISO 14001 requirements specific to the aerospace industry. The International Organization for Standardization is a European body responsible for creating and maintaining international standards. It developed a set of quality standards, referred to as ISO 9000 and environmental standards, referred to as ISO 14000. These standards are made up of many subparts. This study will narrow the focus down to only ISO 9001 and ISO 14001 standards or derivatives to these that are specific to the aerospace industry. It will then explore how these companies deal with the compliance and investigate the challenges and benefits of it.

International Organization for Standardization (ISO) is a non-governmental organisation based in Geneva. Its mission is to bring together expert knowledge from national standards bodies for developing voluntary, consensus-based, market relevant international standards that support innovation and provide solutions to global challenges (ISO, 2015). The ISO certification process is lengthy and expensive (Berk & Berk, 2000). According to them, the process typically involves contracting with a consulting organisation to guide the company's implementation process, which typically takes 12-18 months and a series of pre-audits by the consulting company to assess the company's readiness (Berk & Berk, 2000).

The big question is whether the implementation of the ISO standards has provided its hope for returns. The answer for some companies is yes; for others, it is no. Some companies claimed to have realised significant sales increases once the certification was awarded. Others have spent much effort, time and money to become certified but experienced no increase in overseas sales. The effects of implementing the ISO certification could vary from one company to another. This could be caused by several factors (Heras et al., 2001). Firstly, there are many internal and external drivers that can influence a company's performance. For example, in order to proclaim that a company's higher profitability is only and directly affected by ISO 9000 certification, there needs to be an assurance that no other variables could possibly cause the difference. Secondly, the characteristics of the companies undergoing the ISO implementation might differ in terms of size, economic sectors and types of goods produced (Heras et al., 2011). Thirdly, the implementation of the ISO standards may only be effective in the long run. A study by Heras et al. (2001) demonstrated that the ISO 9000 standard benefits a company several years after implementation.

This study aims to investigate two underlying subjects – quality management and environmental management, and explore how they influence firm performance and how they are implemented in the aerospace industry. There is a vast literature that studied the effect of the implementation of ISO certification on firm performance. However, a review of literature discovered that there has not been any that focused on the companies in the aerospace industry. The purpose of the study is to explore the benefits and challenges of the implementation of ISO 9001 and 14001 certifications in companies belonging in the aerospace industry, and to analyse the factors that affect the implementation of ISO certification and investigate the influence of those factors. The study will be beneficial for the organisations that are involved in the aerospace industry and other readers that have interests in the industry by (1) providing a valuable and useful analysis for aerospace companies which intend to pursue the ISO certification, (2) helping aerospace companies to effectively and strategically adopt and utilise the ISO certification for their organisational benefits, and (3) as research of the aerospace industry in this topic is not widely available in the literature, it can be used as a supplement, complement, as well as a comparison of the results of research of similar topic.

2. Literature Review

The adoption of ISO certification in a firm involves the identification of a set of benefits and challenges in order to assess the investment effectively. However, this information can be difficult to calculate, mainly because of a lack of specific assessment criteria (Alberti et al., 2000). Investments in quality and environmental management incur both benefits and barriers/challenges.

2.1 Quality Management

Studies within the field of quality have incorporated a variety of concerns such as quality definition, quality control and quality management. Flynn et al. (1994) explored in depth the aspect of quality management, identified its key dimensions and tested the measurement of those dimensions for reliability v and validity to come up with a clear framework for quality management evaluation programs. Sousa & Voss (2002) provided a reflective review of literature on quality management. Their research reflected on three fundamental issues to quality management: the definition of quality management, validity of its set of practices, and the implementation of quality management in a real business setting. In addressing these issues, the research was structured in five main themes: the definition of quality management, the definition of product quality, the impact of quality management on firm performance, quality management in the context of management theory, and the implementation of quality management.

Practitioners and scholars have faced a problem with quality, which is trying to understand the precise meaning of quality and its role for effective organisations (Beckford, 2002). Garvin (1988) defined quality based on its characteristics as being transcendent, product based, user based, manufacturing based, and value based. While Pekar

(1991) viewed quality as something that is achieved when firms provide goods or services that meet or exceed customer requirements. Reeves and Bednar (1994) found that instead of a global definition, practitioners and scholars should seek for different definitions under different circumstances. However, there is one certain thing about quality: 'high quality means pleasing consumers, not just protecting them from annoyances' (Garvin, 1987, p.103). Garvin (1987) also added that in order to compete on quality, managers need to break it down in several components/dimensions and subsequently plan a strategy to compete on selected dimensions. These dimensions consist of performance, features, reliability, conformance, durability, serviceability, aesthetics, and perceived quality. Organisations might also face some barriers to achieving the quality they desire. Beckford (2002) categorized these barriers under four groups: systems and procedures, culture, organisation design, and management perspective.

In order to ensure that the quality of product or service is being planned, assured, controlled and developed, quality management needs to be introduced and practiced within the organisation. Flynn et al. (1994, p.342) defined quality management as 'an integrated approach to achieving and sustaining high quality output, focusing on the maintenance and continuous improvement of processes and defect prevention at all levels and in all functions of the organisation, in order to meet or exceed customer expectations.' They suggested a framework for quality management which contained seven dimensions that characterise a continuous cycle of improvement: top management support, quality information, process management, product design, workforce management, supplier involvement, and customer involvement. Firms that adopt a quality management strategy emphasise on implementing management practices as the inputs and quality performance as the outputs (Flynn et al., 1994). Flynn et al. (1994) proposed seven dimensions of quality management (inputs) that have an impact on the continuous improvement of manufacturing capability (outputs) which leads to customer satisfaction. Basing on this study and other related studies, Jaafreh & Al-abedallat (2013) constructed six dimensions of quality management and measures their implications on organisational performance. The results indicate that top management, strategic planning, employee relation, and customer focus have a direct significant positive impact on organisational performance, while supplier quality and process management have low impact.

Various studies on the effects of quality management have measured firm performance financially as well as non-financially. Financial measurements could include return on assets, profits, market share, sales growth (Sadikoglu & Olcay, 2014). Non-financial measurements could include quality performance (Yang, 2006), company reliability (Sila, 2007; Sadikoglu & Olcay, 2014), customer satisfaction (Yang, 2006; Sila, 2007), employee performance (Sadikoglu & Olcay, 2014). These studies resulted in different findings due to the different characteristics of the nature of their studies. They found that the firms studied use different methods, tools and techniques to improve the quality performance of their product/service. Overall, a common finding is that employees need to actively participate in the quality improvement process in order for the organisation to obtain success in the pursuit of quality (Beckford, 2002).

A fundamental purpose of quality improvement is to increase the benefit achieved from the increased market share and to lower costs of attaining quality (Hwang & Aspinwall, 1996). However, an investment in quality does not result in quality improvement in the short term, as it might take more than five years to witness the effect of quality improvement after implementing quality management practices, especially from the customers' perspectives (Mitra & Golder, 2006). Mitra and Golder (2006) also found that the effect of quality is asymmetric with regard to improvements and declines in quality: A decline in quality is more quickly perceived by customers and has more effects than an improvement in quality.

2.2 Implementation of Quality Management in the Aerospace Industry

There is a limited amount of literature on the aerospace industry, especially within the field of quality management (Dickenson & Blundell, 2000). Lean operations delivering the right quality and performance at the appropriate cost is expected to be the industry norm. This gives pressure on aerospace firms to comply with emerging quality standards as not meeting these standards may mean being excluded from the supply chain (Williams et al., 2002). Williams et al. (2002) studied the global aerospace supply chain and developed seven drivers and eleven responses for the aerospace industry. Drivers represent any events or actions that prompt business strategies, while responses represent capabilities and resources for dealing with drivers. The industry drivers comprise: (1) manufacturing scheduling and performance, (2) competition, price, and cost, (3) supply chain performance, (4) technology, (5) offset (industrial participation), economic, political and social factors, (6) civil product requirements, and (7) military product requirements. The industry responses comprise: (1) manufacturing scheduling and performance, (2)

lifecycle management, (3) supply chain performance, (4) technology and design, (5) workforce and organisation, (6) understanding customers, sales and marketing, (7) contracts and intellectual property rights, (8) offset, (9) finance, (10) diversification, acquisitions and mergers, (11) managing politics. Co-occurrence between driver and response categories that is found indicates that correlation and causation may exist between the sub-categories in the industry drivers and responses. Williams et al. (2002) argued that as most aerospace firms are not operating in a single-product, single-market, and single-tier, it restricts the clear identification of linkages between drivers and responses in the aerospace industry.

Dostaler (2013) investigated the key success factors of the Canadian aerospace industry and found eleven generic factors, which consist of: price/cost, dependability, reputation, quality, service, responsiveness, flexibility, technology, managerial capabilities, financial resources to fund non-recurring cost, inside knowledge or requirements. Among these key success factors, the quality dimension (product quality, service quality, perceived quality) was found to be one of the most significant elements needed for aerospace firms to acquire project contracts. The increasing competition and uncertain economic environments in the industry have stressed the importance of product and process innovation (Rebolledo & Nollet, 2011). In addition, the development of products requires sufficient technological capabilities due to the high degree of precision required in the manufacture and assembly of products (Amesse et al., 2001). Aircraft manufacturing can be characterised as being dependent on multiple tiers that include raw materials and parts, small and large-scale integration, and assembly. This means that firms in the aerospace industry are interconnected as they need to put great reliance on their partners in the supply chain to access the knowledge and resources they do not possess (Rebolledo & Nollet, 2011). Rebolledo and Nollet (2011) also added that the suppliers' growing involvement in design and improvement efforts also contributes to the development of firm capabilities. If quality is within their capabilities, that means they also need to rely on their suppliers to engage in the quality improvement efforts. According to Dickenson & Blundell (2000), the implementation of certain quality systems and managerial practices will only lead to continuous improvement and consistent quality if it also contributes to the organisation's culture, which is defined as 'a complex set of values, beliefs, assumptions, and symbols that define a way in which a firm conducts its business' (Barney, 1986, p.657). In the production of aerospace materials, the culture emphasises on the quality management of the whole process instead of the quality control of the final product (Dickenson & Blundell, 2000).

As previously mentioned, achievement of quality could face barriers from the organisation's systems and procedures, culture, organisation design, and management perspective (Beckford, 2002). Lopez (1996) studied the quality planning in an aerospace company which was in the process of moving from a traditional manufacturing system towards a customer-driven quality system. Through the study, Lopez (1996) found that the major barriers to implementing a quality planning system include organisational inertia, organisational culture, lack of employees training, lack of top management support, lack of understanding of the technology. Organisational inertia is defined as an organisation's resistance to make transitions and inability to react to change in a quick and efficient manner (Kinnear & Roodt, 1998). In order to make a change, an organisation needs to identify the anticipated benefits of it, which can include reduced layers of management, lower operating costs, reduced lead times, higher customer satisfaction and higher employee morale (Lopez, 1996).

2.3 Environmental Management

There are a number of tools to the environmental management related to both processes and products in a company, including: environmental policy, environmental management system, environmental auditing, environmental indicators, and eco balance (Starkey, 1998). This section will especially examine the environmental management system (EMS), which is defined by Starkey as a tool to enable a firm to plan and manage its environmental activities in a systematic way and help improve its environmental performance in order to benefit the business performance. There are two well-recognised EMS schemes: (1) ISO 14001, the international standard to environmental management system, and (2) EMAS, the European Community's eco management and audit scheme. However, this study will focus on the first EMS scheme (ISO 14001) to investigate the benefits and challenges of the implementation of an environmental management system in the aerospace industry.

Different scholars have defined environmental management in the supply chain from different perspectives. Starkey (1998) defined it from a general view as management of a firm's activities that have or can have an effect on the environment. Klassen and McLaughlin (1996) approached the definition from the perspective of the firm's product proposing that environmental management aims to minimise the negative environmental impact of the product life

cycle. While Bowen et al. (2001) approached the topic from the green supply view as he suggested it attempt to improve the environmental performance of purchased inputs, or of the suppliers that provide them. Despite the different views on the definition, the ultimate goals of an environmental management system are compliance with the legal and regulatory standards and waste reduction (Sayre, 1996). There are many potential advantages of implementing an environmental management system, including cost savings, reduced environmental risk, meeting supply chain requirements, improved company image, and increased market opportunities (Starkey, 1998).

Corporate attitude towards the environment has now become a developing business strategy and not simply a theory in the management literature, as a response to globalisation and the expansion of multi-national enterprises (Williams & Aguilera, 2008). Internal and external pressures exist to urge firms to undertake environmental management appropriately. Internal pressures arise from the internal requirements and regulatory standards, while external pressures arise from the market's expectations to act responsibly for the benefits of the community and environment (White et al., 2014). Klassen and McLaughlin (1996) put together the aspects of environmental management and corporate performance and studied the influence and benefits of it. According to them, improved environmental performance resulted from minimised environmental impact and a strong EMS will lead to improved environmental performance (Lee, 2008) and subsequently improved financial performance of a firm.

Melnyk et al. (2003) assessed the impact of an informal environmental management system, a formal system that does not meet ISO 14001 standard, and a formal system that meets ISO 14001 standard on corporate performance. They found that the impact of environmental activities on corporate performance is strongly affected and influenced by the presence of a formal and certified EMS. They suggested that the certification process involves the participation of the employees (Hui et al., 2001) and creates a greater awareness of the environmental activities and their opportunities. Supporting Melnyk et al. (2003), Vachon and Klassen (2008) who linked environmental collaboration with manufacturing performance also found that it can have a significant positive effect on both manufacturing and environmental performance. More positive influence is also found in these studies: (Gonzalez et al., 2008). On the other hand, studies also discovered no significant influence (Nyirenda et al., 2013) and negative influence (Cho & Patten, 2007) between an environmental management system and firm performance. Differences in the findings may be found due to the different environmental policies employed and performance indicators used (Gil et al., 2001). It is also suggested that studies on firms' environmental management practices should focus on a single industry, as different industries may show different attitudes toward environmental management (Gil et al., 2001). In additions, environmental regulation is mainly industry-specific and therefore firms within a particular industry comply with their specific industry standards (Gil et al., 2001).

A case study on BAE Systems, a British multinational aerospace company discovered that a reduction in the negative impact of the company's operations could help reduce costs, increase efficiency and improve compliance with legal regulations (Gopalakrishnan et al., 2012). On recognition of its environmental impacts generated from energy usage and manufacturing processes and the economic benefits of environmental efficiencies, BAE Systems carried out a number of initiatives that include the implementation of ISO 14001, employment of an environmental management policy, utilising environmental-friendly machinery and equipment, life-cycle assessment for all products, and environmental auditing. The company has employed all environmental management tools comprising environmental policy, environmental management system, environmental auditing, environmental indicators, and eco balance (Starkey, 1998). The positive results from the implementation of proper environmental management systems are supported by a study by Mollenkopf et al. (2010) who discovered that environmental initiatives increase efficiency and productivity, reduce risks and costs, and thus increase profitability. In addition to long-term cost savings, manufacturing firms adopting green practices also benefit from brand image enhancement, better regulatory traction, greater ability to attract talent and investor interest (Sarkar, 2012). However, Sarkar (2012) also argued that as the economics of green manufacturing is still not well understood, firms need to engage in a long-term commitment to gain these benefits.

3. Methodology

A research study can have three types of purposes: exploratory, descriptive and explanatory. Exploratory study is conducted when there is limited information related to the topic. It is conducted as preliminary research to construct the themes for the subsequent research (Lee et al., 2007). The objective of exploratory research is to identify key issues and key variables. Descriptive study expands on themes already discovered. It describes the characteristics of the variables and identifies patterns or trends in a situation, but not the causal linkages among the variables (Braun

& Clarke, 2006). Explanatory study seeks detailed explanations of a particular phenomenon and also tests the relationship between variables (Lee et al., 2007). This study combines exploratory and descriptive research purposes. The exploratory research is executed in the early phase to help identify the research problem in the aerospace industry. Methods used are in-depth interviews with the practitioners in the aerospace industry and observations to understand the issue faced. After that, a descriptive analysis is used to describe the patterns of the findings obtained from the interviews.

This research relies on both primary and secondary data. The primary data used in this research are acquired through in depth interviews with practitioners in the aerospace industry that took part or experienced the implementation process of the ISO 9001 and ISO 14001 standards in their companies. The secondary data supporting this paper are sourced from company reports, published journals and other literature work that is relevant to the topic of this paper. The data collected are qualitative data obtained from the interviews, observation from the interview recordings, and review of documents, such as company reports.

4. Research Findings and Discussions

This study uses in depth interviews as the main tool to collect data. Findings of this study are based on in-depth interviews with nine people working in the aerospace industry who are familiar with the management of the quality and/or environmental systems in their respective companies. The researcher selected participants who volunteered themselves to participate in the interview via personal connections and publicly posted web links to postulate a random and diverse population of volunteers.

Around 45% of the participants reported that their companies are certified to both ISO 9001 and ISO 14001. A third of them reported that their companies are certified to only ISO 9001 and not ISO 14001, on the other hand, none of their companies are certified to only ISO 14001. While 22% of them stated that their companies are neither certified to any of the two ISO standards but are planning to do so in the future. Hence around 78% of the companies comply with ISO 9001 or a derivative to ISO 9001 that is specific to the aerospace industry. While the rest of them comply with the quality management system of their own companies, often developed based on ISO 9001. However, being part of the aerospace industry, interviewees revealed that compliance with just one standard might not be enough in certain situations.

According to SASB (2015), the aerospace & defence industry is subject to multiple regulatory standards in the markets they serve and must comply with regulations related to government contracting and international trade. Companies belonging in the aerospace industry are also regulated by their national aviation authority (e.g. FAA, EASA), which oversees the quality of aircraft engines and parts, inspections and maintenance procedures, security measures, and other operational and environmental concerns (FAA, 2015). As safety measures are vital in the aerospace industry, another participant also stated that their company has to comply with multiple regulations.

"There's a lot of regulations that we need to comply with because again it relies on safety."

The time and resources needed for the initial implementation of this ISO standard could vary from one organisation to another. One of the particpants claimed that two important factors could affect the length of implementation: the size of company and number of value creating processes. Karapetrovic & Casadesus (2009) however argued in their study that the implementation time would depend on the efficiency in the use of resources and the effectiveness of the application of standards. Often times, the implementation process involves using an existing company framework and adapting it to fit perfectly to the ISO requirements (Janas & Luczak, 2002). As one of the participants mentioned, *"We have currently colleagues who are doing it internally - describing the processes and producing the work orders, adapting our processes to fit perfectly to the ISO process… All these processes are written out. We have to adapt it for ISO."*

Some companies which comply with ISO 9001 standard have started the implementation from the beginning of the company establishment. From an observation, a similarity is found in these companies. Once the ISO processes are fully implemented, the quality department is held reliable for the continuous compliance with the quality standard and for organising regular audits.Internal audits are performed by internal departments whereby one department of an organisation evaluates another department of the same organisation (Zink & Schmidt, 1998), while external audits are performed by a qualified third-party organisation, which in this case has to be an aviation-certified

assessor. Any updates to ISO 9001 are also closely monitored so that the organisation could adapt its procedures to fulfil the new requirements as one participants mentioned, *"In aviation you must be audited by aviation-certified assessors. You cannot use anybody from the street. There are only aviation-certified assessors or audit companies that are allowed to perform that."* Regular auditing helps ensure that company processes are still following the ISO standard. It also keeps the organisation informed of the efficiency of its quality management processes (Stephens & Roszak, 2010).

Based on the shared views from the participants as well as investigation of the secondary sources, ISO 9001 is a voluntary certification that aerospace companies have the option to obtain and implement as their quality management system. Without ISO 9001, most participants have already implemented their company's internal quality management system that may or may not be developed based on the ISO 9001 standard. As one of the respondents mentioned, *"It is not mandatory for us to comply with certain quality standards from the regulation perspective."*

Quality processes in the company, however are seen as mandatory and strict. Every staff member is pressured to achieve a certain quality level and follow the quality rules. In spite of this, employees in different departments do not experience the same level of pressure. Those who are in the quality and production departments, for example, experience more pressure to follow the strict quality regulations. There is an internal pressure by the parent company to follow different quality procedures and to base processes on an industry conformed standard. One of the participants expressed that the pressure can be seen differently from different departments within the company. Another participant had a different opinion as they think it is more of an external pressure, which is given by the customers to implement the standard. They also added that this pressure applies along the supply chain, as their company could also demand the proper implementation of ISO 9001 standard from its suppliers. These companies are known as customer-driven companies as they seek certification mainly to satisfy the customer requirements (Fotopoulos et al., 2010). Customers play an important role in influencing a company's decision to obtain the ISO 9001 certification.

As this study has explored the internal and external pressure given to aerospace companies for implementing the ISO 9001 standard, it then aims to discover the challenges in the research findings. This study subsequently found that there are four main challenges that the participants experienced and witnessed in the implementation of the standard: (1) varied interpretation of the standard, (2) the need to learn and get trained with regard to any changes or updates in the standard, (3) tailoring the standard framework to the company's requirements, and (4) lack of agreement, acceptance, and understanding of the standard. Finally, a number of participants expressed that the lack of understanding of the standard, especially the goals and purposes of it, could lead to an incorrect or poor implementation. This finding is in agreement with a research finding by Janas & Luczak (2002) which stated that the employees' lack of acceptance of the quality management system could impact negatively the efficiency of the system. Another participant mentioned that if the acceptance and agreement occur and start in the senior management level, it can then be passed down to the lower levels. This could then lead to a shared agreement and understanding of the purposes of the standard.

From the shared views of the participants, the benefits of ISO 9001 could be classified into two categories: internal and external benefits. The internal benefits consist of: (1) ability to produce and manage a quality of products that is consistent, (2) ability to charge a higher price, (3) cost prevention or reduction of unforeseen costs, and (4) keeping the organisation structured and organised by following the requirements or principles. Whereas external benefits comprise: (1) ease in the participation of projects, (2) customer satisfaction, and (3) attracting new customers. ISO 9001 designs a framework of requirements of quality management for an organisation, which will ensure customers get consistent, good quality products and services (Tummala & Tang, 1996). Brown et al. (1998) also reported that the ISO standards do not only contribute to improvements in the quality of the products and services, but also improvements in quality awareness and improved management control. ISO 9001 can also contribute towards customer satisfaction (Low & Omar, 1997). Gotzamani & Tsiotras (2001) added that improvements in company performance, particularly in complaints handling and processing for the quality improvement of products and/or services, are vital for customer satisfaction. As one of the participants stated, *"Best quality product supplied. This makes customer happy and helps in getting more business."*

As noted earlier around 45% of the participants comply with ISO 14001 and are certified to this ISO standard. These ISO 14001 certified companies also hold an ISO 9001 certification. Karapetrovic & Casadesus (2009) studied the

sequence of the implementation of ISO certifications and found that most companies implemented ISO 9001 first, followed by ISO 14001. This could explain the lower percentage of ISO 14001 compliance among the participants. The companies that are certified are typically manufacturers of aircraft parts or components, engines, avionics and other aviation products, and have a production site(s) for the production/manufacturing activities. These companies are also larger than other companies in terms of number of employees and/or revenue generated. This observation is supported by Walker et al. (2008) who stated that the size of the organisation could affect the level of sensitivity of the organisation toward customer pressure on commitment to sustainability. The larger or the more reputed the company, the more sensitive it is to customer pressure. As ISO 14001 designs a framework for the management of resource efficiency improvement, waste and cost reduction, it seems that the standard would directly impact mainly the managers and employees connected to the environmental work (Bomark, 2011), such as those working in the production and procurement departments, as they have to deal with supplying resources, processing them in an efficient manner with minimal waste and ultimately reduced cost. However, in order for an organisation to achieve environmental performance through a systematic and cyclical process of continual improvement, training all employees to become aware of their environmental responsibilities is an essential element in complying with an environmental management system (Netherwood, 1998).

A fundamental purpose of ISO 14001 is to assist companies in minimising negative environmental impact, continually improving their environmental performance and complying with applicable regulations (ISO, 2009). However, companies are responsible for setting their own environmental targets, with the standard assisting them in reaching the goals. Therefore, establishing and fulfilling environmental goals are an important duty for a company in order to comply with ISO 14001. The participants had varied opinions on the pressure of the ISO 14001 implementation. The opinions are divided into internal and external pressure. However, most of them claimed that it was more of an external pressure. This finding is supported by Walker et al. (2008) and Gopalakrishnan et al. (2012) who argued that customers play a vital role in putting pressure on a company's sustainability actions. One of the interviewees believed that their company was given pressure from the public regulation authorities. These authorities are environmentally and socially aware organisations who provide public access to environmental information and encourage greater awareness of issues that affect the environment (Delmas, 2001). Their existence could then motivate companies to introduce new business practices with regard to sustainability (Sharma & Vredenburg, 1998).

According to Morrow & Rondinelli (2002), in order for a company to receive the benefits of an environmental management system, strong employee participation and environmental training programs are required. One of the participants contended that only large companies would truly benefit from complying with ISO 14001 standards due to the larger resources. This argument is supported by Rutherfoord et al. (2000) who argued that larger firms are able to benefit from resource efficiencies and economies of scale in managing environmental issues. Another interviewee suggested that their company is a large company and has more complications in managing its environmental issues, thus an environmental management system should take in place to assist it in meeting its environmental goals. The findings on ISO 14001 show that this ISO standard seems to mainly impact the managers and employees related to environmental work. Employees in the other roles are mostly unaware of the process and its significance.

5. Conclusions

This research has studied nine companies in the aerospace industry on their implementation of the ISO 9001 and ISO 14001 standards. In order to explore the challenges and benefits of the implementation, interviews were conducted with practitioners in the aerospace industry who experience the implementation process of these standards. Based on the data collected and analysed, several conclusions are drawn.

The findings show that the principal motivations for adopting ISO 9001 are requirements from the internal organisation and customers. However, even without this ISO standard, quality management principles and policies are already strictly implemented. Those companies who pursue ISO 9001 reported a number of internal and external benefits, as discussed in detail in the previous chapter. For instance, they are able to charge a higher price as the ISO standard could work as a guarantee of their ability to produce a product/service that meets the customer's needs. By producing a consistent quality of product/service, the companies could also prevent warranty costs and other unforeseen costs. Apart from that, being certified to ISO 9001 could ease the companies in the participation of projects that require the adoption of the standard as well as increase demand of future customers. However, the implementation process also faced challenges within the organisation. One of the most significant challenges was

varied interpretation of the standard. Even though the ISO 9001 is an international standard which could apply to companies of different sizes, cultures, and industries, they apply it differently in their organisations as they need to adjust the standard to their company requirements. This variation could lead customers to write their own standard and require companies to comply with it. As the aerospace industry is a multi-tiered industry, companies in the lower tier face more challenges as they have to comply with many different standards that their customers require.

The findings on ISO 14001 show that this ISO standard seems to mainly impact the managers and employees related to environmental work. Employees in the other roles are mostly unaware of the process and the significance of it. This study found that the larger the company size, the more sensitive it becomes toward customer pressure on commitment to sustainability. It also found that large companies could capture more benefits of this standard due to resource efficiencies and economies of scale in managing environmental issues. However, they would also have more complications in managing these issues. This study concludes that in order for a company to receive the full benefits of an environmental management system (e.g. ISO 14001), strong employee participation and environmental training programs for all employees are required.

The main findings of this research offer a justified and formal answer to the research gap presented in the literature about the benefits and challenges of the implementation of ISO 9001 and ISO 14001 in aerospace companies. Practitioners might believe that ISO certifications will lead to business benefits. This is reinforced by the vast amount of literature that argued that a certified management system will improve business performance. However, due to the varied findings on the impact of the certification, it might be a wise decision to pursue the ISO certification if major customers require it. Companies, however, are recommended to be fully committed and motivated to the management of their quality and environmental systems in order for them to extract the maximum benefits of the adoption the standard. Companies need to also track the implementation of the ISO standard over-time and investigate whether it conforms to the performance requirements of the organisation as part of a continuous improvement strategy.

Despite the vast amount of literature on the implementation of ISO standards, there is very little of it that studied the aerospace industry. This research contributes toward this gap and provides a link between the adoption of quality and environmental management systems and business performance. However, as the information on this topic in the aerospace industry is limited, this study could not extract much information from the literature to be synthesised with the findings. This could provide the justification for future research into exploration of the aerospace industry on the standard adoption and its impact on organisational performance. This study could also be improved by expanding the interview number and/or developing a questionnaire to reach out to more participants of the industry for more valid results and by focusing on companies of similar sizes (in terms of sales and number of employees) or within a territory (e.g. country, region). Further research could also focus on the companies' commitment to quality and environmental management after the ISO 9001 and ISO 14001certification. This in turn could lead to the development of broader theory that will enrich the understanding of these management systems.

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