

Impacts from the Implementation of the ISO 22000

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STRUCTURED ABSTRACT

Purpose- The main purpose of this article is to assort different impacts of the ISO 22000 implementation considering internal or external impacts, positive or negative impacts. It also intends to provide a worldwide overview on the topic, to distinguish companies from different sectors and to gather different methodologies that are used in previously published articles related with this implementation.

Design/methodology/approach- Different articles of the ISO 22000 implementation from different countries were gathered and singled out according to the information that was provided. The information of interest was analyzed and rewritten according to the initially established categories.

Findings- The results from several studies, researches and points of view from different authors show that the ISO 22000 implementation carries positive impacts. Negative impacts are hard to find. Most of the impacts are directly related to the organizations themselves, hence being internal impacts. Studies are mainly carried out with the help of questionnaires that are presented to the companies.

Research limitations/implications- The main goal was to come across different impacts and classify them either as positive and negative or internal and external. However, it's unusual to find authors that consider negative impacts from the ISO 22000 implementation. Also, external impacts are not so common.

Originality/value- This article mainly highlights the ISO 22000 implementation positive impacts in worldwide organizations. It summarizes the different countries views towards Food Safety Management Systems (FSMS) and how they affect the performance of their companies.

Keywords: ISO 22000, Food industry, Impacts, Worldwide organizations

Paper type: Literature review

INTRODUCTION

As food safety represents a matter of public health, there is a higher demand of better and more purposive food safety systems. Therefore, this aspect has risen over the past three decades (Voca, 2014). Due to the affection of the safety of food products, caused by the recurrent crisis in food chains, there emerged a need to create precautionary measures for this type of problems (Teixeira and Sampaio, 2011). Moreover, consumers also became more concerned with this aspect which made food standards and regulations to be more developed in order to increase food safety standards, being set in developed countries first, and established in developing countries later (Kök, 2009; Teixeira and Sampaio, 2011). It was then perceived large improvements in food management systems through the combination of both national and international standards with consumer's demands and other aspects (Voca, 2014).

HACCP (the acronym to Hazard Analysis and Critical Control Points) is a system of safety management, in which the monitoring and the control of biological, chemical and physical risks are insured in every single step of the production (Varzakas et Arvanitoyannis., 2008). Since its development in the 1960's, it has been effectively implemented in several food industries in order to reduce and control risks that can cause food unsafe to consume (Voca, 2014).

HACCP system includes seven principles:

1. To conduct a hazards analysis;
2. To determine Critical Control Points;
3. To establish critical limits for each CCP;
4. To establish a monitoring system for each CCP;
5. To establish corrective actions;
6. To establish verification procedures;
7. To establish documentation and record keeping.

The ISO 22000, developed in 2005, appeared to strengthen the HACCP system. This standard comprises the preliminary HACCP steps/principles, defines management responsibility and it also uses an approach to the systems that aims to avoid new hazards in the food production process again (Warren, 2015). The main goal of this standard is to attune the food safety management globally among food chains organizations (Zimon and Domingues., 2019).

ISO 22000:2005 was published by the International Organization for Standardization (ISO) in 1st September and it was reviewed for the last time in 2018. It is both an international ISO standard and

European EN standard (Teixeira and Sampaio, 2011). This type of standards establishes the requirements that can be objectively audited for certification purposes (APCER, 2011). Additionally, the “Plan-Do-Check-Act” (PDCA) methodology is applied to the ISO 22000: 2005.

This methodology focuses on an ongoing improvement and can be described in the following steps:

- Plan: to set both goals and procedures to propound the results according to client’s requirements and the politics of the organization;
- Do: to put in practice the previously planned procedures;
- Check: to verify and monitor, not only the procedures, but also the product itself, comparing politics, goals and requirements for the product and to report the results obtained;
- Act: to take actions in order to improve the performance of the procedures in a continuous way (APCER, 2011).

Regarding the standards’ implementation, the gathered information and the assessment and analysis of the magnitude of cost of planning before the actual implementation, play a major role (Maldonado, 2005). Also, implementing this type of standards carries along several impacts: internal, which brings benefits to the organization throughout the process of implementation, or external, which privileges other parts, external to the organization; and on the other hand, positive, when the procedure of implementation results on the improvement of quality of something, or negative, when there is a clear damage to the quality of something, or even neutral, when the impact doesn’t have neither a positive or a negative effect. Different countries and cultures are expected to experience different impacts when implementing this system.

RESEARCH METHODOLOGY

Articles and documents on the ISO 22000 implementation and its impacts were mainly researched in platforms such as *Google Scholar* and *Research Gate*, using keywords such as “ISO 22000”, “ISO 22000 implementation”, “impacts of ISO 2200 implementation” and “ISO 22000 worldwide”. The APCER website and several documents were also an excellent source of information. After analyzing approximately 25 articles and documents, adhering to 12 of them, this review about the impacts of the implementation of the ISO 22000 in seven countries was developed. The selection was done choosing those about positive and negative aspects of the standard implementation, the effects of the standard in the organization and in external entities and also about the implementation in several countries and different sectors of activities.

Different methodology to study the impact of the ISO 22000

1. Portugal

Teixeira and Sampaio (2010) developed a questionnaire composed of 6 groups of questions. With this questionnaire, authors intended to collect information about the company, to identify motivations that led to the standard implementation, to understand which had been the benefits of Food Safety Management Systems implementation and also the main difficulties and drawbacks from the implementation, to know about the implementation and certification costs and impact on the final consumer and, finally, to evaluate the evolution perspectives concerning the ISO 22000 certification. The scale adopted in the questionnaire was a 5-point Likert scale. Data were analyzed using SSPS.

2. Poland, Slovakia and Portugal

To assess the impact of standardized Food Safety Management Systems on food safety in the supply chain in Poland, Slovakia and Portugal, Zimon and Domingues (2019) presented a questionnaire to several organizations.

The authors' main focus was if the company was certified by the ISO 22000, how many employees are part of it, how many years the company have the ISO 22000 MS implemented, if the implementation impacted (successfully) in the food safety of products, the level of impact of the standard on production, purchase, distribution and design and development processes and process control, the improvement on the detection of potential errors and mistakes, the improvement of the integration of individual partners and if the implementation of FSMS in companies operating in the food supply chain is needed. All the questions were formulated with "I don't know", "Yes" and "No" answers, except the question about the level of impact of the standard, presented as a 5-point Likert scale. At last, companies were asked to express in words an opinion on the legitimacy of implementing the ISO 22000 standard in supply chains.

3. Sudan

The authors used a descriptive method in their research. To conclude about the impact of the ISO 22000:2005 implementation on a food organization, a questionnaire test about the effects of the standard on marketing, sales, quality control and supply chain departments was used. The questionnaire was developed with a 5-point Likert scale, from strongly disagree to strongly agree. Data were analyzed using SSPS (Khames, 2017).

4. Romania

The study developed by Păunescu et al. (2017) included a quantitative research which builds upon a questionnaire-based survey. It was presented to Romanian companies distributed at all levels of the food supply chain, but mainly at the production level.

The questionnaire was organized with six sections: a general question about the achievements of the ISO 22000 certification, a question about the certification motivations, a question about the effectiveness of certification, a question about the difficulties of the ISO 22000 adoption, a question about food safety methods in use, and a question regarding the company's and respondent's general profile. Most of the answers were indicated with a 5-point Likert scale. The answers to the questionnaire were analyzed using SSPS.

5. Turkey

This research aims to holistically examine the implement ability of the ISO 22000 in food and beverage Turkish companies. The data were collected through face-to-face interviews with the help of an interview form, sound recordings of the interview as well as notes taken by the researchers - "semi-structured interview" technique. Researchers presented questions mainly related with companies' characteristics, performance of the standard used before the ISO 22000, facilities and difficulties involved in the transition process to the ISO 22000, safe product planning and realization, contribution of the ISO 22000 to revenues and expenses and reliability and image and evaluation of redundancy/insufficiency status of the items in the ISO 22000.

The data collected were organized in tables and posteriorly interpreted using 8 of the companies interviewed (Mercan and Bucak, 2013).

6. China

In China, to investigate the status of FSMS implemented at pork slaughter plants, Xiong et al. (2016), prepared a questionnaire and checklist with scoring system. The questionnaire was developed with the aim to collect companies' information. Checklist was used to analyses the Food Safety Management System - for example, specifications including product release, management responsibility, procedures, purchasing - Good Manufacturing Practices - personal hygiene, facility layout and process flow, staff facilities - and Control of Food Hazards - control of allergens, HACCP, food defense.

Data analysis and statistic were developed using Kruskal-Wallice nonparametric tests (Xiong et al., 2016).

To summarize all the methodologies used in the different studies, for different countries, information was graphically organized (Figures 2 and 3), considering the questioning method and scale used, data analysis method and the main topics addressed with the questionnaires. The information used to construct the graphics is organized in tables in Annex 1.

It's possible to conclude that the preferred methodology used to data collection were questionnaires using 5-point Likert scale (Figure 2). The data collected were analyzed mainly with SSPS. Also, table analysis and Kruskal-Wallice nonparametric tests were used (Figure 3).

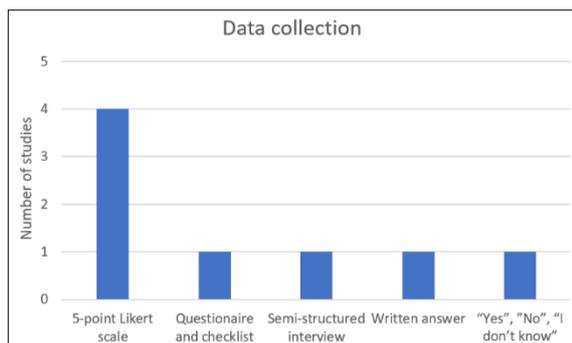


Figure 2: Methodology used for data collection

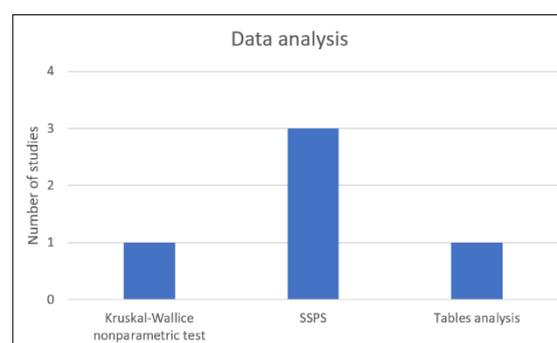


Figure 3: Methodology used for data analysis

Finally, the main topics addressed with the questionnaires, common to most of the studies, were information about the companies and benefits of FSMS. The distribution of those and other topics are presented on Figure 3.

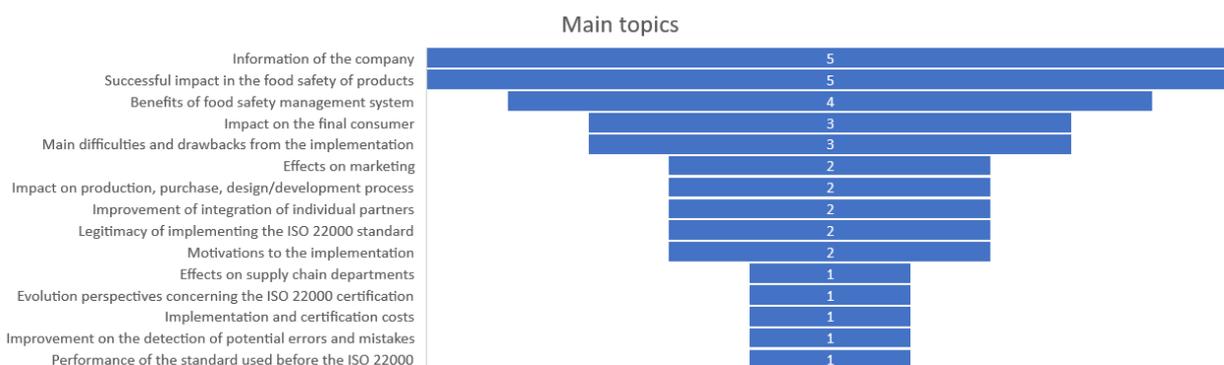


Figure 4: Main topics addressed in the questionnaires used in different studies by different authors

Impacts from the implementation of the ISO 22000 in different countries

1. Portugal

Zimon and Domingues (2019) analyzed in their paper a total of 38 Portuguese enterprises throughout a survey. They claimed that all the companies (100%) answered “yes” when they were asked if there was a successful impact when the ISO 22000 standard and its requirements were implemented. After

that, it was introduced a question to rate from 1 (negative) to 5 (positive) the impacts of the ISO 22000 implementation in some key procedures.

The highest rate of positive impacts of the standard implementation was given to the control procedure. The ISO 22000 standard requires records of deliveries and processing and tracking system in order to relate individual batches of products to a specific batch of raw material. Such requirements aimed only at the improvement of the level of safety in the food chain that turns on an increased confidence between its individual cells and between the companies and the customer(s) (Zimon and Domingues, 2019). In addition to the control process, the production, purchase and distribution process rated high values of positive impacts.

The strengths of cooperation within the supply chain was other positive impact observed by Zimon and Domingues (2019) in Portugal. Furthermore, when asked, companies answered that the ISO 22000 helped improving the integration of individual partners and additionally it eased the identification of eventual errors and mistakes.

Teixeira and Sampaio (2010) also analyzed food safety management systems in Portugal. The majority of the surveyed companies were large companies (51,6%), and part of the sector of the “Manufacture of other food products” (25,8%).

Analyzing companies’ answers about the benefits of ISO 22000 certification, authors noted that most of the companies determined the “improvement of food safety methodologies and practices, and management system related documentation” as the main benefit (50% of the answers) followed by “improvement of customers and other interested parts satisfaction” (32,2%). Other positive impacts were likewise registered: “consumers’ confidence improvement”, “food safety improvement”, among others (Teixeira and Sampaio, 2010), which sustains the information of the above article. These impacts can be simultaneously considered as positive and internal impacts due to their internal influence nature (Teixeira and Sampaio, 2010).

2. Poland and Slovakia

To understand the ISO 22000 implementation impact on the running of the supply chain in Poland and Slovakia, Zimon and Domingues (2019) included 43 organizations in their research. Similar to what had been done with Portuguese organizations, several questions were made to Polish and Slovak organizations.

About the standard implementation, having a positive effect on improving the food safety throughout the food chain, 67% of the companies involved in the research confirmed a positive impact, whereas 15% didn’t consider any effect and the remaining 18% were not familiar with the topic. Those who

didn't find positive impacts on the implementation of this standard on food safety, defend that the ISO 22000 in order to fulfill the main goals should be backed by other systems, since it doesn't seem to affect the growth of food safety in itself in a very significant way. According to the authors, these derogatory opinions about ISO 22000 may result from anomalies in the standardized systems implementing. (Zimon and Domingues, 2019)

In the same research, companies were questioned on the ISO 22000 impact in some key processes in the food supply chain improvement. Polish and Slovak organizations considered that the standard implementation had a greater impact in the production process, control process, and design and development process. The less affected procedures were the ones of purchase and distribution, which might be connected by the fact that Eastern European companies don't have a very important role in the food supply chain so the norm impact in the distribution phase it wasn't substantial.

Both in Poland and Slovakia, 65% and 16% of the enquired companies agreed and strongly agreed, respectively, that the ISO 22000 favored to the integration of several partners as being part of the supply chain. However, 5% and 2% of the organizations disagreed or strongly disagreed, and the remaining 12% neither agreed nor disagreed. Polish and Slovak organizations also agreed on the importance of the implementation of this standard in what the identification of potential errors and mistakes are concerned. 21% and 67% of these organizations strongly agreed and agreed, respectively, that ISO 22000 eased the identification of errors and mistakes. Only 2% strongly disagreed, 5% disagreed and the remaining 5% neither agreed nor disagreed. To conclude, several organizations were asked if the Food Safety Management Systems in companies operating in the food supply chain was needed. Only 4% of them answered negatively. The majority of the Polish and Slovak organizations (86%) considered that the implementation is needed. The remaining 10% answered that they didn't know (Zimon and Domingues, 2019).

3. Sudan

In Sudan, a study was developed by Khames (2017) about the impact of the ISO 22000:2005 application on a food organization, with results obtained through a questionnaire testing which included the departments of marketing, sales, quality control and supply chain. Based on the obtained results, the author concluded that the ISO 22000 implementation set several positive impacts.

Considering the profit of the company, this implementation increased the sales, and the marketing department was impacted by an increase in the market share. The ISO 22000:2005 also had a positive impact in what the resource management is concerned when based on the optimum distribution of the resources and the customer satisfaction/retention was also impacted positively by enhancing customer

confidence. Moreover, it had a positive impact on internal procedures, and this is due to the reduction of waste and enhanced performance.

Finally, the ISO 22000 had a positive impact on the quality of the product by upgrading the safety and the quality on the final product (Khames, 2017).

4. Romania

In Romania, a study based on the motivations, difficulties and key benefits of the ISO 22000 implementation was developed and it was carried out through a questionnaire. The Romanian food companies were the subject of study, being companies that act in different levels of the food supply chain.

According to the review literature, Păunescu et al. (2018) registered 16 benefits pointed by the certified companies with the standard. The classification of the extent to which each company achieved the benefits mentioned above, due to the application (implementation and certification) of the ISO 22000 was achieved through a 5-point Likert scale (1- not important to 5- very important).

Based on the obtained results, it was viable to acknowledge which were the main obtained benefits in the studied companies:

- Improvement in food safety;
- A reduction in foodborne illnesses and other dangers;
- Consumer confidence had been increased;
- Customer and stakeholder satisfaction were improved- increasing the volume of sales (Păunescu et al., 2018)

5. Turkey

Other similar survey made in Turkey aimed to study the application and the ISO 22000 standard impacts in food and beverages certified companies from İzmir/Turkey (Mercan and Bucak, 2013). In this survey, it was reported material benefits with the standards implementation, such as material benefits as in waste and loss reduction in the system due to the standardization of operations. Moreover, the catering sector highlighted that companies that adhered to the standard provided trust to customers. The same certification allows companies to gain a higher status and reputation in the market too (Mercan and Bucak, 2013). These impacts can be considered as positive and internal.

6. China

In China, the Food Safety Management Systems status was assessed in the Chinese pork slaughter plants, by Xiong et al. (2016).

60 different companies were included in this study, 78,3% of them had the ISO 22000 certification. In this research, the organizations answered to a scoring checklist so that researchers could assess the impact of the implemented system by checking the compliance of the requirements. After analyzing all the data, the higher scores were related to a complete compliance of the requirements, which corresponds to a good consequence of management systems implementation, a positive impact.

Implementation performance was better in FSMS that got a score of 82,9%, including specifications related with product release, traceability, corrective actions, procedures, product analysis, etc. After, with a score of 73,8%, Control of Food Hazards, and, at last, Good Manufacturing Practices, such as personal hygiene, cleaning and disinfection, pest control and water quality, with a 62,7% score. Considering these results, authors considered that there was a need to help food business operators improve their actions so the organizations could take full advantage of this type of systems, particularly in this case, of the ISO 22000 (Xiong et al., 2016).

The ISO 22000, implemented in worldwide organizations, carried a wide range of positive impacts (Figure 5).

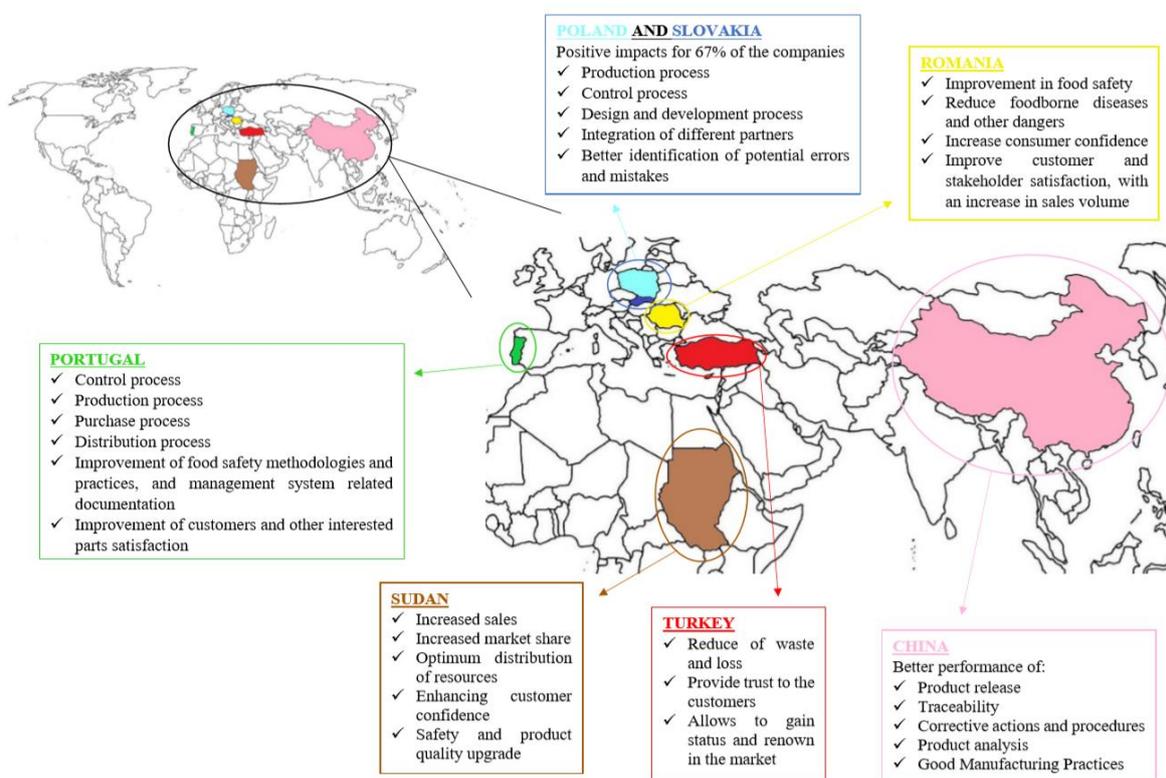


Figure 5: Worldwide view in the countries involved in the mentioned studies and impacts of the ISO 22000 implementation in the organizations

CONCLUSIONS

The analysis of the several studies previously mentioned associate different impacts from the ISO 22000 implementation to diverse food industries and systems. The results obtained were mainly qualitative, acquired through surveys and questionnaires presented to the different enterprises. In general, the implementation of the ISO 22000 standard leads to positive impacts regardless of the country and food sector. The outcome benefits from the standard implementation in the companies seemed to develop increased confidence in consumers and clients, and consequently the enterprise's status. The benefits observed were also mainly internal impacts, since they directly influenced the company and their products. The improvement of the identification of potential errors and mistakes is one example of these internal benefits, which translates in less waste and loss, and better food security.

It can thus be concluded that getting a company certified by the ISO 22000, is an investment to the company that, in a long term, will bring several benefits to the industry in question and therefore to the consumer and client that will buy the product of that company in the future.

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ANNEX 1 - INFORMATION REGARDING QUESTIONNAIRES AND SCALES; DATA ANALYSIS; AND MAIN TOPICS ADDRESSED

Table 1: Type of questionnaire and scale used to collect data by different authors in different articles

| Type | Countries | Authors | Total studies |
|-----------------------------|---|--|---------------|
| 5-point likert scale | Portugal; Poland, Slovakia and Portugal; Sudan; Romania | Teixeira and Sampaio (2010); Zimon and Domingues (2019); Khames (2017); Păunescu et al. (2017) | 4 |
| Questionnaire and checklist | China | Xiong et al. (2016) | 1 |
| Semi-structured interview | Turkey | Mercan and Bucak (2013) | 1 |
| Written answer | Poland, Slovakia and Portugal | Zimon and Domingues (2019) | 1 |
| “Yes”, ”No”, “I don’t know” | Poland, Slovakia and Portugal | Zimon and Domingues (2019) | 1 |

Table 2: Data analysis by different authors in different articles

| Program | Countries | Authors | Total studies |
|-------------------------------------|--------------------------|--|---------------|
| Kruskal-Wallice non-parametric test | China | Xiong et al. (2016) | 1 |
| SSPS | Portugal; Sudan; Romania | Teixeira and Sampaio (2010); Khames (2017); Păunescu et al. (2017) | 3 |
| Tables analysis | Turkey | Mercan and Bucak (2013) | 1 |

Table 3: Main topics addressed in the questionnaires by different authors in different articles

| Topics | Countries | Authors | Total studies |
|---|----------------------------------|---|---------------|
| Benefits of food safety management system | Portugal; Romania; Turkey; China | Teixeira and Sampaio (2010); Păunescu et al. (2017); Mercan and Bucak (2013); Xiong et al. (2016) | 4 |

| | | | |
|---|---|---|---|
| Effects on marketing | Sudan; Turkey | Khames (2017); Mercan and Bucak (2013) | 2 |
| Effects on supply chain departments | Sudan | Khames (2017) | 1 |
| Evolution perspectives concerning ISO 22000 certification | Portugal | Teixeira and Sampaio (2010) | 1 |
| Impact on production, purchase, design/development process | Poland, Slovakia and Portugal; China | Zimon and Domingues (2019); Xiong et al. (2016) | 2 |
| Impact on the final consumer | Portugal; Sudan; Turkey | Teixeira and Sampaio (2010); Khames (2017); Mercan and Bucak (2013) | 3 |
| Implementation and certification costs | Portugal | Teixeira and Sampaio (2010) | 1 |
| Improvement of integration of individual partners | Poland, Slovakia and Portugal; China | Zimon and Domingues (2019); Xiong et al. (2016) | 2 |
| Improvement on the detection of potential errors and mistakes | Poland, Slovakia and Portugal | Zimon and Domingues (2019) | 1 |
| Information of the company | Portugal; Poland, Slovakia and Portugal; Romania; Turkey; China | Teixeira and Sampaio (2010); Zimon and Domingues (2019); Păunescu et al. (2017); Mercan and Bucak (2013); Xiong et al. (2016) | 5 |
| Legitimacy of implementing the ISO 22000 standard | Poland, Slovakia and Portugal; Turkey | Zimon and Domingues (2019); Mercan and Bucak (2013) | 2 |
| Main difficulties and drawbacks from the implementation | Portugal; Romania; Turkey | Teixeira and Sampaio (2010); Păunescu et al. (2017); Mercan and Bucak (2013) | 3 |
| Motivations to the implementation | Portugal; Romania | Teixeira and Sampaio (2010); Păunescu et al. (2017) | 2 |
| Performance of the standard used before ISO 22000 | Turkey | Mercan and Bucak (2013) | 1 |
| Successful impact in the food safety of products | Poland, Slovakia and Portugal; Sudan; Romania; Turkey; China | Zimon and Domingues (2019); Khames (2017); Păunescu et al. (2017); Mercan and Bucak (2013); Xiong et al. (2016) | 5 |