Implementation of Quality Management System with ISO 22000 in Food Italian Companies

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Abstract

The worldwide implementation of Quality Management System (QMS) has increased significantly during the last few years. ISO 22000 certification demonstrates the ability of an organization to implement a Food Safety Management Systems (FSMS). This paper analyzes the benefits gained and the obstacles encountered by Italian companies when implementing ISO 22000 standards, and considers the effects of Company size and years of certification on the outcome. The research was carried out using a sample of 180 Italian food Companies interviewed. The sample considered in the present study is constituted by Companies in the Italian food industry certified for at least 2 years. The respondents were all qualified as Quality Control / Assurance Manager. Data were elaborated through SPSS 22.0 Statistical Software Package. The main benefits derived from the application of this standard are both external and internal: ISO 22000 improves commercial opportunities and internal procedure; the main obstacles to implementation are perceived particularly by Micro-Small Companies at the beginning phase of certification and they are related to changes in internal organization and the costs involved in certification.

Keywords: *ISO 22000, management system, quality assurance, food safety.*

1. Introduction

The implementation of international standards constitutes a necessary element for competitiveness. Hudson and Orviska (2012) note that the adoption of international standards may be required for entry into certain markets, especially in the European Union Countries (Djordjevic *et al*., 2011). Retailers often impose their own quality standards on suppliers (Fulponi, 2006). In this way, private standards in agri-food sector, have increased in importance, often becoming more complex and stringent than government standards (Hamoudi *et al*., 2009).

Competitiveness entails the adoption of new marketing strategies by food Companies. Thus, the number of food Companies that are adopting quality assurance systems to improve their competitiveness in the global market is continually increasing (Karipidis *et al*., 2009). In fact, Food Safety and quality standards are key prerequisites to maintaining and improving the reputation of a Company. Furthermore, retailers are moving in the direction of a harmonization of Food Safety standards (Fulponi, 2006).

The competitiveness of food Companies in national and international markets depends, in fact, on their ability to adopt production processes, which meet the Food Safety and quality requirements (Holleran *et al*., 1999). Efstratiadis and Arvanitoyannis (2000) argue that HACCP should be a part of the Total Quality System, because it encourages training and creates an environment of cooperation between the management and the personnel. The implementation of quality assurance systems in the global food market improves the competitiveness of Companies (Karipidis *et al*., 2009). Assurance systems play an essential role in Food Safety and quality control. Fotopoulos *et al*. (2010) analyze the implementation of QMS with ISO 9001 in food industry; results showed that the major reasons for certification concern the internal business environment and then the external one and no particular difficulties were observed during the standard implementation. Psomas *et al*. (2014) argue that food companies should realize the leading role of the "soft" aspect of total quality management and the supporting role of the "hard" aspect in maximizing the quality management benefits and as a consequence in withstanding the current economic downturn.

Kheradia and Warriner (2013) argue that implementing operational and physical controls had a positive impact on the food safety and QMS. The "human factor" strongly impacts the implementation of a HACCP system; for example, a high turnover of staff constitutes a great barrier to HACCP efficiency (Casolani and Del Signore, 2016). Food Safety is a fundamental public health issue. An increasing number of food Companies have been implementing Food Safety Management System (FSMS) with the aim of improving the quality and safety of their products. Customer care, healthy and safe food are the conditions that modern business requires (Djordjevic *et al*., 2011). Food Safety has become one of the most important issues influencing national and international business (Aggelogiannopoulos *et al*., 2007). A safety assurance system is required at each step of food production (Trienekens and Zuurbier, 2007).

The implementation of FSMS and its certification are an important strategy to ensure Food Safety in the public and private spheres (Souza-Monteiro and Anders, 2009). Among the constraints identified in the literature related to Food Safety standards implementation are: high establishment cost and insufficient financial support (Aggelogiannopoulos *et al*., 2007; Teixeira and Sampaio, 2011; Herath and Henson, 2010; Tunalioglu *et al*., 2012), absence of international market expectations

(Tunalioglu *et al*., 2012), uncertainty of the potential benefits of the system (Bas *et al*., 2007; Herath and Henson, 2010), lack of consumer awareness of the usefulness (Khatri and Collins, 2007; Tunalioglu *et al*., 2012) and inadequate support from the authorities (Bas *et al*., 2007).

A science based approach to Food Safety is founded on understanding the nature of hazards in food and the way to control them. Without a scientific approach, interventions may fail to properly assess the hazards that pose the greatest risks to health (Adams and Motarjemi, 1999).

ISO 22000:2005 standard requirements are used for the selection and assessment of control measures, while conducting hazard analysis and assessment. To conduct hazard analysis, proper planning is required to determine which hazards need to be controlled (ISO 22000:2005). ISO 22000 shares the following common elements with other management system standards: policy, planning, implementation and operation, performance assessment, improvement, and management review (Surak, 2007). Faegermand (2008) maintains that ISO 22000 completes, complements and reinforces the effectiveness of a HACCP system by adding emphasis to traceability and interactive communication. Consequently, this standard implements the FSMS. An important discriminating factor of FSMS implementation is the type of business: Mortlock *et al*. (1999) have found a higher degree of food safety system adoption by food industries than by retailers in the UK. Focusing on Food Companies, many studies have analyzed the impact of FSMS implementation with various standards, among which ISO 22000 (e.g. Bilalis *et al*., 2009; Teixeira and Sampaio, 2011). Vladimirov (2011) analyzed the implementation of FSMS in Bulgaria; his findings revealed that FSMS implementation is hindered by some infrastructural difficulties and perceived negative effects of the official control.

Certification is nowadays an important tool to improve FSMS; a survey of the scientific literature revealed that there is a scarcity of research on the effects of the variables of company size and length of time of ISO 22000 certification in relation to the perception of the benefits and obstacles connected with ISO 22000 application in the food sector. The aim of this study is to consider these variables. Similar research was carried out by Kök (2009) in a comparison based on enterprise size in relations to FSMS implementation (ISO 22000/HACCP) but limited to the specific subsector of the Turkish poultry industry. With a view to filling this gap, this paper proposes an analysis of ISO 22000 implementation in the Italian Food industry. In addition, company satisfaction with ISO 22000 was analyzed considering the company's size.

2. Literature review

The Hazard Analysis Critical Control Point (HACCP) was defined by the National Advisory Committee (NAC, 1998) as, "*A management system in which Food Safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement and handling, to manufacturing, distribution, and consumption of the finished production*". The World Health Organization has published prerequisites for practices and conditions needed prior and during the implementation of HACCP essential for Food Safety (WHO, 1999). Companies that implement an FSMS generally do so for a wide variety of reasons (Herath and Henson, 2010). HACCP is a system applied in all phases of food production (Caswell and Hooker, 1996; Mortimore and Wallace, 1998). However, the scientific literature highlights a number of obstacles to the successful implementation and operation of HACCP (Bas *et al*., 2007; Damikouka *et al*., 2007). ISO 22000: 2005 (Food Safety Management Systems - Requirements for any Organization in the Food Chain) is based within the framework of a structured management system that integrates an HACCP System. Hudson and Orviska (2012) noted that the adoption of international standards may be required for entry into certain markets, especially in Europe. The ISO 22000 international standard specifies the requirements for a Food Safety management system that involves an interactive communication and an improvement of the QMS following HACCP principles. The ultimate goal of ISO 22000 is to provide clients with safer products (Bilalis *et al*., 2009; Henson and Holt, 2000). Furthermore, Companies sometimes commit to an ISO 22000 approach in order to complete ISO 9001 and ISO14001 (Talbot *et al*., 2007). Psomas *et al*. (2015) in their study identified the differences between the ISO 22000 certified and non-certified dairy Companies with regard to HACCP Food Safety System (FSS) effectiveness. They found that ISO 22000 certified dairy Companies significantly outperform the non-certified with regard to the HACCP Food Safety System effectiveness, advantaged by the structured organization and the documented procedures provided by the ISO 22000 standard.

Fernández-Segovia *et al*. (2014) present a methodology to carry out hazard and control measures assessments in order to properly establish operational prerequisite programmes and the HACCP plan in the food supplement industry according to ISO 22000 standards. The effectiveness of ISO 22000 in simplifying some aspects of HACCP and in reducing the number of critical control points and pre-requisite programmes, has been underlined by Douieb and Benlemlih (2010) and Afoakwa *et al*. (2013).

An analysis of the literature reveals a list of benefits attributable to ISO 22000 application; Escanciano and Santos-Vijande (2014) underline that a major factor underlying the adoption of ISO 22000 is the Companies' desire to strengthen their competitive position by improving their image and responding properly to market requirements; in the same study, conducted in Spain, they found that other determinants are internal, specifically the desire to improve efficiency, productivity and quality. Weyandt *et al*. (2011) conducted a case study of the fish processing Industry in Portugal; they found that one of the most important reasons for implementing FSMS with ISO 22000 was the competitive advantage gained from implementation. Arvanitoyannis and Varzakas (2009) argue that among the advantages of applying this standard there is also an improvement in the effectiveness of internal and external communication between suppliers, clients, regulatory bodies and other authorities involved. Other benefits concern technical management aspects, like the focus on control measures and monitoring procedures (Fernández-Segovia *et al*., 2014), but also internal procedures to improve product quality and safety (Macheka *et al*., 2013).

Obstacles to FSMS implementation vary depending on the country and the sub-sector; specifically, in regard to ISO 22000, they include lack of financial resources (Aggelogiannopoulos *et al*., 2007; Karipidis *et al*., 2009; Macheka *et al*., 2013) and lack of knowledge and experience of personnel (Aggelogiannopoulos *et al*., 2007; Karipidis *et al*., 2009). Furthermore, Escanciano and Santos-Vijande (2014) identified three major barriers to implementation of the ISO 22000: since it is not a well-known standard, many food Companies are unaware of its potential and they also perceive high costs associated with its adoption. Teixeira and Sampaio (2011) and Herath and Henson (2010) found financial constraints to be a huge barrier to FSMS implementation.

The following research hypotheses are proposed in this paper:

- RQ 1. What do Italian Companies perceive as the main benefits and obstacles involved in ISO 22000 application?
- RQ 2. Does company size influence benefits, barriers and satisfaction of implementation of the ISO 22000 standard?
- RQ 3. Do years of certification influence the benefits and

barriers of applying the ISO 22000 standard?
- ❑ RQ 4. Does the Companies size correlate to satisfaction with ISO 22000?

3. Materials and methods

3.1. Data collection

A review of relevant literature, in terms of benefits and barriers derived from FSMS implementation with ISO 22000, was carried out in order to produce a first draft of a questionnaire. This draft version was tested with the aim of identifying the issues that needed to be improved. After a pilot study with 30 participants, the survey items were improved and modified in terms of clarity.

A survey was developed though the following steps:

- ❑ Conceptualization: the main output of this stage was to list the target variables. It was performed after a careful bibliographic research focus on different thematic areas regarding ISO 22000.
- ❑ Questionnaire design and pre-test: after the conceptual basis, a first draft of the questionnaire with the sequence of the thematic sections was designed, elaborating the topics that had emerged in the previous stage. The comprehensibility of the questions was checked through a pre-test. The questionnaire was administered to a group of 30 people to find and fix possible errors of interpretation or superfluous or confused questions. At this stage respondents were encouraged to critique and comment.
- ❑ Revision: finally, a revision of the questionnaire based on the pre-test findings was done and the final version of the survey was prepared.

The final version of the survey was structured into different sections; the first was devoted to general information about the Companies (dimension, type of food sector, etc.); in the second, respondents evaluate their agreement with benefits of ISO 22000 application in a Likert scale from 1 (strongly disagree) to 9 (strongly agree); a similar question then solicits the respondents' evaluation of the main barriers. The survey ends with a question about respondent satisfaction with ISO 22000.

The sample considered in the present study is constituted by Companies in the Italian food industry that have been ISO 22000 certified for at least 2 years. The participants were contacted in the following way:

- ❑ phone interviewing (20% of total respondents);
- ❑ contacting Companies via email (80% of total respondents).

The respondents were all qualified as Quality Control / Assurance Manager; surveys were distributed from January to April 2017.

3.2. Sample profile

The sample composition is reported in *Table 1*. 450 listing the companies that were contacted to take part in the survey. A total number of 180 respondents completed the questionnaire (response rate=40%). Most of the Companies (37.8%) are Micro-Small (up to 50 workers); with regards to the typology of food sector in which the respondents operate, the bakery-pasta sector was predominate (26.1%), followed by milk and dairy products (25.0%) and meat and derivates (21.1%). 27.8% of the sample are not included in any of the previous food sectors mentioned. 61.6% of the sample has a revenue of up to 10 million euro. 38.9% of the sample declared that they had been ISO 22000 certified for from 4 to 7 years.

Table 1. Sample composition

		n	%
Dimension	Micro-Small (up to 50 workers)	68	37.8
	Medium (51-250 workers)	57	31.7
	Large (more than 250 workers)	55	30.6
Food sector	Bakery-pasta	47	26.1
	Milk and dairy products	45	25.0
	Meat and derivates	38	21.1
	Other	50	27.8
Revenue	Less than 2 million euro	46	25.5
	Between 2 and 10 million euro	65	36.1
	More than 10 and up to 20 million euro	40	22.2
	More than 20 million euro	29	16.1
Length of time Companies have been ISO 22000 certified	0-3 years	55	30.6
	4-7 years	70	38.9
	8 years and more	55	30.6

3.3. Analysis procedure

Data were elaborated through SPSS 22.0 Statistical Software Package. For each statement related to benefits and barriers deriving from ISO 22000 application, a mean and standard deviation was calculated. Student's t test was applied to analyze the effects of the company's dimension and the time of certification (significant value at $p < 0.05$).

4. Results and discussions

In the next paragraphs, the benefits and barriers involved in ISO 22000 certification are analyzed; a comparison considering Company size (Micro-Small, Medium and Large) and years of certification (0-3 years, 4-7 years, 8 years and more) was done in order to analyze the impact of the standard, using the same approach as Murmura *et al*. (2016) in the Italian context.

The benefits from ISO 22000 certification were divided into three main typologies, which are those found in the literature: benefits related to market, to technical management aspects and lastly those related to regulatory aspects.

Finally, in the last paragraph of this section, satisfaction toward ISO 22000 was analyzed considering Company size.

4.1. Benefits for certifying ISO 22000

ISO 22000 application is related to the improvement of the capacity to access European, International and also Italian markets, with values of 7.8/9 and over (*Table 2*); this result is in accordance with the findings of Teixeira and Sampaio (2013) and Escanciano and Santos-Vijande (2014). ISO 22000 can be used as a sign of quality in the market that decreases buyers' uncertainty and, consequently, reduces transaction costs, facilitating access to new customers and markets (Gawron and Theuvsen, 2009). Furthermore, Fotopoulos *et al*. (2011) maintain that the need to satisfy stakeholders / customer pressure is a critical factor in the implementation of HACCP systems, and that it is related to the pressure the market exerts on the firm.

Table 2. Benefits related to market aspects for certifying ISO 22000

	Mean	St. dev.
Improving the capacity to access the European	7.9	1.82
Improving the capacity to access the Italian market	7.9	1.86
Improving the capacity to access the International	7.8	1.78
Improving the firm's image in the commercial market (GDO, supermarket, etc.)	7.5	1.42
Possibility to increase market share	7.1	1.82
Strengthen the brand of company	6.8	1.78

Scale: 1 = strongly disagree; 5 = neither agree, neither disagree; 9 = strongly agree

The results regarding effectiveness of ISO 22000 implementation in terms of technical-management aspect are reported in *Table 3*. The main benefits are the improvement of product safety (7.8) and traceability of products (7.6); this group of benefits is related to the specific characteristics of ISO 22000 standard, in coherence with its aim and the tools provided by its application (Bilalis *et al*., 2009; Henson and Holt, 2000). Assurance activities are crucial for the performance of a FSMS in the long term (Ren *et al*., 2016). Moreover, Escanciano and Santos-Vijande (2014) found that in Spain monitoring internal processes and procedures was an important incentive for improving FSMS through implementation of ISO 22000.

Improving productivity (4.8) seems not to be a significant benefit of ISO 22000 application; Schuster and Maertens (2015) showed that there was no impact on labor productivity from the application of a private food standards management system.

Table 3. Benefits related to the technical management aspects for certifying ISO 22000

	Mean	St. dev.
Improving product safety	7.8	1.78
Improving the traceability of products	7.6	1.62
Improving quality management system	6.5	1.52
Improving product quality	6.3	1.87
Improving internal processes and procedures	6.2	1.92
Reducing the number of audits	6.2	1.82
Improving quality control system	6.1	1.56
Improving productivity	4.8	1.65

Scale: 1 = strongly disagree; 5 = neither agree, neither disagree; 9 = strongly agree

Regulatory aspect such as "Compliance with Food Safety legislation" (7.8), "provide a guarantee in the theme of Food Safety with official Authorities" (7.8); Macheka *et al*. (2013) in their study found that policy requirements account for 20% of the motivational factors for implementation of an FSMS.

The increase of communication in the food chain (6.8) emerges as an important benefit reported by Companies that are ISO 22000 certified (*Table 4*).

Complementarity with ISO 14001 (4.9) seems not to be a significant benefit of ISO 22000 application for the total sample.

Table 4. Benefits from ISO 22000 certification related to regulatory aspects

	Mean	St. dev.
Respect the Food Safety legislation	7.8	1.76
Provide a guarantee regarding Food Safety with official Authorities	7.8	1.68
Increasing the communication in the food chain	6.8	1.64
Improving customer satisfaction	6.5	1.68
Improving documentation	6.5	1.44
Increasing confidence of regulatory agencies'	6.4	1.64
Complementarity with ISO 9001	6.3	1.80
Improving the consumers' image of the firm	6.0	1.18
Complementarity with ISO 14001	4.9	1.58

Scale: 1 = strongly disagree; 5 = neither agree, neither disagree; 9 = strongly agree

4.2. Effect of dimension and length of certification on benefits perceived

The results in *Table 5* point out differences in perceived benefits from ISO 22000 application in relation to Company size. Micro-Small Companies differ with Large companies in their perception of benefits related to: improving internal processes and procedures (t = 2.170), improving product quality (t = 1.908), improving the capacity to access the Italian (t = 1.880), the European (t = 2.406), the International (t = 2.408) markets and "Improve the firm's image in the commercial market" (t = 1.880). Vladimirov (2011) points out that Small Companies are pushed by large customers to get a quality certification.

Complementarity to ISO 9001 (t = 1.759) and ISO 14001 (t = 1.984) are benefits perceived more often by Large Companies than by the Micro-Small; Kök (2009) points out that large firms were shown to adopt more stringent schemes related to ISO 22000/HACCP implementation and make better use of governmental support services than small-medium enterprises. ISO 22000 is perhaps a management system that establishes a link between the HACCP system and ISO 9001 QMS. In fact, as Mayes (1993) has underlined: "Management systems offer the food industry a structured framework around which Companies can define and implement measures to enable the consistent manufacture of products of the required safety and quality standards".

Table 5. Results of the Student t test based on Company dimension focusing on benefits perceived by ISO 22000 applications. Only statistically significant values are reported

	Companies	Student's t	*p* - value
Improving internal processes and procedures	Micro-Small/Large	2.170	< 0.05
Improving product quality	Micro-Small/Large	1.908	< 0.05
Improving the capacity to access Italian market	Micro-Small/Large	1.880	< 0.05
Improving the capacity to access European market	Micro-Small/Large	2.406	< 0.01
Improving the capacity to access International market	Micro-Small/Large	2.408	< 0.01
Improve the firm's image in the commercial market	Micro-Small/Large	1.880	< 0.05
Complementarity to ISO 9001	Large/Micro-Small	1.759	< 0.05
Complementarity to ISO 14001	Large/Micro-Small	1.984	< 0.05

Impact of years of certification on benefits perceived from ISO 22000 application. The improvement of the capacity to access European (t = 2.408) and International markets (t = 2.460) is mainly perceived as a benefit of ISO 22000 certification by Companies at the beginning phase of certification (0-3 years); these companies probably also look to this standard as a means of improving commercial opportunities, as is shown by Student t test in *Table 6*. In his study Kök (2009) found that the application of ISO 22000 is seen to aid the export market. In addition, it should be noted here that the adoption of certification may be required for entry into certain markets (Djordjevic *et al*., 2011; Masakure *et al*., 2009).

Table 6. Results of the Student t test based on length of Company certification time focusing on perceived benefits of ISO 22000 applications. Only statistically significant values were reported

	Companies	Student's t	*p* - value
Complementarity to ISO 9001	0-3 years / 8 years and more	1.859	< 0.05
Improving the capacity to access Italian market	0-3 years / 8 years and more	1.980	< 0.05
Improving the capacity to access European market	0-3 years / 8 years and more	2.408	< 0.01
Improving the capacity to access International market	0-3 years / 8 years and more	2.460	< 0.01
Improving the firm's image in the commercial market	4-7 years / 8 years and more	1.886	< 0.05

4.3. Main barriers to ISO 22000 application

Table 7 shows the main barriers to ISO 22000 implementation. Cost for certification (7.9) is the main barrier perceived, followed by slower procedures (7.1) as a result of ISO 22000 application. Similarly, Macheka *et al*. (2013) found that the main barriers for the implementation of a FSMS include lack of financial resources and inadequate infrastructure and facilities.

Table 7. Main barriers related to ISO 22000 applications

	Mean	St. dev.
Cost for certification	7.9	1.48
Sometimes this standard slows down some procedures	7.1	1.24
Lack of international consumer expectations	7.0	1.34
In some cases, it is not flexible	6.8	1.48
Uncertain about the potential benefits and/or advantages of the system	6.8	1.52
It does not a fully guarantee food safety	6.5	1.58
It requires a different organization	6.7	1.62
It requires adequate staff training	6.7	1.56
Difficulty in understanding the procedure	6.5	1.56

Scale: 1 = strongly disagree; 5 = neither agree, neither disagree; 9 = strongly agree

4.4. Effect of dimension and length of time of certification on barriers perceived

Company size impacts on barriers perceived as obstacles to ISO 22000 applications, as is shown in *Table 8*. Micro-small Companies, in contrast with Large companies, strongly perceive cost (t = 2.606)); and the different organizations required by ISO applications (t = 2.070) as barriers to certification; similarly, Aggelogiannopoulos *et al*. (2007) find common internal barriers in these Companies such as lack of financial resources and resistance of employees to changing their way of working.

Table 8. Results of the Student t test based on Company dimension focusing on perceived barriers encountered in ISO 22000 application.
Only statistically significant values were reported

	Companies	Student's t	*p* - value
Cost for certification	Micro-Small/ Large	2.606	< 0.01
It required a different organization	Micro-Small/ Large	2.070	< 0.05
It required a different organization	Medium/ Large	2.628	< 0.01
Sometimes slows down some procedures	Micro-Small/ Large	1.808	< 0.05
Cost for certification	Medium/ Large	1.982	< 0.05

In *Table 9,* the results of the Student t test are reported. They show the effect that length of time of implementation of ISO 22000 has on the Company's perception of the barriers encountered in implementation. Companies in the beginning phase of certification perceive cost for certification (t = 2.018), the difficulty in understanding the procedure (t = 1.992), the need for adequate staff training (t = 1.808) as significant barriers in comparison with Companies that have been certified 8 years or more. The difference in organization required to apply this standard is instead perceived as a barrier by Companies certified for from 0-3 years (t = 2.088) and 4-7 years (t = 1.904) compared with Companies that have been certified for 8 years or more.

Table 9. Results of the Student t test based on Companies' length of time of ISO 22000 applications.
Only statistically significant values were reported

	Companies	Student's t	*p* - value
Cost for certification	0-3 years / 8 years and more	2.018	< 0.05
Sometimes this standard makes slower some procedures	0-3 years / 8 years and more	1.908	< 0.05
It required a different organization	0-3 years / 8 years and more	2.088	< 0.05
It required a different organization	4-7 years / 8 years and more	1.904	< 0.05
Need adequate staff training	0-3 years / 8 years and more	1.808	< 0.05
Difficulty to understand the procedure	0-3 years / 8 years and more	1.992	< 0.05

Every certification process needed time to conform the organization to the standard, as observed by Murmura *et al*. (2016).

4.5. Satisfaction toward ISO 22000

Lastly, there is a positive correlation between Company size and a higher rate of satisfaction derived from ISO 22000 application (*Figure 1*). 8% of Micro-Small, 12% of Medium and 15% of Large Companies declared to be fully satisfied. A negative response has been given by 20% of Micro-Small, 18% of Medium and 18% of Large Companies.

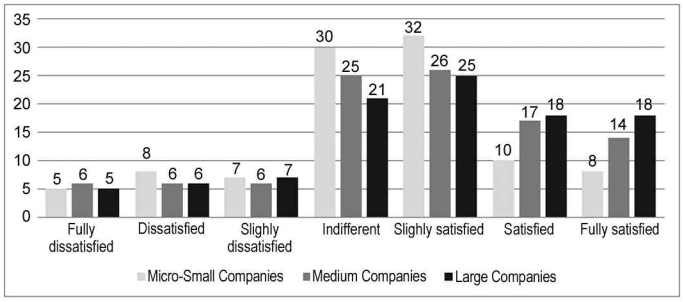

Figure 1. Correlation between Company size and the rate of satisfaction derived from ISO 22000 application

6. Conclusion

This paper has attempted to shed some light on the complex world of FSMS through an analysis of its implementation with ISO 22000 analyzing which internal and external reasons most influence the recourse to ISO 22000 certification and the main barriers encountered in its implementation, considering variables such as size and length of time. As the literature suggests, the implementation of an FSMS is a complex process, because it involves a combination of management, technical and organizational issues (Karaman *et al*., 2012). Results of this study confirm that Companies have ambivalent perceptions of the ISO 22000 standard as a FSMS that improves technical aspects and Food Safety. This study clearly showed that Company size and years of certification impacts benefits and barriers deriving from ISO 22000 application, similarly to application of other ISO standards in the Italian context, like, for example, ISO 9001 (Murmura *et al*., 2016). From these results, there emerges a picture of the great importance this standard has for commercial opportunities, on the national as well as international level. In Italy, the great distribution channel is very strong and ISO 22000 is a form of guarantee of Food Safety perceived by buyer (Gawron and Theuvsen, 2009). FSMS implementation is becoming a mandatory issue in some commercial channels.

Fundamentally it is the Micro-Small enterprise at the beginning phase of certification that has the strongest perception of barriers and the most important difficulties perceived regard internal organization. These results could be reflected in future policy strategy that gives greater support to Small Companies, particularly at the beginning stage. However, despite the obstacles, only 20% of Micro-Small Companies declared they were unsatisfied with ISO 22000 application. This means that the trade-off between benefits and barriers is considered positive. According to Aggelogiannopoulos *et al*. (2007) and Karipidis *et al*. (2009), there is a need for tools to help Companies, especially Small and Medium enterprises, to improve their FSMS, especially the necessary skills and resources.

The results constitute information of interest to all actors involved in ISO 22000 implementation and revision and they provide a means for estimating the potential effectiveness and limits by considering the size of the company and the length of time of ISO 22000 certification, in order to better evaluate the certification investment.

The study has some limitations; firstly, data are represented by personal opinions of managers who answered the survey. Furthermore, the study surveyed only those Companies that currently held certification, but did not consider the opinions of those who had abandoned the standard. In light of this it should be noted that, the level of dissatisfaction would probably be higher if the Companies who no longer had certification had been taken into account.

Further studies could be conducted to extend the analysis to include other factors, in particular the influence of Food Companies sub-sectors and the integration of ISO 222000 with other standards (e.g. ISO 9001 and ISO 14001).

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