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Diffusion of integrated Occupational Health and Safety Management Systems

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ABSTRACT: The number of companies operating simultaneously with several normative, standardized and certifiable Management Systems (MSs) steadily increases over the years. A great deal of these companies implements an Occupational Health and Safety MS (OHSMS) in order to address the safety concerns from a specific and relevant stakeholder—the employee. This subsystem seldom operates as the single MS and often coexists with other subsystems, namely, the Quality MS (QMS) and/or the Environmental MS (EMS). This paper intends to "snapshot" the diffusion of the integrated OHSMSs in Portugal dissecting the following features: regional geographic location, evolution throughout the years, more involved activity sectors, more often found integrated management systems (IMSs) typologies and the most relevant and active certification bodies. To the best of our knowledge this is the first time that a comprehensive analysis of the integrated OHSMSs diffusion is developed in Portugal.

1 INTRODUCTION

The integration of MSs is a contemporary and hardly controllable phenomenon from the point of view of an academic researcher. Although this evidence asks for mainly qualitative research methodologies some relevant research findings may be possible through the analysis of quantitative data, namely, the data throughout the years depicting the diffusion of the different MSs. This paper intends to adopt this latter methodology to point out and highlight several aspects concerning integration of OHSMSs in Portugal.

This paper follows with a brief revision of the literature regarding the diffusion of MSs where one may find the soundest works developed focusing other MSs than the OHSMS. Furthermore, the following subsection dissects the most recent reported studies concerning IMSs. The "Methodology" section describes the research path adopted and discloses the main two bibliographic sources that supported the data collection. In order to improve the readability of the paper several subsections encompass the "Results and Discussion" section. Each subsection deals with the diffusion of the integrated OHSMSs considering a specific feature. The "Final Remarks" section sums up the main conclusions that can be drawn from the results.

2 LITERATURE REVIEW

2.1 *Diffusion of management systems*

To our knowledge there is not, at this time, a comprehensive assessment of the integrated or non-integrated OHSMSs diffusion at a regional or worldwide level. This fact relates mainly to the lack of information sources concerning national diffusion of OHSMS and the fact that ISO Survey of Certifications do not publishes data concerning OHSMS (OHSAS 18001). ISO Survey of Certifications reports, each year, the data concerning ISO 9001 and ISO 14001 (among others) issued certificates by country which enables the evaluation and monitoring of the certificates diffusion by macro regions.

Some previous reported studies may be considered as references or benchmarks to the work intended to be developed regarding IMSs. The analysis of the geographic diffusion of the ISO 9001 issued certificates was targeted by the work of Sampaio *et al.* (2009, 2010), Sampaio & Saraiva (2011), Salgado & Sampaio (2013), Viadiu *et al.* (2006), Neumayer & Perkins (2005), Mangiarotti & Riillo (2010) and Franceschini *et al.* (2004). Concerning the geographic diffusion of ISO 14001 certificates one should point out the work developed by Casadesús *et al.* (2008), Marimon *et al.* (2011) and Peixe *et al.* (2012).

The analysis by activity sector was reported by Llach *et al.* (2011) and Marimon *et al.* (2011) and, meanwhile, Marimon *et al.* (2009) proposed a projective model for the decline phase of ISO 9000 and ISO 14000 certifications. The certifications according some sector specific standards were also focused namely the ISO/TS 16949 standard (Franceschini *et al.*, 2011). These works enabled the development of forecasting models, highlighted the features that seem to condition a successful dispersion of certificates, outlined the path to sustainable certification

Table 1. Papers addressing several topics of the IMSs research in 2015.

Author	Scope/Topic	Obs
Bernardo *et al.*	Revision of literature concerning the benefits of MSs integration.	**
Carvalho *et al.*	The paper dissects some of the benefits of the integration of the QMS, EMS and OHSMS.	
Cook *et al.*	The authors dissect the topic of environmental audits.	
Domingues *et al.* (2015a)	The authors present a model to assess IMSs maturity.	*
Domingues *et al.* (2015b)	The authors present IMSs from the point of view of CASs.	
Genaro & Loureiro	The authors present a model aiming at IMSs from a stakeholder perspective.	*
Gianni & Gotzamani	The authors describe a case where MSs integration was unsuccessful.	*
Kauppila *et al.*	The authors point out some potential trends concerning IMSs.	
Klute-Wenig & Refflinghaus	The authors suggest how to integrate some sustainability issues into an IMS.	
Mesquida & Mas	The authors point out some issues concerning the IT service management from an integrated perspective.	
Mežinska *et al.*	The authors dissect the constructs of sustainability and social responsibility from the point of view of MSs integration.	
Röβler & Schlieter	MSs integration from a model-based perspective.	*
Samy *et al.*	The authors discuss MSs integration from the environmental perspective and as enabling sustainable development.	
Savino & Batbaatar	Resources for IMSs.	
Su *et al.*	Strategies for MSs integration.	*
Vaughen *et al.*	The authors list some guidelines for MSs integration.	
Visser & Kymal	The authors dissect the construct of integrated value creation (IVC).	*

* of special interest; ** of outstanding interest.

programs, identified the drivers and determinants for ISO 9001 and ISO 14001 certification and pointed out those countries where a saturation level apparently had been reached. This paper intends to report the results from a similar analysis focusing the integrated OHSMSs in Portugal.

2.2 *Integrated management systems*

Various literature streams are distinguishable concerning the research focusing on the domain of IMSs. Although not constrained by any peculiar limitation, the revision of the literature addressing the domain of IMSs establishes and discloses some topics commonly analyzed. Usually, the shortcomings of non-integrated management (Domingues *et al.*, 2014), the benefits of MSs integration (Bernardo *et al.*, 2015) and the reasons and obstacles of the integration process (Kauppila *et al.*, 2015) are topics addressed. Additionally, the attained integration levels (Almeida *et al.*, 2014), the audit function (Cook *et al.*, 2015) as a potential enabler and guidelines to proceed with a successful MSs integration (Sampaio *et al.*, 2012; Vaughen *et al.*, 2015) are also topics focused in a great deal of papers. Furthermore, several models and frameworks aiming at a well succeeded integration are commonly reported by academic researchers (Genaro & Loureiro, 2015). A recent revision of the topics addressed in the IMSs research domain was published elsewhere (Domingues *et al.*, 2014). Table 1 lists some of the papers published in 2015 focusing specifically the phenomenon of MSs integration or, at least, addressing some subtopics within.

3 METHODOLOGY

A thorough analysis of two Portuguese publications (*Barómetro da Certificação* and *Guia de Empresas Certificadas—GEC*) was carried out. These publications report once a year the evolution of the number of certifiable MSs, such as, the QMS, the EMS and the OHSMS. The results (till 31/12/2013) from integrated OHSMSs encompassing the following typologies were considered: QMS+EMS+OHSMS; QMS+OHSMS and EMS+OHSMS.

In order to clarify further reading one should point out that, concerning the current paper, the population under study are the Portuguese integrated OHSMSs (certified) encompassing the following three typologies: ISO 9001+ISO 14001+OHSAS 18001, ISO 9001+OHSAS 18001 and ISO 14001+OHSAS 18001. It should also be emphasized that 'Integrated OHSMSs' solely represents, in this paper, OHSMSs cohabiting simultaneously with other MSs due to the fact that it is not possible to evaluate the actual level of integration achieved.

4 RESULTS AND DISCUSSION

The following subsections address each of them, a specific aspect of the diffusion of integrated OHSMSs and are presented separately in order to improve the paper readability although its interpretation should be performed taking into account all of them.

4.1 *Non-integrated OHSMSs*

The percentage of companies that adopted a single OHSMS is fairly low (Fig. 1) being around 1,5% considering the last available data.

If one look back throughout the previous years it is possible to conclude that seldom are the companies that opted by the OHSMS as the primordial subsystem focusing the development, implementation and certification of a hypothetical and potential IMS. In fact, according to Figure 1, the higher percentage of non-integrated OHSMSs was reported in 2010 and barely surpasses the 5,0%.

4.2 *Integrated OHSMSs—typology*

As stressed in the "Methodology" section, solely the most common integrated typologies encompassing the OHSMS were considered in the analysis. As depicted in Figure 2 other typologies should be mentioned since them account for 14% of the population.

The integrated typology encompassing the three subsystems accounts for around 70% of the population and the typologies encompassing two subsystems, combined, account for 17%.

Figure 3 presents the evolution throughout the years of the different typologies that one may find in the studied population.

The results displayed by Figure 3 suggest that, ultimately, companies seek for an IMS encompassing three components: the QMS, the EMS and the OHSMS. The other viable typologies seem to be an intermediate stage in the process of achievement this ultimate goal. This statement is supported by the fact that the higher rates of growth of the ISO 9001+ISO 14001+OHSAS 18001 typology seem to match with the decrease of the other typologies, namely, the ISO 9001+OHSAS 18001 typology.

4.3 *Integrated OHSMSs—geographic location*

The geographic diffusion of integrated OHSMSs (Fig. 4) throughout Portugal matches the density of the Portuguese industrial complex. More than 95% of the studied population is located at the Lisbon, north and center regions.

According to the results displayed by Figure 4 all the NUTS II regions present the three component

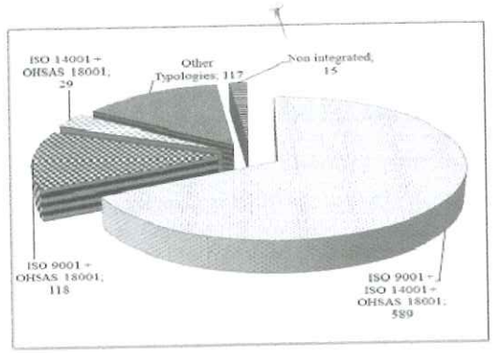

Figure 2. Integrated OHSMSs: Relevance by typology.

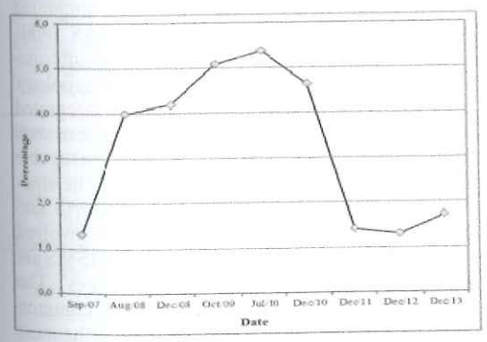

Figure 1. Time evolution of the percentage of non-integrated OHSMSs (Portugal).

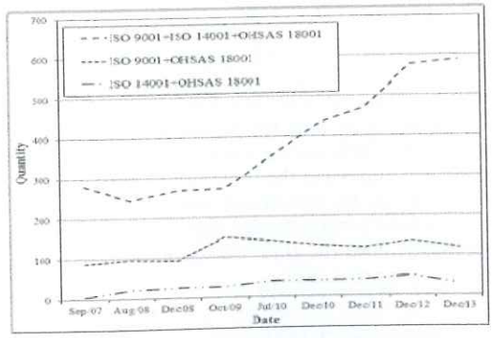

Figure 3. Integrated OHSMSs: Time evolution by typology (Portugal).

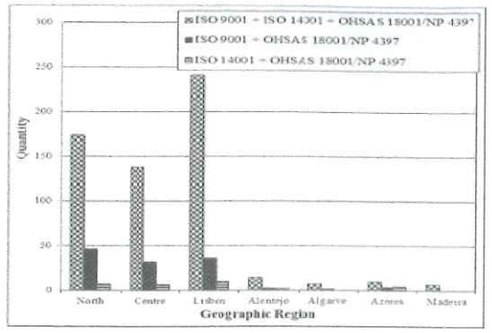

Figure 4. Integrated OHSMSs: Typology by geographic location (NUTS II region—Portugal).

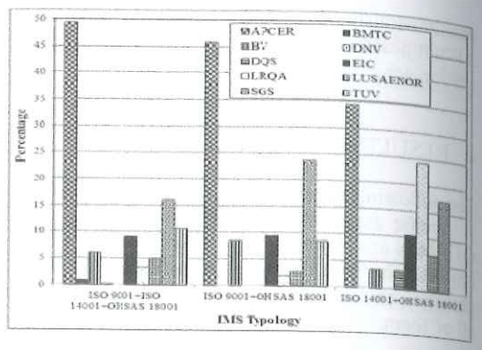

Figure 6. Integrated OHSMSs: Typology by certification body.

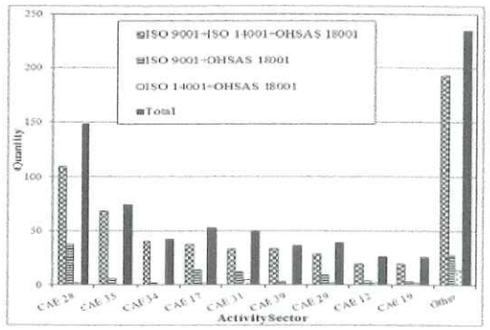

Figure 5. Integrated OHSMSs: Typology by activity sector.

typology as the most representative. It should be highlighted that not all regions present all typologies, namely, the Algarve and the Madeira regions where none integrated systems encompassing simultaneously solely the EMSs and OHSMSs was reported.

4.4 *Integrated OHSMSs—Activity sector*

The analysis by activity sector is presented in Figure 5. The 'Construction' (Code 28) and the 'Other services' (Code 35) activity sectors are those where one may find the higher amount of integrated OHSMSs with a remarkable percentage of them encompassing the three subsystems.

It should be mentioned that all the activity sectors that pertain to the Top Ten of integrated OHSMSs have the three subsystems typology as the most representative.

4.5 *Integrated OHSMS—Certification bodies*

Concerning the certification bodies (Fig. 6) more involved in the integration of OHSMSs one may see that APCER (*Associação Portuguesa de Certificação*) leads the ranking.

This result matches the result attained if one considers the entire population of certified companies. It should be mentioned that Figure 6 suggests that LRQA (Lloyds Register Quality Assurance) is deeply involved in the certification of companies encompassing the ISO 14001+OHSAS 18001 but less involved in the certification of the other typologies.

5 FINAL REMARKS

This paper reported, for the first time as we were able to find out, a thorough analysis of the integrated OHSMSs diffusion in Portugal. The results presented in this paper suggest that the majority of the certified OHSMS cohabit with other MSs, namely, the QMS. The integrated typology encompassing three subsystems (ISO 9001+ISO 14001+OHSAS 18001) is the most representative and the results suggest that this typology is the ultimate goal of the companies that opted by the integration of MSs. It seems that other integrated typologies such as the ISO 9001+OHSAS 18001 and ISO 14001+OHSAS 18001 act as an intermediate stage to attain the three component typology. Concerning the geographic location of integrated OHSMSs throughout Portugal it is possible to state that this matches the density of the Portuguese industrial complex being a great deal of the studied population located at the Lisbon, north and center regions. The activity sectors more involved in integrating their MSs including the OHSMS are the 'Construction' and the 'Other Services'. The most active activity sectors all present a common feature: the three component typology is the most reported one. Concerning the certification bodies APCER is the one that assess more IMSs regardless the integrated typology.

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The influence of the quality of the cooking oil from the frying process in food safety—case study in the catering industry

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ABSTRACT: One of the most significant aspects of Food Hygiene and Safety (HSA) is connected to the conservation of the features of each food, individually or in association with others until the consume moment. The fried foods in degraded oils can jeopardize food safety and enhance public health problems. With this research study our aim is to try to study the type of control that is performed in the catering establishments part of the study sample. They are geographically located in the Northern Region of Portugal, and the study concerns the formation of polar compounds, which are originated by the thermal treatment done to foods on high temperatures. For the statistical treatment of the data resorted to methods of statistical analysis and exploratory studies (statistical software package SPSS 20.0 and statistical correlations), in seeking to meet the planned objectives. We concluded that the results obtained, and also considering the practices observed by the assessment of the frying processes, were generally safe as well as the consumption of these foods.

1 INTRODUCTION

Nowadays the Food Hygiene and Safety (FHS), has a fundamental role and a huge importance in the criteria selection on the food to be consumed. As a main component of Man development, their habits and traditions, it is definitely a very important theme to our society which is now more interested and aware. One of the most significant aspects of the HSA is connected to the conservation of the features of each food, individually or in association with others until the consume moment. As well as a resulting concern to prevent the effects of possible changes and composition changes, facing the contamination dangers from biological, chemical, physical and nutritional nature.

In the eating habits of the Portuguese Society, as it is also common in Mediterranean societies, it is rooted the consume of considerable quantities of vegetable fats (olive oil) and of food cooked through the frying process, as a usual cooking method. These contribute significantly to the ingestion of considerable amounts of fats. The frying has contributed to the increase on the consumption of vegetable oils and fats, flavor and texture, that are very appreciated by the consumer and can be used in a large amount of food. This thermal processing is advantageous from the food security point of view (as there is a destruction of microorganisms due to the high temperatures which take place) and sensorial (they give the food unique organoleptic characteristics in texture, appearance and flavor) (Saguy e Dana, 2003; Varela *et al.*, 1988).

From a nutritional standpoint, fats are essential for a good body functioning. In addition to help satisfy the daily energy needs, they provide fatty acids essential for its development and they work as a vehicle to the fat-soluble vitamins (A, D, E and K). However, excess fat intake is harmful to the health.

This problem is aggravated when ingested fats are changed due to, for example, an incorrect use of the same in frying foodstuff (Soriano *et al.*, 2002).

The commercial use of frying, on a large scale, began in the second half of the XX century, with the development of cold for domestic and