Adoption of Management Systems by Companies According to International Standards – an Overview of the Empirical Literature and a Case Study on Automotive Suppliers in Saxony

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Abstract

Today, an increasing number of organizations are certified according to international management standards, such as ISO 9001 and ISO 14001. It is not easy, however, to identify the driving motivations given the small number of studies and the wide variety of results. A large survey by ISO shows that "quality and environmental improvements", "corporate image" and "marketing advantage" are the most important motivations. Beyond this, motivations vary from industry to industry. The automation industry, for example, perceives "marketing advantage" and "customer pressure" as the most important motivations for adopting ISO 14001. Other research reveals a link between the size of organizations and the motivations. Large transnational corporations and small enterprises are more concerned about pressures from domestic customers and medium sized enterprises are more concerned about their international customers. In order to add additional evidence to this complex issue, the authors set up a questionnaire on the adoption of management standards by the automotive supplier industry in Saxony, Germany with a special focus on to the potential need for consultancy assistance obtaining certification. One result of the survey is that "competitors" are considered as the main driving motivation after "customer pressure". The study also shows that companies have a higher esteem for the certificates than their real efforts to obtain them. Moreover, a recommendation from personal contact and the experience of the consultant team are the key issues for companies to select a management consultant.

Keywords: environmental management systems, quality management systems, ISO standards

Introduction

Why do organisations install and maintain a management system or several managements systems according to International Standards? The empirical evidence collected and discussed in this paper is based upon a survey of the literature and upon a survey carried out by the authors in the automotive industry in Germany. The paper is organised as follows. In the first section we present an overview of some empirical studies on the motivations of organisations to adopt management systems according to International Standards. Since the ISO Standard 9000 for quality management is the oldest and most widely adopted standard,

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several studies relate to it. The second section describes a survey about the adoption of such managements systems by automotive suppliers in Saxony with a specific focus on consultancy needs. The paper ends with some conclusions and recommendations for further work.

Motivations of Organizations to Adopt a Certified Management System

Since the introduction of the ISO 9000 and ISO 14000 standards, an increasing number organizations in an increasing number of countries have implemented these standards to manage their products and/or services quality and environmental aspects. Each year, thousands of organizations from various businesses choose to carry the costs and efforts of implementing a QMS and/or an EMS according to the standards. Moreover, these organizations also have a high tendency to voluntarily formalize the certification through a third-party conformity assessment even though this is not compulsory.

There are several motivations for the implementation and certification according to ISO 9001 and/or ISO 14001. The first motivation consists in the expectation of organizations of benefits to gain and costs or threats to be reduced through the adoption of ISO 9001 and/or ISO 14001 (Andrews & Darnall, 2001). The second motivation relates to the geographic range of activities of organizations that are most likely motivated to adopt a QMS and/or an EMS, i.e, whether the adoption of a QMS or an EMS is more likely in organizations that are operating either domestically or else internationally (Andrews & Darnall, 2001). The third motivation addresses the pressures or drivers that are most influential in encouraging organizations to adopt and certify according to ISO 9001 and ISO 14001 (Andrews & Darnall, 2001). These three elements are further discussed below.

Expectations of Organizations to Adopt a Certified Management System According to the ISO Standards

Table 1 shows a list of selected studies[1] by various research institutions with a focus on the expectations of organizations to adopt a certified management system according to the ISO standards and the effects of certification on the performance of these organizations.

No	Title of survey	Area and period of survey	Objective of survey	Number of organizations surveyed
1	"Global Perspectives on Global Standards – a 15 Economy Survey of ISO 9000 and ISO 14000"	15 countries in North America, Europe & Asia 1999 to 2001	The study focuses on the evaluation of the motivations of organizations to seek ISO 9001 and ISO 14001 certification and the benefits of ISO 9001 and ISO 14001 certification	5398 organizations from 15 countries that are certified according to ISO 9001 and ISO 14001
2	"Environmental Management Systems – Paper tiger or powerful tool"	Sweden 1998 to1999	The study focuses on the reasons effecting the decisions of selected organizations to introduce an EMS.	172 respondents out of a survey of 354 organizations certified according to ISO 14001
3	"ISO 14001: Profitable – Yes! But is it Eco-effective?"	Switzerl and 1999	The study focuses on the effectiveness of EMSs to support the ecological performance and to determine the sufficiency of EMS to meet the challenge of continuous environmental improvements in Swiss organizations.	158 respondents out of a survey of 348 organizations certified according to ISO 14001
4	"Environmental Management Systems: History, Theory, and Implementation Research"	United States 2000	The study focuses on the effect of implementation of an EMS on the environmental and economic performance of an organization. Furthermore, the study aims to determine motivations of organizations to implement and certify EMSs.	31 certified organizations
5	"ISO 14001 in Germany – A Survey of German Experience"	German y 2000	The study focuses on the main reasons of organizations to set up an ISO 14001 environmental management system	565 out of 2286 certified organizations
6	"Voluntary Adoption of ISO 14001 in Japan: Mechanism, Stages and Effects"	Japan 1999	The study examines the type of factors which contribute to ISO 14001 adoptions in Japan	2918 certified and non-certified organizations. 718 certified organizations.
7	"The ISO 9000 series as a tool for organizational change – Is there a case?"	1994 Western Australia	The study examines reasons of organizations in Western Australia to seek ISO 9000 series certification and motivations of these organizations to implement Total Quality Management (TQM).	160 out of 500 certified organizations
	"ISO 9000 series certification over time: What have we learnt?"	1999 Western Australia	The main aim is to explore the links between motivation for implementing the ISO 9000 and continued certification.	30 out of 94 certified organizations

Table 1: Selected Studies with a Focus on the Expectations of Organizations to Adopt a Certified Management System According to the ISO Standards. Source: Compiled by the authors based upon (Andrews & Darnall, 2001; Corbett & Luca, 2003; Dylick, & Hamschmidt, 2002; Enroth & Widing, 2000; BMU, 2001; Welch & Mori, 2001; Brown, & Wiele, 2002; Brown & Wiele, 2001).

The first survey listed in Table 1 was done by Corbett, Luca and Pan for the years 1999 to 2001. In the survey, a total of 5398 organizations from 15 countries[2] (i.e., equivalent to 25.19 percent of the total sample) communicated their motivations to seek ISO 9001[3] and ISO 14001 certification. Respondents were asked to rate, on a five-point scale, the importance of a set of eleven possible motivations in their decision to seek certification (Corbett & Luca, 2003). Figures 1 and 2 show the results of the survey by country and by business sector respectively[4]. This database contains 5264 organizations that are certified according to ISO 9001.
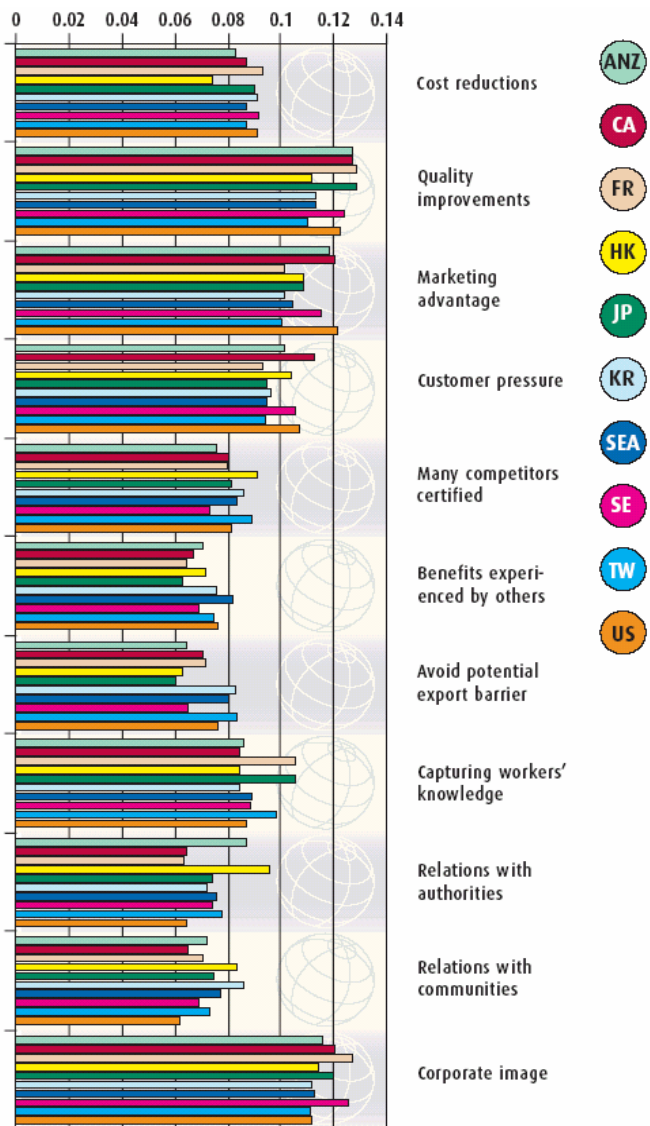
Figure 1: Motivations to Seek ISO 9001 Certification – Based on Countries[5]. Source: ISO. Global Perspective on Global Standards – A 15-Economy Survey of ISO 9000 and ISO 14000. 11 May 2004. http://www.iso.org/iso/en/iso9000-14000/pdf/survey_1-03.pdf
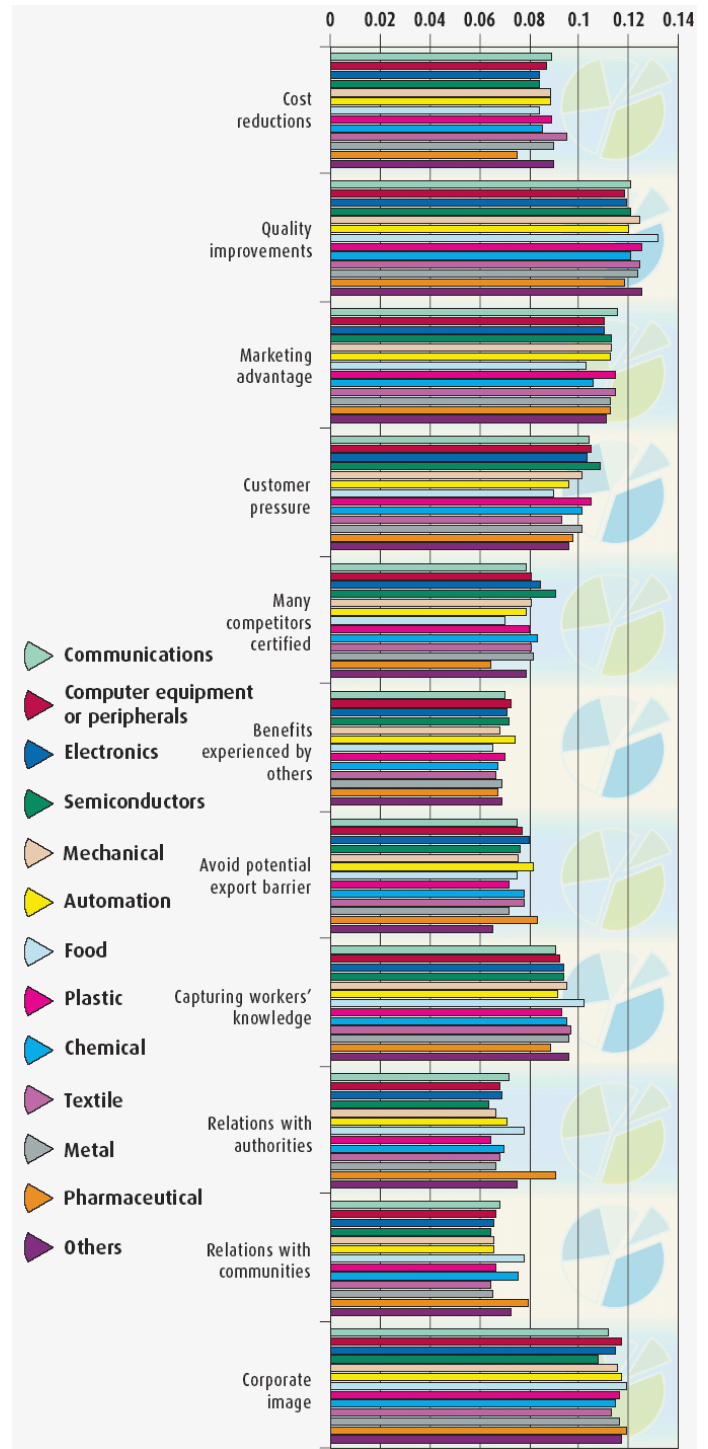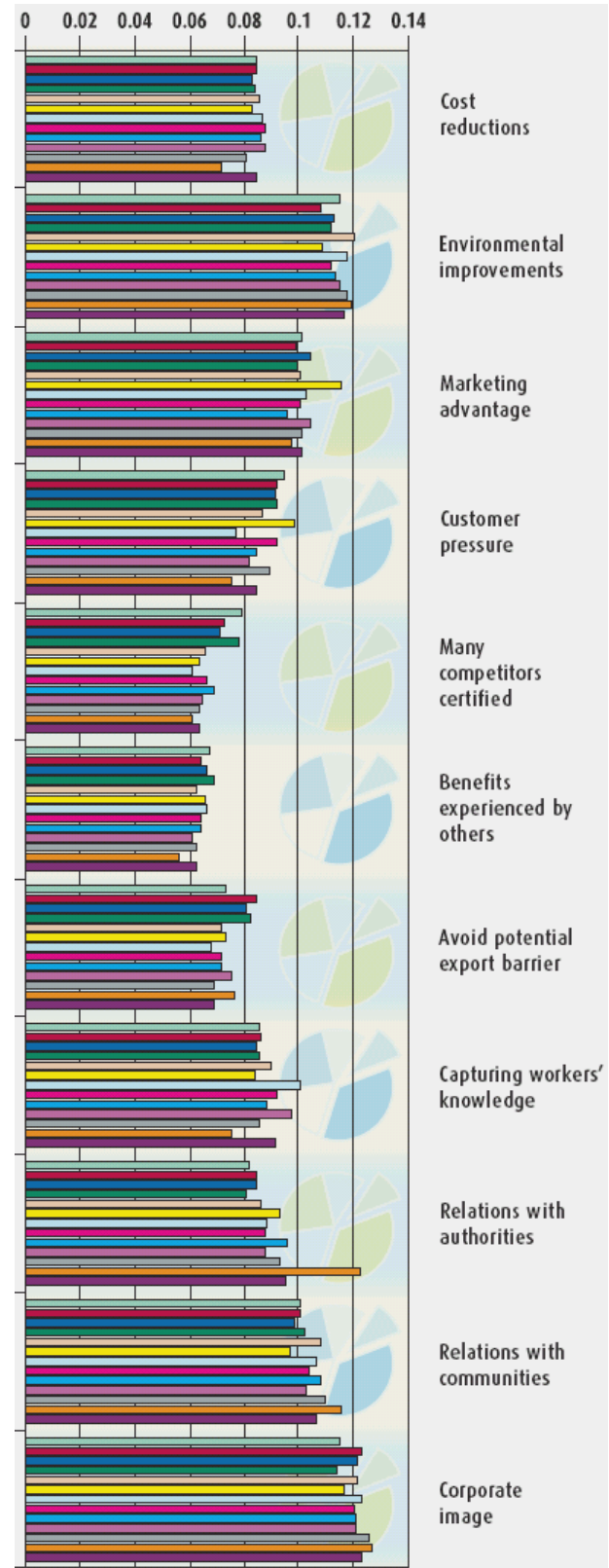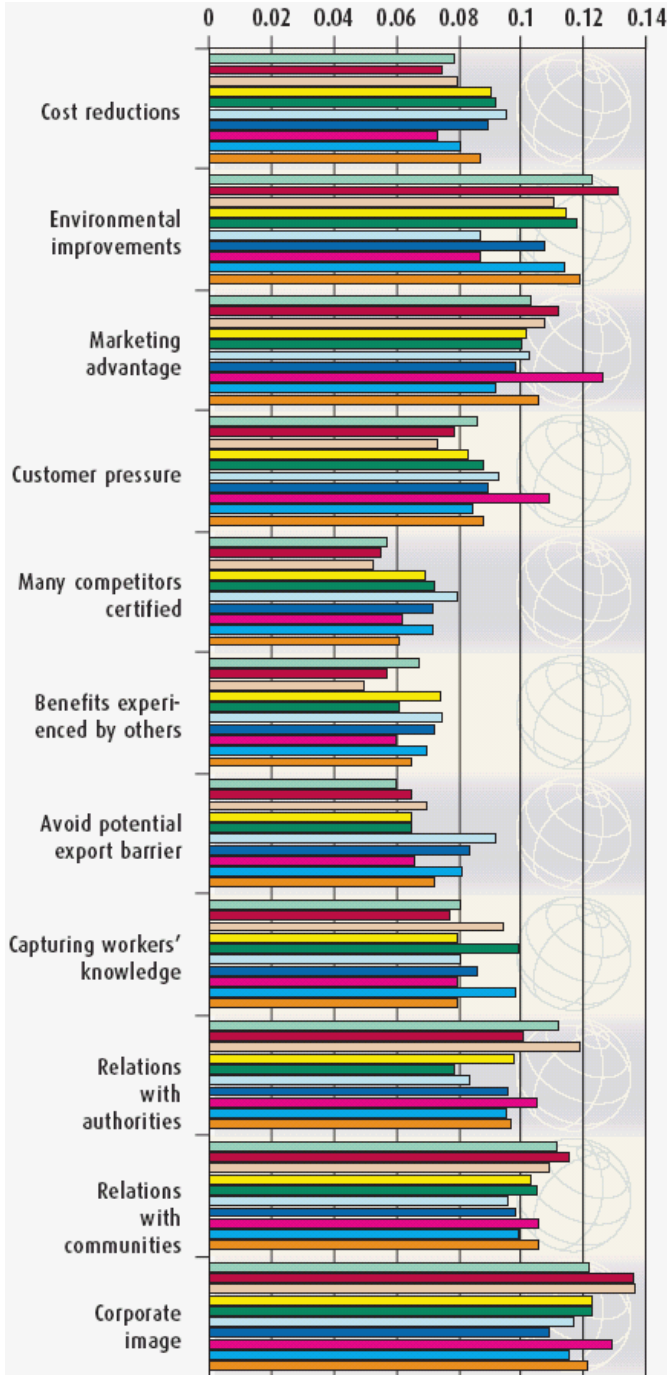

Figure 2: Motivations to Seek ISO 9001 Certification – Based on Business Sectors. Source: ISO. Global Perspective on Global Standards – A 15-Economy Survey of ISO 9000 and ISO 14000. 11 May 2004. http://www.iso.org/iso/en/iso9000-14000/pdf/survey_1-03.pdf

The results show that organizations seeking ISO 9001 certification tend to be motivated especially by the following factors: "quality improvement", "corporate image" and "marketing advantage". This pattern is similar for the two dimensions, i.e. countries and sectors.

Figure 3: Motivations to Seek ISO 14001 Certification – Based on Countries. Source: ISO Global Perspective on Global Standards – A 15-Economy Survey of ISO 9000 and ISO 14000. 11 May 2004. http://www.iso.org/iso/en/iso9000-14000/pdf/survey_1-03.pdf

Figure 4: Motivations to Seek ISO 14001 Certification – Based on Business Sector. Source: ISO. Global Perspective on Global Standards – A 15-Economy Survey of ISO 9000 and ISO 14000. 11 May 2004. http://www.iso.org/iso/en/iso9000-14000/pdf/survey_1-03.pdf

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However, one should be careful in interpreting the results as they show that different organizations tend to be motivated by different factors. For example, the food industry reports the highest score for seeking "quality improvement" and "capturing workers knowledge" while the textile industry aims to reduce costs through certification. Therefore, the survey shows that all eleven motivations are important with a strong emphasis on "quality improvement", "corporate image" and "marketing advantage" in motivating organizations of the surveyed countries and businesses to seek ISO 9001 certification.

The results of the survey for of 1400 organizations which are certified according to ISO 14001 are shown in Figures 3 and 4.

The figures show that the main motivations for organizations to seek ISO 14001 certification are "environmental improvements", "corporate image" and "marketing advantage". Organizations in the industrial automation sector expect to achieve the highest "marketing advantage" and experience "customer pressure" as most important in seeking for ISO 14001 certification. This might due to the fact that organizations in the industrial automation sector have higher demands on the suppliers in the sector to be certified according to ISO 14001. This tendency is similar to the automotive sector, as witnessed by large organization such as Ford Motor Company and General Motors which require all their Tier I suppliers manufacturing sites to be certified according to ISO 14001, and have encouraged the Tier I suppliers to require such a certification from second and third tier suppliers as well (Andrews & Darnall, 2001). Toyota took the same measure which became effective at the end of 2003. The communications and semiconductor sectors gave the highest scores to "many competitors are certified" and the pharmaceutical industry was motivated by improving "relations with authorities" for both ISO 9001 and ISO 14001 certification (Corbett & Luca, 2003).

The second survey, summarized in Table 2 by the Industrial Research Institutes (IRIS) Eco-efficiency Group in Sweden, aims to investigate the expectations of organizations that are certified according to ISO 14001 in Sweden. Questionnaires were sent to a total of 360 organizations that were certified according to ISO 14001 up to November 1998. From this sample, 172 organizations (equivalent to 49 percent) from various industries replied. Of the 172 organizations, 53 percent replied that they were motivated by "competitive advantage" in adopting an EMS[6] 27 percent replied that they were requested by their parent organizations to adopt an EMS and certify according to ISO 14001. A total of 18 percent replied that they were required by their customers to be ISO 14001 certified.

In a third survey by Professor Dyllick and Dr. Hamschmidt from the University of St. Gallen, a total of 348 Swiss organizations that were certified according to ISO 14001 were asked in 1999 about their expectations about implementing an EMS. 158 organizations, representing 45 percent of the total sample, replied. Figure 5 shows the results of the survey.
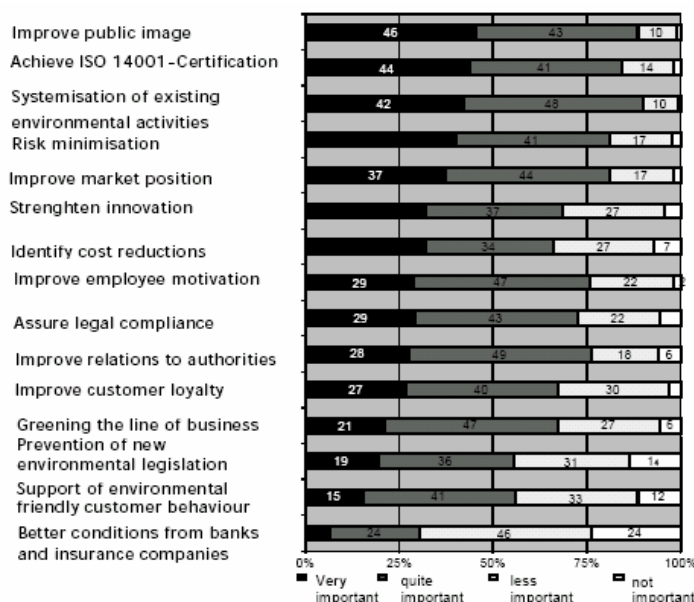

Figure 5: Expectations from Implementing an EMS by Swiss Organizations
(percent, n = 158) Source: University of St. Gallen. ISO 14001: Profitable – Yes! But is it Eco-effective? 22 September 2004.
http://www.unisg.ch/org/iwo/web.nsf/SysWebRessources JHDT_GMI2002.pdf/$FILE/JHDT_GMI2002.pdf

Figure 5 shows that the organizations of this Swiss sample expected to improve their public image and to achieve ISO 14001 certification through the implementation of an EMS. This means that they were primarily expecting to gain external recognition for their EMS activities (Dylick, & Hamschmidt, 2002). Other expectations such as a systemization of existing environmental activities and risk minimization followed in third and fourth positions (Dylick, & Hamschmidt, 2002).

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All three surveys discussed above show a large number of different but highly valued reasons motivating organizations across countries and business sectors to be certified according to ISO 9001 and ISO 14001. The results suggest that the ISO standards are not perceived as instruments serving only a specific, narrowly defined purpose, but much rather as broad, general instruments serving a wide array of purposes. Furthermore, one of the most striking results from the surveys is that the organizations are not identifying cost reduction as their main priority for an implementation of ISO standards.

Types of Organizations that Tend to Adopt ISO Standards

Early predictions generally maintained that the main adopters of ISO 9000 and ISO 14000 standards would be large transnational corporations (TNCs)[7] because implementing such standards requires a large capacity of human resources, time and financial support. For example, one study found that, in Germany, setting up an EMS to ISO 14001 takes an average of 13 months, requiring a workload of 180 days per person and 30 days of external consultancy (BMU, 2001). The EMS triggers environmental protection investments averaging 95,000 € and further costs of about 22,000 € are incurred for training, information and auditing (BMU, 2001). The adoption of a QMS according to ISO 9001 takes an average of 14 months[8] The timeframes and costs for the introduction of a QMS or an EMS vary from organization to organization due to size, the complexity of their operations, the existence of other management systems, and the availability of human and information technology resources (Halkos & Evangelinos, 2002).

Large TNCs have greater internal resources and management capabilities to absorb the administrative costs of the implementation of a QMS and an EMS (NDEMS, 2003). In addition, large TNCs are often thought to have the highest profile and to be the largest polluters. Therefore, it is predicted that large TNCs would have a greater motivation for adopting the ISO standards as they will gain greater returns from external factors such as brand enhancement and international trade, and internal factors including standardization of procedures (NDEMS, 2003). In practice, however, organizations other than large TNCs are also motivated by various factors to adopt a certified ISO system.

Through the increase of global competition, both small and large organizations have to change their behaviour to meet the challenges of the competitive world. Large TNCs tend to have the capability to control the market and force their suppliers directly or indirectly to meet their requirements. As many small and medium enterprises (SMEs)[9] are heavily dependent on sales to the large TNCs, they might, therefore, also be tempted to adopt the ISO standards in response to the pressure of customer expectation and to gain competitive advantage in the global market (Andrews & Darnall, 2001). As mentioned above, this can be seem in the cases of large TNCs such as Ford Motor Company, General Motors and Toyota which imposed a requirement of all their Tier I suppliers to be ISO 14001 certified. As a consequence, the Tier I suppliers are encouraged to require such certification on their second and third tier suppliers who are mostly SMEs.

The importance of customer and shareholder pressures on organizations in adopting the ISO standards can be seen in a study by Andrews & Darnall (2001). In this study, a total of 31 facilities[10], both from the private sector and the public sector, large and small organizations in the United States, were asked whether customer and/or shareholder pressures were important factors in their decisions to adopt an EMS. Figure 6 shows the results of the survey.

Surprisingly, Figure 6 shows that large organizations were far more concerned about pressures from domestic customers than from international customers or shareholders although they are the ones who are considered as very active in the international market. The medium-size organizations were less concerned about pressures from domestic customers but were slightly more concerned about international customers. Furthermore, the small organizations were very concerned about domestic customers but not at all about international customers. The figure also shows that both international and domestic customers were important for organizations that were active in foreign trade. For those that were not active in foreign trade, neither type of customer pressure was perceived as important.
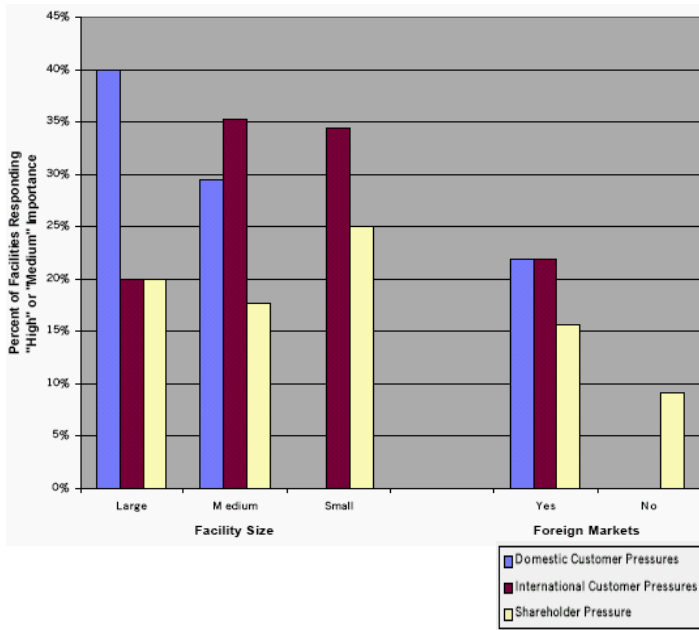
Figure 6: Importance of Customer and Shareholder Pressures for the Adoption of an EMS. Source: Andrews, Darnall et al. Environmental Management Systems: History, Theory, and Implementation Research. 2 November 2004. http://www.eli.org/isopilots/NDEMS2000Compendium.pdf

Apart from the findings of Figure 6, it is also interesting to note that government participation in providing technical assistance and training programmes to organizations in the adoption of a QMS and an EMS did encourage more organizations, especially SMEs to voluntarily adopt the ISO standards. Most SMEs perceive the implementation and certification of a QMS and an EMS as a costly burden. SMEs face a variety of barriers related to organizational, economic, knowledge, and information and technologies issues in their efforts to implement a QMS and an EMS (Andrews & Darnall, 2001). With additional assistance from government, SMEs did have more motivation to adopt a QMS and an EMS.

In the same study by Andrews & Darnal, the importance of government assistance to different sizes and types of facilities, whether publicly or privately owned, is analyzed. The results are shown in Figure 7.

The survey shows that government assistance was perceived as very important for small businesses and government (non-market) organizations, as they have limited human resources, knowledge and financial support to seek certification. Government assistance was also perceived as distinctly more important by organizations that were not active in international trade and by those that were not part of a larger organization (Andrews & Darnall, 2001)

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Overall, QMS and EMS are implemented by organizations of all sizes and in various businesses. Large TNCs tend to be more concerned about the pressure from domestic customers in the adoption of ISO standards while medium size organizations are concerned more about the pressures from international customers. Small organizations are very concerned about domestic customers because most of them are operating domestically. Organizations that are active in foreign trade will emphasize both international and domestic customers. Moreover, government assistance in the certification process by providing training programmes and technical assistance will encourage more SMEs and government organizations to seek ISO certification.
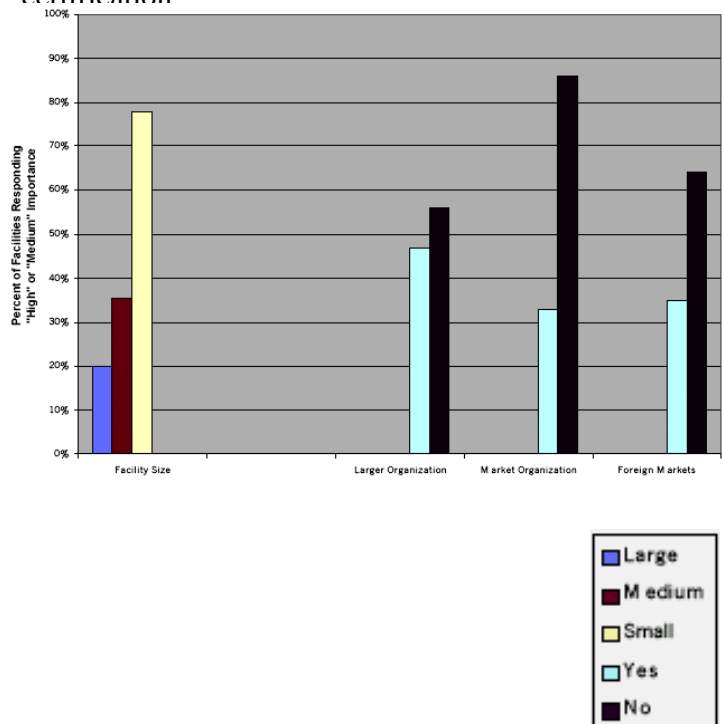

Figure 7: Importance of Government Assistance for the Adoption of an EMS by Organization Size and Type. Source: Andrews, Darnall et al. Environmental Management Systems: History, Theory, and Implementation Research. 2 November 2004. http://www.eli.org/isopilots/NDEMS2000Compendium.pdf

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Internal and External Drivers for Decision-Making of Organizations to Adopt ISO Standards

The partitioning of drivers in external and internal is often seen as important for the decision- making of organisations to seek for certification of management standards. Table 2 contains an attempt to identify these external and internal drivers in more detail.

Internal drivers are related to the resources and internal capabilities that affect the routines and competencies of an organization, including management strategy and resources to sustain its competitive advantage in the market Darnall (2000). In order to survive through various levels of changes and competitions, organizations tend to use strategic resources, such as assets, human resources, and less tangible knowledge-based advantages, such as socially complex organizational process and reputation assets Darnall (2000). Therefore, internal drivers can be divided into three categories, i.e., management system capabilities, resources capabilities and organizational culture, as suggested by Darnall (2000). In contrast, external drivers comprise all factors outside an organization that influence its routines and competencies, and motivate organizations to adopt a QMS and an EMS [11]. According to Darnall (2000) and as shown in Table 4, there are four types of external drivers acting upon an organization that effect its decision to adopt an EMS – regulatory forces, resource drivers, market drivers and social drivers. These forces are also applicable to the decision of organizations to adopt a QMS. More details about the external and internal drivers can be found in Darnall (2000).

Type of drivers	Driver Categories	Internal and External Drivers[11]
Internal drivers	Capabilities of the management system	• Improve quality and environmental performance based on continuous improvement philosophy • Develop a change of corporate culture • Serve as a basis for further management initiatives • Provide the foundation for total quality management (TQM) • Systematization of existing quality, environmental and other management activities (integrated management system)
	Resources capabilities	• Improve employees' participation and attitude toward quality and environmental performance • Capture workers' knowledge • Cost reduction through improved internal efficiency • Strengthen motivation
	Organizational culture	• Organization philosophy (responsibility and sustainability) • Requirement of the parent organization[12]
External drivers	Regulatory forces	• Assure and improve regulatory compliance • Prevent new environmental regulations • Pressure from regulators, government policy and others
	Resource drivers	• Pressure from shareholders • Assistance from government to adopt QMS and EMS • Better conditions from banks and insurance companies
	Market drivers	• Pressure from domestic and international customers • Maintain or increase market share • Value as marketing or public relations tools • Gain competitive advantage • Universality (worldwide acceptance and validity of the standard) • Avoidance of potential export barriers • Many competitors are certified • Corporate image (good example and credibility)
	Social drivers	• Improve relations with communities and authorities • Pressure from stakeholders • Recognition (demonstrate performance)

Table 2: Internal and External Drivers for Organizations to a Adopt Certified QMS and EMS. Source: prepared by the authors

In order to determine the importance of internal and external drivers on the decision of organizations to voluntarily adopt the ISO 9000 and ISO 14000 standards, two studies are discussed. The first study by Brown and Van der Wiele, carried out in two phases, examines the links between the motivations of organizations for undertaking the ISO 9000 series[13] and continued certification in Western Australia. The study

also examines the motivations of organizations to implement total quality management (TQM)[14] before and after certification. The second study by Nicole Darnall (1997) investigated the rationality of organizations in the United States to adopt ISO 14001 certification. The data used in the study were collected by the National Database on Environmental Management Systems (NDEMS)[15].

In the first study, a first questionnaire was sent out in 1994 to 500 organizations certified according to ISO 9000 series in order to determine their motivations to adopt certification of the ISO 9000 series and the implementation of a TQM. A follow up questionnaire was sent out to the same sample five years later to determine the reasons of continued certification and the impact on the TQM practices, and the types of gains achieved throughout this five years period (Brown & Wiele, 2002). The sample size and the response rates of the survey are summarized in Table 3.

	Number of Responses
Sample size of the 1994 questionnaire on the relationship between ISO 9000 series certification and TQM	500
Responses to the 1994 survey (response rate = 32%)	160
Sample size of the 1999 questionnaire on the longitudinal effects of ISO 9000 series and TQM	94
Sample size for the 1999 survey (response rate = 32%)	30

Table 3: Samples Size and Response Rates of the Survey. Source: Brown and Van der Wiele. ISO 9000 Series Certification Over Time: What Have We Learnt? 11 November 2004. http://www2.eur.nl/WebDOC/doc/erim/erimrs20020311163123.pdf

The size of the sample for the second survey was much smaller than the first because only the respondents to the initial survey were of interest in order to make comparisons over time (Brown & Wiele, 2002). Moreover, organization closures, mergers and takeovers between the dates of the two surveys implied that not all 160 earlier respondents were available (Brown & Wiele, 2002). In their first survey, Brown and Van der Wiele (1996) had formulated five types of quality strategies for approaches towards an ISO 9000 series certification. Table 4 shows the five types of quality strategies adopted by organizations.

Based on Table 4, Brown and Van der Wiele placed their respondents into the five categories. Table 5 shows the results of the categorization with comparison of the response groups of 1994 and the follow-up groups of 1999.

Type	Quality Strategy	Features
1	Minimalists	• Forced to become certified according to ISO 9000 by governments or private customers • Few benefits are perceived from certification and it is believed to be a costly exercise • The use of management consultants to assist with the registration process • Little involvement of employees during the development of the manuals, procedures and work instructions • Usually in the category of small and medium-sized enterprises (SMEs)
2	Converts	• Initially, scepticism about the ISO 9000 series • The goal is to develop an effective quality management system • Employees are involved in developing procedures and work instructions • Employees are made aware of the importance of the system and how to make best use of it • From the start, there is a positive perception of the organizational benefits of a quality system
3	Committed/Wider view of quality	• Have some aspects of a quality management system in place • See the ISO 9000 series process as a small part of their total quality drive • Do not see the ISO 9000 series as a major contributor to business success in terms of customer satisfaction or expanding market share
4	Simultaneous ISO and TQM	• Have only recently discovered the potential benefits of the ISO 9000 series and TQM • Pursuing certification according to ISO 9000 is seen as providing a tangible, measurable and external measure of quality • A decision has been taken that the ISO 9000 series within a TQM framework is necessary to enhance business performance • TQM provides support and direction to management by helping to ensure that the organizational culture is conducive to continuous improvement
5	TQM first, then ISO 9000	• A detailed quality management system is in place • Intensions exist for receiving (famous) quality awards • Operate in international markets • Have been pursuing a TQM approach for three or more years • Public sector organizations or larger private organizations

Table 4: Quality Strategies Adopted by Organizations toward ISO 9000 Series Certification. Source: Brown, Van der Wiele et al. The ISO 9000 Series As A Tool For Organizational Change: Is There A Case? 17 December 2004. http://www.few.nl/vanderwiele/papers/bpmj7(4)2001p323.pdf

Type	Quality Strategy	Responses 1994		Responses 1999	
		N	%	N	%
1	Minimalists	79	49	18	72
2	Converts	14	9	2	8
3	Committed/Wider view of quality	13	8	3	12
4	Simultaneous ISO and TQM	21	13	–	–
5	TQM first, then ISO	22	14	2	8
	Total	149	100	25	100
	Missing	11	–	5	–
	Overall total	160	–	30	–

Table 5: Response Groups Defined by the Five Types of Quality Strategies. Source: Brown and Van der Wiele. ISO 9000 Series Certification Over Time: What Have We Learnt? 11 November 2004. http://www2.eur.nl/WebDOC/doc/erim/ erimrs20020311163123.pdf

Table 5 shows that the largest share of the respondents were minimalists. These respondents were only seeking a certification according to ISO 9000. As shown in Table 6, minimalists act upon external pressure (either from private customers or governments). The percentage of minimalists even increased from 49 to 72 percent after five years of certification. In the study conducted in 1994, an analysis of correlation between, on the one hand, (internal and external) pressures to obtain certification according to ISO 9000 and, on the other hand, the improvement of business performances was performed. The main results of this correlation analysis are summarized in Table 6 (Brown & Wiele, 2001).

	Correlations	
	Short-term improvements[a]	Long-term improvement[a]
External pressures from:		
o Customers	-0.04	-0.15
o Headquarters ("external" business unit or division)[16]	0.02	0.01
o External reasons to adopt ISO 9000[a]	0.50**	0.20*
Internal pressures from:	0.69**	0.49**
o Internal reasons to adopt ISO 9000[a]	0.49**	0.43**
o Internal motivation[a]		

Notes: [a]   Factor based on factor analysis on the responses to various questions related to this issue
    *   Significance level <0.05
    **   Significance level <0.01 (two-tailed)

Table 6: Relationship between Internal or External Pressure to Obtain ISO 9000 Series Certification and Business Performance Improvement. Source: Brown, Van der Wiele et al. The ISO 9000 Series As A Tool For Organizational Change: Is There A Case? 17 December 2004. http://www.few.nl/vanderwiele/papers/ bpmj7(4)2001p323.pdf

The results show that there is a strong significant correlation between internal pressure and short-term as well as long-term business performance improvements (Brown & Wiele, 2001). In respect of the external pressures, the table shows that only one of the three characteristics, i.e., the external pressure to obtain

a certification correlates significantly with both short-term and long-term improvement. Through a follow-up survey done in 1999, Brown and Van der Wiele found that internal gains from an ISO 9000 series certification were more strongly correlated with internal reasons to commence and continue certification than external reasons. Table 7 shows the results of the second survey.

List of questions	Number of items[18]	Mean (1 to 5 scale)	Standard deviation[19]
Reasons to continue ISO 9000 series registration (Q07):			
• pressure from customers	1	3.22	1.45
• pressure from headquarters	1	3.16	1.57
• internal oriented reasons (Cronbach alpha = 0.87)[20]	5	3.80	0.83
• external oriented reasons (Cronbach alpha = 0.87)	7	3.55	0.92
Worthwhile achievements of ISO 9000 series certification (Q08):			
• internal gains (Cronbach alpha = 0.77)	5	3.78	0.66
• external gains (Cronbach alpha = 0.91)	2	3.42	1.23
Activities/tools/instruments that have been part of the follow-up activities during the past five years (Q12):			
• activities related to systems (Cronbach alpha = 0.71)	8	2.31	0.64
• activities related to training (Cronbach alpha = 0.92)	8	2.56	0.84
• activities related to staff development (Cronbach alpha = 0.73)	5	3.21	0.67
• improvement activities (Cronbach alpha = 0.78)	5	3.20	0.74
• activities related to business policies (Cronbach alpha = 0.76)	7	2.72	0.69
• measuring the costs of non-quality	1	2.59	1.09
Improvements realized as a result of the quality initiatives during the past five years (Q15):			
• organizational improvements (Cronbach alpha = 0.91)	11	2.96	0.64
• operational improvements (Cronbach alpha = 0.89)	9	3.52	0.55
General business benefits realized during the past five years (Q16):			
• stakeholder group appreciation (Cronbach alpha = 0.87)	7	3.11	0.63
• direct costs/productivity (Cronbach alpha = 0.87)	6	3.32	0.58
• managerial benefits (Cronbach alpha = 0.85)	5	3.34	0.64
• market opportunities (Cronbach alpha = 0.80)	4	2.78	0.81
• transparency/organizational consistency (Cronbach alpha = 0.79)	3	3.51	0.64
Reaction of stakeholder groups to the fact that the company have an ISO 9000 series quality certified system as a follow-up to quality activities (Q17):			
• all stakeholder groups (Cronbach alpha = 0.85)	5	3.48	0.49
Respondents perception about the importance given to quality during the past five years (Q18):			
• all stakeholder groups (Cronbach alpha = 0.86)	4	3.44	0.68

Table 7: Constructs and Statistics from the 1999 Questionnaire on Longitudinal Effects of the ISO 9000 Series (n = 25)[17]. Source: Brown and Van der Wiele. ISO 9000 Series Certification Over Time: What Have We Learnt? 11 November 2004. http://www2.eur.nl/WebDOC/doc/erim/erimrs20020311163123.pdf

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Drivers	Publicly traded (n=18) (%)			Private (n=14) (%)			Government (n=7) (%)			Average (n=39) (%)		
	H	Mᵃ	L	H	Mᵃ	L	H	Mᵃ	L	H	Mᵃ	L
EXTERNAL DRIVERS												
Regulatory Drivers												
1. # Violations	38	–	63	38	–	62	29	–	71	35	–	65.3
2. # Non-compliance	47	–	53	29	–	71	57	–	43	44.3	–	55.7
3. # Potential non-compliance	40	–	60	31	–	69	71	–	29	47.3	–	52.7
4. Regulatory benefits	33	28	39	21	43	36	71	0	29	41.7	23.7	34.7
5. Improve compliance	44	28	28	50	29	21	71	29	0	55	28.7	16.3
Regulatory Driver Index Dichotomous[b]	41	–	59	33	–	68	52	–	48	42	–	58.3
Regulatory Driver Index Ordinal[b]	39	28	33	36	36	29	71	14	14	48.7	26	25.3
Market Drivers												
1. US Customer Pressures	17	22	61	7	14	79	0	0	100	8	12	80
2 International customer pressure	17	22	61	14	0	86	0	0	100	10.3	7.3	82.3
3. Marketing tool	29	29	41	21	21	57	0	0	100	16.7	16.7	66
4. Public relations tool	17	28	59	29	43	29	43	14	43	29.7	28.3	65.5
5. Competitive advantage	22	61	17	29	50	21	0	29	71	17	46.7	36.3
6. Environmental professionals support EMSs	6	25	69	7	21	71	0	29	71	4.3	25	70.3
Market Driver Index[b]	18	32	51	18	25	57	7	12	81	14.3	23	63
Resource Drivers												
1. Insurance pressure	0	0	100	0	21	79	0	0	100	0	7	93
2. Shareholders/Owners	18	12	71	14	7	79	0	0	100	10.7	6.3	83.3
3. Technical assistance	0	11	89	36	14	50	29	43	29	11.7	22.7	56
4. Reduce costs	44	28	28	36	57	7	43	14	43	41	33	26
5. Increase revenues	14	43	43	8	31	62	0	0	100	7.3	24.7	68.3
Resource Driver Index[b]	16	18	66	19	26	55	14	14	71	16.3	19.3	64
Social Drivers												
1. Facility size	72	17	11	43	29	29	43	0	57	52.7	15.3	32.3
2. 33/50 participation	39	–	61	29	–	71	0	–	100	22.7	–	77.3
3. Green lights participation	28	–	72	7	–	93	0	–	100	11.7	–	88.3
4. # Stakeholder requests	17	17	67	7	14	79	14	43	43	12.7	24.7	63
5. Stakeholder pressures	0	0	100	0	0	100	0	0	100	0	0	100
Social Driver Index Dichotomous[b]	33	–	67	18	–	82	0	–	100	17	–	83
Social Driver Index Ordinal[b]	31	12	57	17	14	69	19	14	67	22.3	13.3	64.3
External Driver Index 1[b]	39	–	62	26	–	74	31	–	69	32	–	68.3
External Driver Index 2[b]	23	23	54	20	25	55	20	13	67	21	20.3	58.7
INTERNAL DRIVERS												
Management System Capability												
1. ISO 9000	72	–	28	79	–	71	0	–	100	50.3	–	66.3
Environment Management Capability												
1. Pollution prevention plan	61	–	39	43	–	57	14	–	86	39.3	–	60.7
Resources Capability												
1. Employee participation	57	29	14	50	29	21	43	43	14	50	33.7	16.3
Organizational Culture												
1. Environmental principles	67	33	0	71	21	7	57	43	0	65	32.3	2.3
Internal Driver Index 1[b]	67	–	33	61	–	39	7	–	93	45	–	35
Internal Driver Index 2[b]	55	30	15	54	39	7	50	36	14	52.3	35	12

[a] "–" represents a dichotomous variable. Weighted averages that comprise the indices for "medium" values include ordinal data only. Dichotomous is a variable that consist of data that are not continuous.

Ordinal means that the data collected have two or more categories, but there is no intrinsic ordering to the categories.

[b] The exact tests were done separately for each type of data. For example, the regulatory driver index is comprised of three dichotomous variables and two ordinal variables. To evaluate this index, each of the five drivers were tested individually, and then two joint tests were performed, one for the ordinal drivers and one for the dichotomous drivers. Similar tests were performed for the social, external, and internal driver indices. In contrast, because the variables that comprise the market and resource driver indices are ordinal, only one joint test was performed for each of them. While employing two types of exact tests for some of the indices creates difficulties in interpreting the results, the nature of the data required that the tests be separated.

Table 8: Results. Source: Darnall, Nicole. Signaling "Green": The Influence of Institutional and Organizational Pressures on Facilities' Environmental Strategies. 2 November 2004. http://www.eli.org/isopilots/NDEMS2000Compendium.pdf

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Organizations reported that they experienced internal gains such as managerial benefits, increased productivity and shareholder appreciation, through the adoption of ISO 9000 certification. Moreover, organizations rated operational and organizational improvements as important noticeable improvements. Next to internally oriented reasons, externally oriented reasons are very important in influencing the decision of an organization to continue certification.

In the second study by Nicole Darnall, a total of 39 facilities in the United States were evaluated based on the basis of a survey. The structural model behind the questionnaire contained four external drivers (regulatory drivers, market drivers, resource drivers and social drivers) and four internal drivers (management system capability, environmental management capability, resource capability and organizational culture).

It should be noted that the sample of organizations involved in the study is very small and that the results cannot be generalized. In the study, the organizations were categorized into three groups because the motivations of organizations to adopt EMS vary based on their business types. The results of the responses of the participating organizations are shown in Table 8.

The results of the statistical analysis show that internal drivers have a greater impact on all types of organizations' decisions to seek ISO 14001 certification than external driver indices. Hence, it seems that the organizations of the United States sample are more concerned about their internal management capabilities in deciding whether to adopt an EMS. Among all internal drivers, organizational culture and resources capability are the most powerful factors effecting the decisions of organizations to adopt an EMS. The management system capabilities are important both for publicly traded and privately owned organizations because the pre-existing capabilities create a basis for the organizations to adopt and maintain the EMS.

Within the group of external drivers, regulatory pressures have the greatest influence on the decisions of organizations to seek ISO 14001 certification. Most organizations in the sample consider regulatory pressure as medium to highly influential in their decision to seek ISO 14001 certification. Market drivers are more relevant to publicly traded and privately owned organizations: 50 and 43 percent of these organizations reported that such market drivers

are medium to highly influential in their decisions to seek ISO 14001 certification [11]. For privately owned and government organizations, government assistance programmes play an important role in the facility's decision to adopt ISO 14001. This might due to the fact that most privately owned and government organizations in the sample have limited human resources, knowledge and financial support to seek ISO certification. Furthermore, all three types of organizations reported that cost reduction was relevant in their decisions to seek ISO 14001 certification. Among all the external drivers, social drivers are the least influential factor on all types of organizations to seek ISO 14001 certification.

Summary of Findings

This section shows that organizations are affected by various factors to seek ISO 9001 and ISO 14001 certification and that these factors can be categorized into internal and external drivers. The results of the studies vary widely and it is not easy to find communalities except for a few general statements about the importance of the various drivers for decisions about seeking certification of International Management Standards. In practice, each organisation has its own set of motivations or drivers for obtaining the required certificates and there is neither uniform theory nor a decision-making model to generalize these motivations and drivers. Hence, authors tend to develop their own theories and models and try to verify them empirically. This was also our intention when we set up a survey of the automotive industry in Saxony.

Certification in the Automotive Industry in Saxony

In view of the survey of the literature, a survey was made about the issue in the automotive industry in Saxony. The reasons for selecting this industry and the region were the following ones:

(1) This industry is growing relatively fast since German reunification when it was completely restructured.

(2) The awareness about certificates in the industry can be assumed to be high.

(3) The industry is grouped into several tiers in dependence of the supplier-client relationship and it is known that customers want their suppliers to be certified.

The survey was based upon a questionnaire which was sent to 471 companies known to be listed in the automotive sector. The addresses were drawn from a database known as *CarNet – Automobilzulieferer Sachsen*. Of these companies, 102 received the e-mails. Moreover, two co-authors spent a day at the 2006 AMITEC Trade Fair for the automotive supply sector in Leipzig and personally interviewed responsible persons from exhibiting companies.

The main focus of the survey was on an issue which has not yet been covered in the literature so far: the need for consultancy services for installing management systems and having them certified according to International Standards. This new focus explains the structure of the questionnaire (which is attached in an appendix). The first part contains questions to the existing situation with respect to certificates owned by the respondents and their importance as seen by the respondents (assessed on a one to five point scale). Table 9 contains some information about the standards included in the questionnaire:

Short Name of the Standard	Short Description	Issuing Organisation
ISO 9001:2000		ISO
ISO 14001:2004		ISO
ISO/TS 16949:2002		ISO
VDA 6.1		VDA
EMAS II		European Union

Table 9: Some Information about the Standards Included in the Questionnaire. Source: Prepared by the authors

Some questions address the importance of so-called stakeholders with respect to seeking certification. The most important part covers the characterisation of the consultancy organisations and the consultant himself. Since many organisations offer student internships for practical work during the installation of managements systems, this issue was also addressed. Finally, indications about firm size, the level in the automotive chain (the so-called tier level) and the legal status (independent company, parent company, daughter company) were covered.

The response rate was very low – as expected - but the answers given by the respondents turned out to be very stable, in the sense that little variation was discovered. This indicates that there exists a certain pattern with respect to the status and the importance of management standards and their certificates in the automotive

industry surveyed. The answers to the questions are graphically represented in charts and some of the interesting results are reported here. The reporting follows the structure of the questionnaire.

In order to improve the visual aspects of the charts, the one to five point scale was transformed into a 1 to 9 scale according to the following key:

- Absolutely not important   – 1
- Not important   – 3
- Depends   – 5
- Important   – 7
- Very important   – 9

Importance of certificates and actual certification

The total scores with respect to the importance as shown in Figure 8 (and subsequent figures) are calculated as the weighted average of the individual scores.
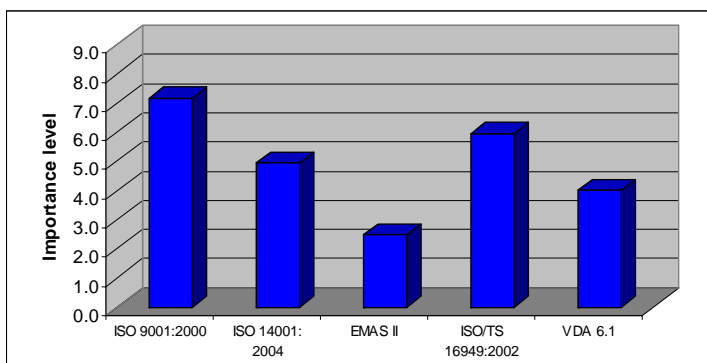
Figure 8: Importance of Certificates for the Companies

Obviously, ISO 9001:2002 is the most important standard, followed by ISO/TS 16949:2002. It should be noted that EMAS II is far less important than ISO 14001:2004.

Plottings of the individual companies with respect to their estimations of the levels of importance of ISO 9001:2000 and ISO 14001:2004 and of ISO 14001:2004 and ISO/TS 16949:2002 show that there is a positive correlation. Companies which tend to appreciate one of these standards also appreciate the other standard within the pair. See Appendix II for details. A comparison of Figures 8 and 9 shows that the differences among the levels of importance are smaller than the differences among the percentages of certificates obtained. Obviously, companies have a higher esteem for the certificates than their real efforts to obtain them.
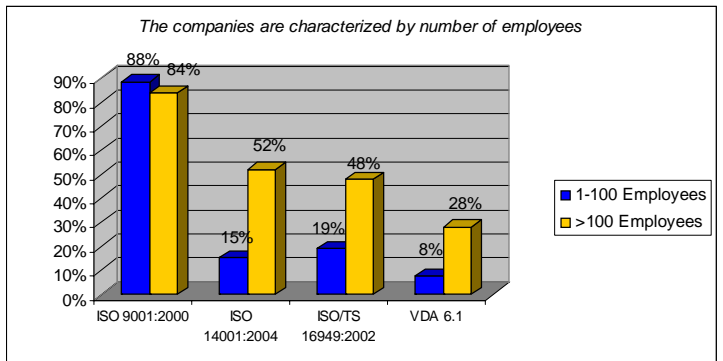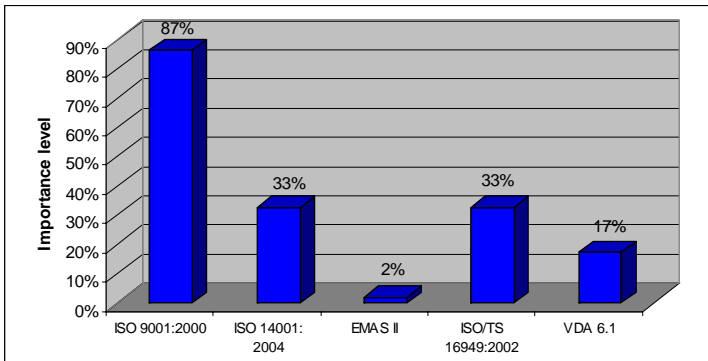
Figure 9: Percentages of Companies Certified According to the Standards

Figure 10 presents the impact of the various stakeholders on the motivation to obtain certificates as seen by the responding companies.
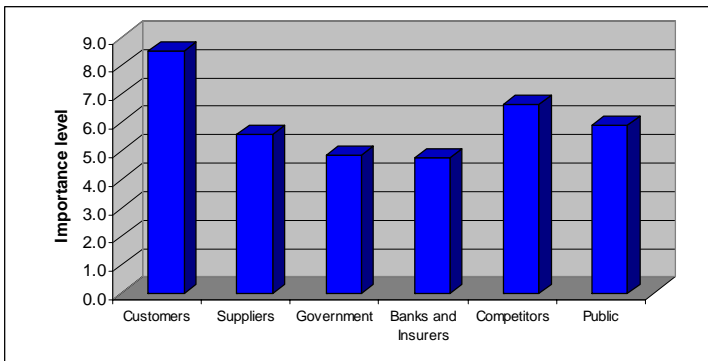
Figure 10: Influence of Stakeholders for the Motivations of Companies to be Certified

From Figure 10, it can be seen that the most important stakeholders are the customers and the competitors.

Given the very low importance of EMAS II, this standard is no longer considered in the rest of the paper.

Figures 11, 12 and 13 and 14 represent the same results as Figures 8 and 9 but differentiated according to the size of the companies as identified by the number of staff and the amount of annual turnover respectively.
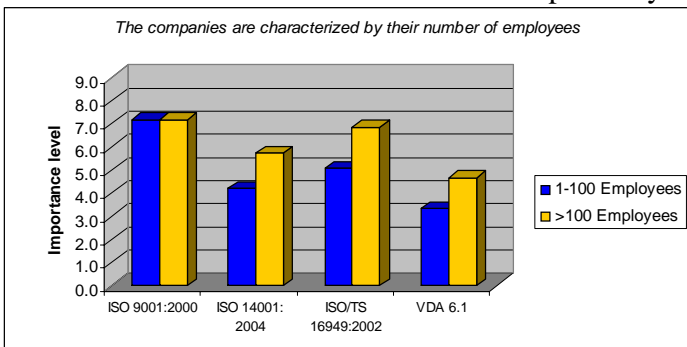
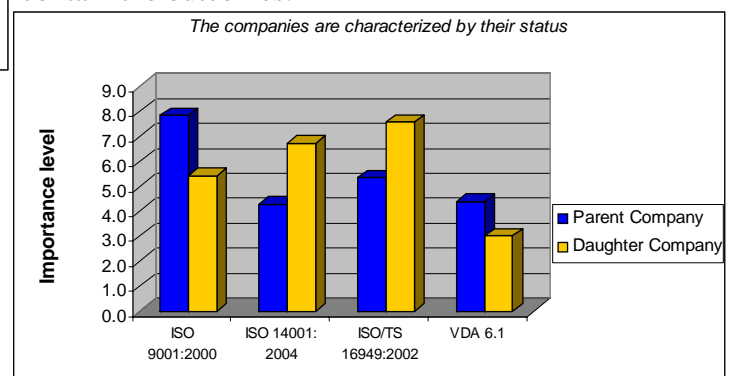*Figure 11: Importance of Certificates for Small and Large Companies*

Figure 12: Percentages of Companies Certified according to the Standards by Number of Employees

Figures 11 and 12 show that, in an aggregated form:
-   The general tendencies shown in Figures 8 and 9 for the entire sample are confirmed: ISO 9001:2000 is the most important standard followed by ISO/TS 16949:2002. Moreover, there seems to be a difference between the "reality" and the desired "reality" as indicated by the levels of importance.
-   ISO 14001:2004 and ISO/TS 16949:2002 are more important for larger companies than smaller ones.
-   The difference between the "reality" and the desired "reality" is larger for the smaller companies than for the larger companies.

However, if individual companies are plotted against the score reflecting the levels of importance of the three most common standards (ISO 9001:2000, ISO/TS 16949:2002 and ISO 14001:2002, there is no outspoken difference between small and large companies. The results of these plots are shown in Appendix III.
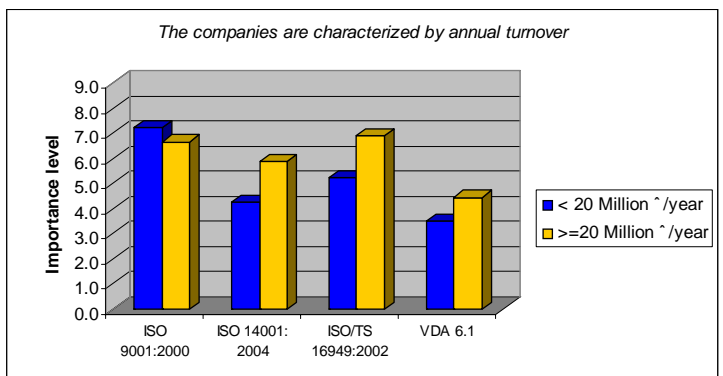
Figure 13: Importance of Certificates for Companies by Annual Turnover
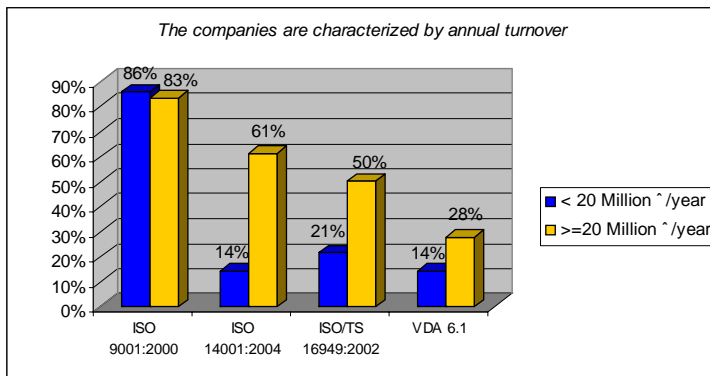
Figure 14: Percentages of Companies Certified according to the Standards by Annual Turnover

Taking annual turnover as the criterion for distinguishing between larger and smaller companies, the outcomes are similar to those represented in Figures 11 and 12.

A third dimension by which distinctions can be made among companies relates to the position in the supply chain. We distinguish among OEM (Original Equipment Manufacturers and Tier 1, Tiers 2, 3 and 4 and the so-called indirect suppliers. Indirect suppliers cannot be exactly classified within the chain, but are important partners. Examples are manufacturers and suppliers of machinery, tools and equipment and consultancy firms. Figures 15 and 16 show the outcomes.
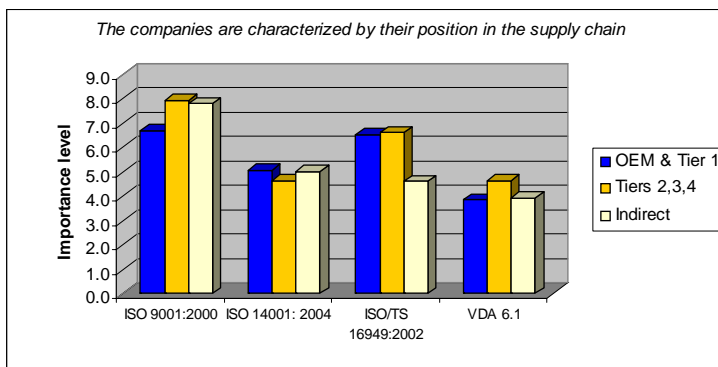
Figure 15: Importance of Certificates for Companies by their Position in the Supply Chain

Figures 15 and 16 reveal some interesting outcomes.

- ISO 9001:2000 is important for the entire supply chain, including indirect suppliers. Moreover, over 80 % of the responding companies are certified according to the standard.

- ISO/TS 16949:2002 is a bit more important for Tiers 2, 3, 4 than for OEMs and Tier 1, but there is a gap between the desired "reality" and the "reality" for Tiers 2,3 and 4. For the indirect suppliers, ISO/TS 16949:2002 is reported as not important. As a consequence, only a few indirect suppliers are certified according to this standard.

- Similar differences between the "desired "reality" and the "reality" can be observed for the standards ISO 14001:2004 and VDA.1 but these were not considered to be important (with the exception of ISO 14001:2004 for the OEMs and Tier 1 lower in percentage
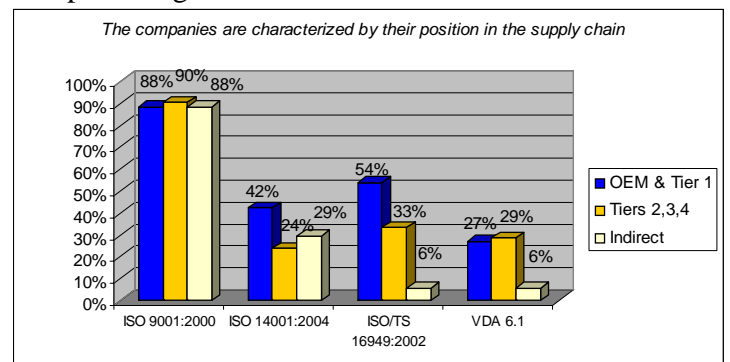
Figure 16: Percentages of Companies Certified according to the Standards Based on their Position in the Supply Chain

The last characteristic in this survey for classifying the companies is their status as "daughter" companies or "parent" companies. The motivation for making the distinction relates to the assumption that parent companies can make their own decisions, including those to adopt a standard and seek certification for it, whereas daughter companies can be ordered by their parent companies to seek such certifications. In the survey, if a company is not a daughter company, it is considered a parent company. Figures 17 and 18 contain the outcomes.

Figure 17: Importance of Certificates for Companies Based on their Status

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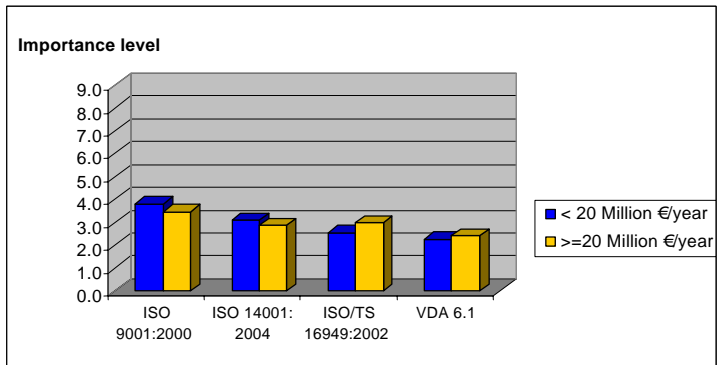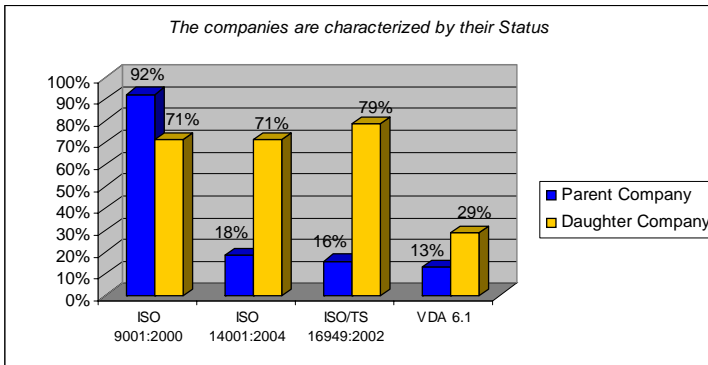
Figure 18: Percentages of Companies Certified according to the Standards Based on their Status

Figures 17 and 18 reveal that there are striking differences between the parent companies and the daughter companies, in particular with respect to the importance of ISO 14001:2004 and ISO/TS 16949:2002 and the percentages of certification of these standards.

Another result, which is more puzzling, can be deducted form a comparison with the outcomes of Figures 15 and 16 dealing with the classification of companies along the supply chain.
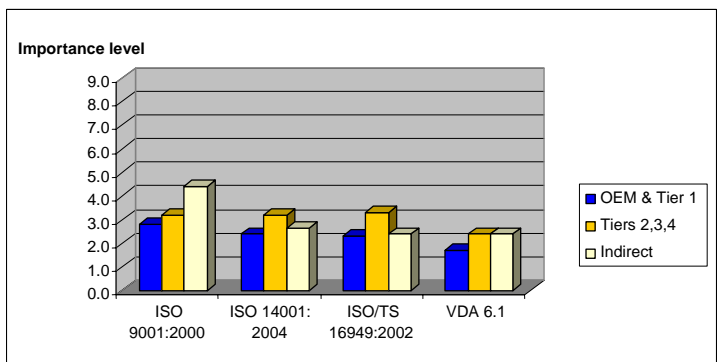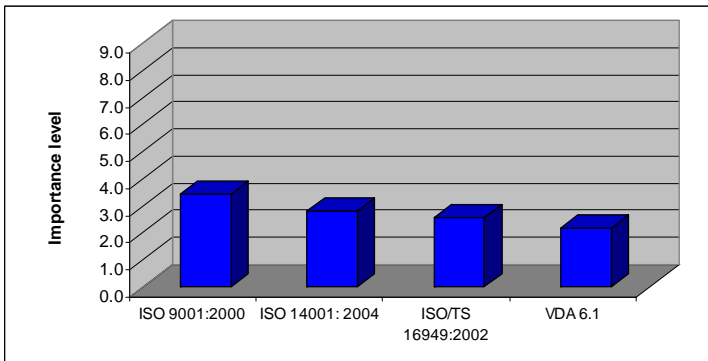
Figure 19: Importance of Consultancy for Companies

Figure 20: Importance of Consultancy for Companies by Number of Employees

Figure 21: Importance of Consultancy for Companies by Annual Turnover

Figure 22: Importance of Consultancy for Companies by their Position in the Supply Chain

Figure 23: Importance of Consultancy for Companies by their Status

Certification activities and consultancy services

One intention of the survey consisted in finding out whether companies need consultancy services for their certification activities. The general tendency of the outcomes is that consultancy services are not considered important. Figures 19, 20, 21, 22 and 23 contain more details.

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The survey also contained questions about the importance of sources of information used to find consultancy services and about the importance of the qualifications of the individual consultants as persons working with the companies. Figure 24 reveals that there is only one source of information which is considered to be important for finding a consultancy service, i.e. personal contacts. Figure 25 shows that, for the individual consultants, i.e. the person ultimately assisting the companies, all characteristics represented in the questionnaire were considered to be important. The two most important characteristics are a good reputation with others ("being recommended") and experience ("experienced team"). Being available and good time management are the second most important characteristics. Hence, even though the responding companies do not see a high importance for working with consultancy services, they have very dedicated opinions about the characteristics and the requirements of the members of consultancy services they want to work with.
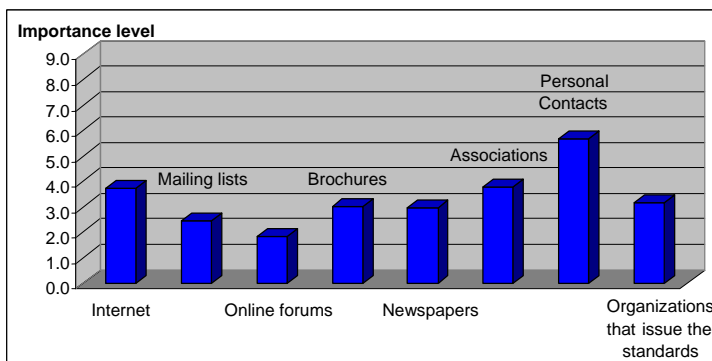
Figure 24: Importance of Information Sources to Find a Consultation Body
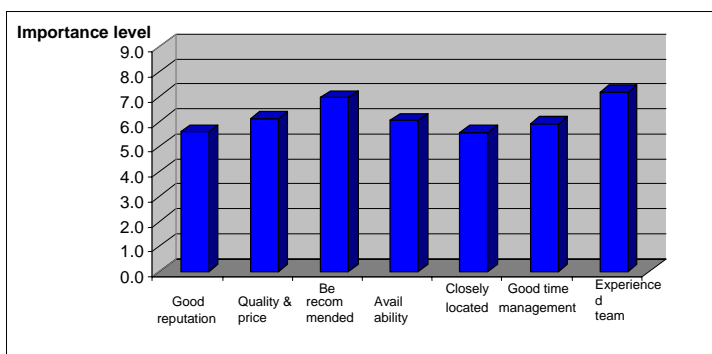
Figure 25: Importance of the Qualifications of Consultants

Since, in addition to professional consultancy service, companies also advertise internships for student of appropriate educational programmes to help them with setting up, installing and maintaining managements

systems according to International Standards, a few questions on the importance and the qualifications of such students were being asked. Figures 26 and 27 contain some results.
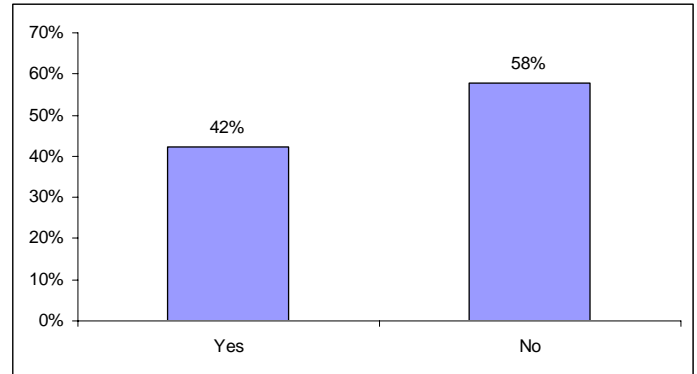
Figure 26: Potential Involvement of Students in Work on Management by International Standards in Companies
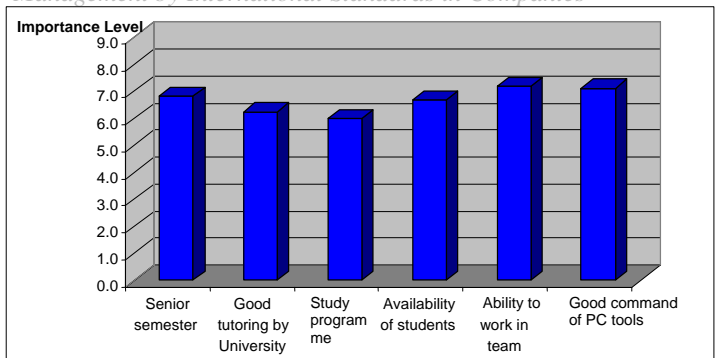
Figure 27: Importance of the Qualifications of Students

Whilst the shares shown in Figure 26 may be biased, given the size of the sample, the results in represented Figure 27 seem to be very plausible.

Conclusions and outlook

The first two sections in this paper show that organizations are affected by various factors to seek ISO 9001 and ISO 14001 certification and that these factors can be categorized into internal and external drivers. The results of the studies vary widely and it is not easy to find communalities except for a few general statements about the importance of the various drivers for decisions about seeking certification of International Management Standards. In practice, each organisation has its own set of motivations or drivers for obtaining the required certificates and there is neither uniform theory nor a decision-making model to generalize these motivations and drivers. Hence, authors tend to develop their own theories and models and try to verify them empirically. This was also our intention when we set up a survey of the automotive industry in Saxony.

The survey was based upon a questionnaire which was sent to 471 companies known to be listed in the automotive sector. The addresses were drawn from a database known as *CarNet – Automobilzulieferer Sachsen*. Of these companies, 102 received the e-mails. Moreover, two co-authors spent a day at the 2006 AMITEC Trade Fair for the automotive supply sector in Leipzig and personally interviewed responsible persons from exhibiting companies.

One focus of the survey is to identify the trend of certification in Saxony's automotive supplier industry, ISO 9001 is perceived as the most important standard for the entire supply chain. Almost 90% of the companies are certified. However, the case is different for ISO/TS 16949 and ISO 14001. Despite the perceived importance of ISO/TS 16949 and ISO 14001, the efforts to seek for certification have not been reflected from the number of certified companies. The gap is larger for smaller companies than for larger companies. One identified factor which contributes to the gap is the status of the companies. Daughter companies seem to seek for certification more than independent or parent companies. Further research is needed to find the cause of this gap. As for motivations, the study of the literature revealed the existence of a survey in the automation industry regarding motivations which showed that the influence of customers is important. This corresponds with our findings.

Another focus of the survey was on the need for consultancy services for installing management systems and having them certified according to International Standards. We discovered that most companies assume consultancy services as less necessary. Further research is needed to reveal the reason of the companies for this tendency. In the case that the companies need a consultant, recommendation from personal contact and the experience of the consultant team are the key issues for selecting one. The companies have very dedicated opinions about the characteristics and the requirements of the consultant team members with whom they want to work with.

Notes

1. The studies listed in Table 1 are chosen from publications available on the internet websites. These studies place a special focus on the evaluations of the quality and environmental effects of Quality Management Systems (QMS) and Environmental Management Systems (EMS).

2. Countries involved in the survey are Australia, Canada, France, Hong Kong, Indonesia, Japan, Republic of Korea, Malaysia, New Zealand, Philippines, Singapore, Sweden, Taiwan, Thailand and United States.

3. The certification of ISO 9001:2000 started in 2000 and organizations were given a time period of three years up to 15 December 2003 for the transition from the 1994 version of ISO 9001, ISO 9002 and ISO 9003 standards to ISO 9001:2000. Therefore, the data for 2000 include organizations that are certified according to ISO 900:1993 and ISO 9001:2000.

4. Australia and New Zealand are combined under the abbreviation ANZ, while Indonesia, Malaysia, Philippines, Singapore and Thailand are combined under the abbreviation SEA. See also Table 3.

5. In some countries, respondents have a tendency to report high scores across the board, while respondents in other countries tend to be more modest. To correct the differences of scores across the board, the "relative motivations" are computed, by dividing each respondent's score for each motivation by the sum of the scores for all motivations for that respondent. Through this method, for each respondent, all motivations must add up to 1.

6. The motivations listed in the questionnaires are competitive advantage, requirements of the parent organization, customer requirements, legislation, employee initiative, financiers' requirements and others.

7. A large transnational corporation (TNC) or multinational corporation (MNC) is often very large and active in the international market. Normally it will have a lot of affiliates in foreign countries and the management of the affiliates is centralized in one country. Examples of TNCs are Siemens, Microsoft, General Motors, Daimler Chrysler and Toyota.

Page 19   Adoption of Management Systems   Jan C. Bongaerts et al.
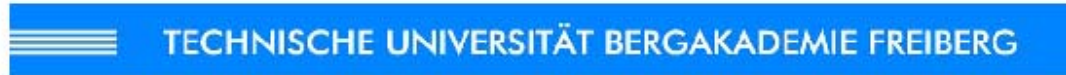
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8. Most organizations tend to adopt ISO 9000 standards in advance than ISO 14000 standards since ISO 9000 standards are introduced much earlier than ISO 14000 standards. This might be one of the main reasons why organizations tend to take a longer time on average in the implementation of ISO 9000 due to lack of initial experience with standards.

9. According to the European Union (1996), SMEs are defined as enterprises which have fewer than 250 employees and have either an annual turnover not exceeding ECU 40 million, or an annual balance sheet total not exceeding ECU 27 million. In the United States, SMEs are defined as enterprises which have fewer than 500 employees in the category of manufacturing or less than US$ 5 million sales for non-manufacturing enterprises.

10. The term "facility" is used by the authors of the survey. Large organizations especially TNCs, tend to have many business units and not all business units are seeking certification. Therefore, questionnaires were sent to the top management of individual facilities that were seeking for ISO certification. According to the definition of ISO standards, the term "organization' refers to company, corporation, firm, enterprise, authority or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration. Therefore, for large TNCs with more than one business unit, a single unit may be defined as an organization.

11. The internal and external factors are obtained from the questionnaires listed in Table 1.

12. In most studies, pressures from parent organizations are classified as internal drivers to seek ISO certification. Some authors tend to classify pressures from parent organizations as external driver to seek ISO certification due to the differences in internal management policies between business units within the same organization.

13. The ISO 9000 series mentioned in the study is the old version of 1994. The certification of ISO 9001:2000 started in 2000 and organizations were given a time period of three years up to 15 December 2004 for the transition from 1994 version of ISO 9001, ISO 9002 and ISO 9003 standards to ISO 9001:2000.

14. Total quality management (TQM) is a management approach that tries to achieve and sustain long-term organizational success by encouraging employee feedback and participation, satisfying customer needs and expectations, respecting societal values and beliefs, and obeying governmental statutes and regulations. Moreover, TQM includes application of quantitative methods such as Kaizan, Poka Yoke, Six Sigma and others to improve the materials and services supplied to and by an organization, all the processes within the organization, and the degree to which the needs of the customer are met.

15. NDEMS is a joint initiative of the University of North Carolina at Chapel Hill and the Environmental Law Institute. It was supported by the United States Environmental Protection Agency (EPA) in cooperation with the Multi-State Working Group on Environmental Management Systems (MSWG), ten state environmental agencies, and approximately 60 businesses and other organizations that have agreed to share data with it.

16. In the study, Brown and Van der Wiele had classified pressures from headquarter to adopt ISO 9000 series certification as external pressure although in many cases, pressures from headquarter are classified as internal pressure to seek certification.

17. The questionnaire is based on a five point scale with 1 standing for 'not relevant' and 5 referring to 'very important'.

18. The number of items is related to numbers of listed answers available for each question stated in the questionnaire where organizations have to choose based on a five point scale. For an example, five listed answers for "internal oriented reasons" include to maintain discipline, to improve company efficiency, to bring together various systems in the company, to help develop a culture change and as a basic for business improvement. Organizations have to choose one of these answers based on its level of influence onto individual organizations. The number of items is important as it is one of the main correlations in the Cronbach's alpha calculation.

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19. The 'mean' data are used to calculate the standard deviation in order to determine the range of the results in the mean set of data.
20. In the survey, Cronbach's alpha is used to measure how well a set of items or variables measure a single dimensional latent construct. Cronbach's alpha is low if the data have a multi-dimensional structure. It should be noted that Cronbach's alpha is a coefficient of reliability and not a statistical test.

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Appendix I
Questionnaire

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Professur für Umwelt- & Ressourcenmanagement

WISSENSCHAFTLICHE UNTERSUCHUNG ZUR ZERTIFIZIERUNG VON MANAGEMENTSYSTEMEN

1. Bedeutung der Managementsystemzertifizierung

1.a. Ist es wichtig für Ihr Unternehmen durch ein Managementsystem zertifiziert zu sein?
☐ Ja   ☐ Nein

1.b. Ist Ihr Unternehmen bereits zertifiziert?
☐ Ja   ☐ Noch nicht

1.c. Welche Zertifikate hat Ihr Unternehmen bereits erhalten? *(Mehrfachnennungen möglich)*

1.	ISO 9001:2000	☐
2.	QS 9000	☐
3.	ISO 14001:1996	☐
4.	ISO 14001:2004	☐
5.	EMAS II	☐
6.	ISO/TS 16949:2002	☐
7.	VDA 6.1	☐
8.	VDA 6.2	☐
9.	VDA 6.4	☐
10.	OHSAS 18001: 1999	☐

1.d. Welche Bedeutung haben die folgenden Gruppen für die Motivation und Entscheidung Ihres Unternehmens, sich zertifizieren zu lassen?

	sehr wichtig	wichtig	offen, ob wichtig oder nicht	weniger wichtig	überhaupt nicht wichtig
Kunden	☐	☐	☐	☐	☐
Lieferanten	☐	☐	☐	☐	☐
Behörden	☐	☐	☐	☐	☐
Banken und Versicherungen	☐	☐	☐	☐	☐
Wettbewerber	☐	☐	☐	☐	☐
Öffentlichkeit	☐	☐	☐	☐	☐
....	☐	☐	☐	☐	☐

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1.e. Wie oft benutzt Ihr Unternehmen die folgenden Medien, um Informationen über die Managementsystemzertifizierung zu sammeln?

	immer	sehr häufig	häufig	selten	nie
Internet	☐	☐	☐	☐	☐
Adressenlisten	☐	☐	☐	☐	☐
Onlineforen	☐	☐	☐	☐	☐
Broschüren	☐	☐	☐	☐	☐
Zeitschriften	☐	☐	☐	☐	☐
Fernsehen	☐	☐	☐	☐	☐
Verbände	☐	☐	☐	☐	☐
Persönliche Kontakte	☐	☐	☐	☐	☐
Organisation, die die Norm veröffentlicht (z.B: ISO)	☐	☐	☐	☐	☐

Sonstiges :

....
....
....

1.f. Wie wichtig sind die folgenden Zertifikate für Ihr Unternehmen?

	sehr wichtig	Wichtig	offen, ob wichtig oder nicht	weniger wichtig	überhaupt nicht wichtig
ISO 9001:2000	☐	☐	☐	☐	☐
QS 9000	☐	☐	☐	☐	☐
ISO 14001:2004	☐	☐	☐	☐	☐
EMAS II	☐	☐	☐	☐	☐
ISO/TS 16949:2002	☐	☐	☐	☐	☐
VDA 6.1	☐	☐	☐	☐	☐
VDA 6.2	☐	☐	☐	☐	☐
VDA 6.4	☐	☐	☐	☐	☐
OHSAS 18001	☐	☐	☐	☐	☐

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2. **Hilfe und Berater**
2.a. Braucht Ihr Unternehmen Beratungsleistung, um die folgende Zertifikate zu erhalten?

	ja, sehr	ja	im Einzelfall zu prüfen	wohl eher nicht	nein, sicherlich nicht
ISO 9001:2000	☐	☐	☐	☐	☐
QS 9000	☐	☐	☐	☐	☐
ISO 14001:2004	☐	☐	☐	☐	☐
EMAS II	☐	☐	☐	☐	☐
ISO/TS 16949:2002	☐	☐	☐	☐	☐
VDA 6.1	☐	☐	☐	☐	☐
VDA 6.2	☐	☐	☐	☐	☐
VDA 6.4	☐	☐	☐	☐	☐
OHSAS 18001	☐	☐	☐	☐	☐

2.b. Wenn Ihr Unternehmen überlegt, eine Unternehmensberatung in Anspruch zu nehmen, wie wichtig sind die folgenden Überlegungen?

	sehr wichtig	wichtig	offen, ob wichtig oder nicht	weniger wichtig	überhaupt nicht wichtig
Unternehmensberatung hat vollständige Information über die Elemente der Norm	☐	☐	☐	☐	☐
Kompetenz bei der Einschätzung des Aufwands bis zur Zertifizierung	☐	☐	☐	☐	☐
Kompetenz bei der Erstellung eine Kostenvoranschlags	☐	☐	☐	☐	☐
Kompetenz einer Einschätzung des Zeitplans bis zur Zertifizierung	☐	☐	☐	☐	☐
Erfüllung des Zeitplans	☐	☐	☐	☐	☐

Sonstiges :

....

....

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2.c. Woher erhält Ihr Unternehmen Informationen über verfügbare Unternehmensberater?

	immer	sehr häufig	häufig	selten	nie
Internet	☐	☐	☐	☐	☐
Adressenlisten	☐	☐	☐	☐	☐
Onlineforen	☐	☐	☐	☐	☐
Broschüren	☐	☐	☐	☐	☐
Zeitschriften	☐	☐	☐	☐	☐
Verbände	☐	☐	☐	☐	☐
Persönliche Kontakte	☐	☐	☐	☐	☐
Organisation, die die Norm veröffentlicht	☐	☐	☐	☐	☐

2.d. Wie wichtig sind die folgenden Merkmale für Ihr Unternehmen, sich für eine bestimmte Unternehmensberatung zu entscheiden?

	sehr wichtig	wichtig	offen, ob wichtig oder nicht	weniger wichtig	überhaupt nicht wichtig
Reputation der Unternehmensberatung	☐	☐	☐	☐	☐
Preis der Beratungsleistung	☐	☐	☐	☐	☐
Referenzen des Beraters	☐	☐	☐	☐	☐
Verfügbarkeit des Beraters	☐	☐	☐	☐	☐
Geografische Nähe des Beraters	☐	☐	☐	☐	☐
Zeitplanung- und Zeitmanagement für das Beratungsprojekt	☐	☐	☐	☐	☐
Erfahrung des Beraters bei Zertifizierungsprojekten	☐	☐	☐	☐	☐

2.e. Ist es in Ihrem Unternehmen üblich bzw. möglich, für die Vorarbeiten für die Zertifizierung auch studentische Praktika und studentische Projekte zu vergeben?
☐ Ja   ☐ Nein

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2.f. Wenn Ihr Unternehmen sich entscheidet, für die Vorarbeiten der Zertifizierung studentische Praktika und studentische Projekte zu vergeben, welche Anforderungen sind wichtig?

	sehr wichtig	wichtig	offen, ob wichtig oder nicht	weniger wichtig	überhaupt nicht wichtig
Fortgeschritten im Studium	☐	☐	☐	☐	☐
Gute Betreuung durch die Hochschule	☐	☐	☐	☐	☐
Studiengänge der Studierenden	☐	☐	☐	☐	☐
Verfügbarkeit der Studierenden vor Ort	☐	☐	☐	☐	☐
Teamfähigkeit	☐	☐	☐	☐	☐
Guter Umgang mir PC-Tools	☐	☐	☐	☐	☐

Ihre Anmerkungen zu weiteren Anforderungen an Studierenden können Sie hier vermerken:

....
....
....

3. Unternehmensprofil

3.a. Welche Position haben Sie in Ihrem Unternehmen?

....

3.b. Ist Ihr Unternehmen selbständig oder ein Tochterunternehmen?
☐ Selbständiges Unternehmen   ☐ Tochterunternehmen

3.c. Wie viele Mitarbeiter hat Ihr Unternehmen?

....

3.d. Wie hoch ist der Jahresumsatz Ihres Unternehmens?

.... €

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3.e. Zu welcher Stufe in der Automobilindustrie gehört Ihr unternehmen? Bitte kreuzen Sie das betreffende Kästchen an und benennen Sie Ihre Produkte. *(Mehrfachnennungen möglich)*

OEM	☐	....
Tier 1 *(OEMs Lieferant)*	☐	....
Tier 2 *(Tier 1 Lieferant)*	☐	....
Tier 3 *(Tier 2 Lieferant)*	☐	....
Tier 4 *(Tier 3 Lieferant)*	☐	....
Nicht direkt Lieferant	☐	....
Keine Lieferant	☐	....

3.f. Sind Sie an eines Kurzfassung der Ergebnisse unserer Studie interessiert?
☐ Ja   ☐ Nein

Bitte geben Sie Ihre Kontaktdaten ein.
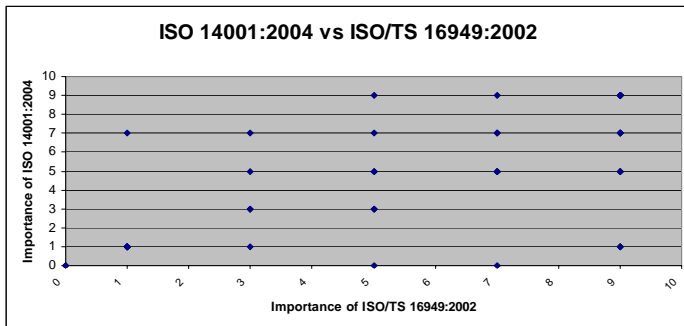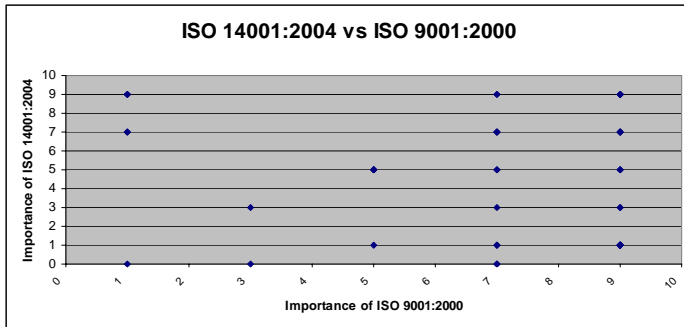
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Appendix II

Level of Importance of ISO 14001:2004 and ISO 9001:2000 and of ISO 14001:2004 and ISO/TS 16949:2002

ISO 14001:2004 vs ISO 9001:2000

ISO 14001:2004 vs ISO/TS 16949:2002

Appendix III

Level of Importance of ISO 9001:2000, ISO/TS 16949:2002 and ISO 14001:2002 by Company

ISO 9001:2000

ISO/TS 16949:2002

ISO 14001:2004