Food integrated management systems: Dairy industry insights

Abstract

Purpose – This research intends to study integrated management systems (IMS) from sector and size perspectives.

Design/methodology/approach – Extant literature is reviewed focusing on food-related management topics. A single case is used to delve into the understanding of management systems integration in a real food manufacturing setting using the contingency approach. Data is drawn from employees of all hierarchy levels and triangulated by the system's documentation and observations on-site.

Findings – This case shows how size and sector-related constraints condition integration. It is found that IMS scope, strategy, level, audits, resources, motives, benefits and difficulties are influenced by sector and size constraints. Traceability is identified as an integration "catalyst" for multiple management systems in food companies. Furthermore, the environmental dimension is considered within the existing integrated structure.

Research implications / limitations – Conclusions bring to light the sustained business leverage provided by food integrated management systems. Thus, food industry managers are driven to streamline the quality, food safety and environmental processes following an IMS approach. Future research on multiple cases of different size would reflect a wider IMS sector-specific perspective. Research on other sectors is expected to provide different particular aspects of integration, as well.

Originality/value – To the best of the authors' knowledge, this is the first in-depth study on the adoption of an integrated generic and sector-specific management system from the contingency perspective. The case visualises the contribution of integration when addressing the critical food safety and quality operations and the significant environmental aspects.

Key words – integrated management system, food safety, traceability, food sector, firm size, contingency approach

Article Classification: Research Paper

1. Introduction

Food sector is thriving in the current challenging times. However, food producers, due to the high market competition, seek ever more efficient and effective managerial practices. Since management standards are recognized as a means to articulate and diffuse recommended principles and practices, the adoption of management standards spreads across food companies. According to the latest ISO survey (ISO, 2014) the number of ISO 22000 certified organisations grows steadily at an annual rate of 15%. In the same survey, Greece is listed in the top three countries world-wide in terms of certifications' number and growth rate.

The ISO 22000:2005 standard integrates systems approach with the methodology used for the hazard analysis and critical control points, widely known as HACCP (Teixeira and Sampaio, 2013). ISO 22000 certification is meant to satisfy customer requirements, to support marketing arguments and to assure full supply chain involvement in the food safety process (Teixeira and Sampaio, 2013) by establishing trust and enabling integration of food safety with other management systems (MSs) and, hence, reducing the need for customer audits (Escanciano *et al.*, 2014). It is emphasized that the retailers - at the end of the agri-food chain - act as primary drivers for the adoption of management systems standards and the MSs integration in the food industry (Kafel and Sikora, 2014; Soderlund *et al.*, 2008).

The agri-food chain is governed by strong interdependencies among its tiers, with retailers and control bodies imposing a variety of regulations, such as the Codex Alimentarius, and requirements, such as traceability. Therefore, the ISO 22000:2005 standard adopts a supply chain approach to manage food safety. Food sector issues aside, there are other economic, environmental and social aspects, common to all industry types, that need to be addressed, as well. In this context, Trienekens and Zuurbier (2008) seem to reflect the integrated management system (IMS) when they suggest a "modular system" encompassing all kinds of standards and norms. From the outcome perspective, Kafel and Sikora (2014) found that food companies implementing MSs acquire higher maturity level and, hence, increased financial performance. In a similar vein, the combined adoption of quality and food safety standards is found to contribute significantly to both food product quality and operational performance (Kafetzopoulos and Gotzamani, 2014).

Extant IMS research on food companies is relatively limited probably due to the late release date of the food safety MS standard (ISO 22000:2005). Even more limited is the focus on food safety MS integration within the IMS structure. The ISO 9001 standard was originally released in 1987 followed nine years later by the ISO 14001 standard's first version. Therefore, IMS is widely established in its "generic" form of quality and environmental MS since the launch of the second flagship MS standard (ISO 14001:1996) (Gianni and Gotzamani, 2015). Thus, this research aims to contribute to the understanding of the food safety MS within the borders of a generic IMS and highlight the synergies.

Furthermore, to date, there is a paucity of research on the contextual IMS factors. Generally, it is stressed, that organizations size and economic sector may condition the decision to integrate systems and the breadth or depth of integration (Jørgensen et al., 2006; Salomone, 2008). Later on, von Ahsen (2014) draws attention to the sector and size potential impact on the benefits and drawbacks of IMS In a similar vein, Savino and Batbaatar (2015) identified relationships of core IMS resources with firm size. In this context, López-Fresno (2010) directs research on the integrated adoption of sectoral standards. Following this line of reasoning, this research intends to explore IMS contextual factors in the food sector. The single case approach and the availability of data from multiple sources allow the researchers to delve into various integration aspects both within the organizational structure and across the food supply chain.

To serve the aforementioned research objectives, a literature review is conducted in the next section on integrated food safety, quality and environmental management within and across food organizations. Research methods and instruments are presented in the third section. In the fourth section, a single case is analysed based on the literature review directions. Next, the results are discussed and, lastly, conclusions are drawn and future research directions are provided.

2. Literature Review

According to the contingency theory, organizational performance depends on the fit (i.e. proper alignment) of internal structure and strategy with external context variables, so-called contingencies (Schneider et al., 2014). To date contingency-based IMS research is scarce, particularly in terms of location (Simon and Douglas, 2013), sector and size (Salomone, 2008; Savino and Batbaatar, 2015). This research aims to draw on the IMS contingency approach by studying a small food company. To this end, research on the IMS features is reviewed in the following paragraphs focusing on food sector and firm size as key contextual factors.

2.1. IMS scope, strategy, methodology, level, audits

Karapetrovic (2003) understands the IMS as a single set of interconnected processes that share a unique pool of human, information, material, infrastructure and financial resources in order to achieve a composite of goals related to the satisfaction of a variety of stakeholders. IMSs are assessed according to their attributes or features, i.e. scope, strategy, methodology, level, audits, motives, benefits, difficulties, and evolution/maturity (Almeida *et al*., 2014; Domingues *et al*., 2014; Simon *et al*., 2012b). Scope refers to the type of integrated MSs either generic or sector-specific. Strategy refers to the MS integration sequence. To date, manifold IMS methodologies are developed, both theoretically and empirically (see e.g. Asif *et al.*, 2010; Rebelo *et al*., 2014; Zeng *et al.*, 2007). However, the vast majority of organizations integrate using widely known tools, such as process mapping and the analysis of common elements (Bernardo *et al.*, 2011). To estimate the IMS advancement Sampaio et al. (2012) propose four levels: documentation integration, management tools integration, common policies and goals, and common organizational structure. Otherwise, Simon et al. (2012b) evaluate IMS in terms of objectives, processes and resources. IMS audits are assessed independently in terms of team, scheduling, strategy, plan, report, methodology, guidelines, frequency and outputs (Simon *et al*., 2014).

2.2. IMS motives, benefits, difficulties, evolution

Khanna *et al.* (2010) compiled the integration driving factors as follows: customer pressure, need for competitiveness and image improvement, continuous improvement culture, costs and redundancies reduction, documents sharing, quest for synergies and enhancement of employees' awareness. On the other hand, the most common IMS drawbacks are the incompatible concepts between systems, the complex organizational system, the initial higher organizational problems, the fact that one problem on a single system may affect the overall management system (MS), the need for update of documentation at the expense of other management activities, and the initial costs increase associated to an increase in non-conformities (Santos *et al*., 2011).

With regard to its outcome, integration is proven beneficial to the internal cohesion, the use and performance of the systems, the corporate culture, the image and strategy, and the stakeholders' implication (Khanna, 2010; Simon *et al.*, 2012a). Furthermore, the level and

the benefits of integration are found to have a positive effect on innovation and competitive advantage (Simon and Petnji Yaya, 2012; Wagner, 2009). Abad *et al.* (2014) identify a positive relationship between the achieved level of integration and the accrued corporate benefits. Moreover, it is found that small and medium-sized enterprises reach higher levels of integration because of their low operational and organizational complexity (Abad *et al*., 2014). Impediments to implementing integration are the lack of integration guidelines, the differences in the models for implemented standards the lack of management commitment, the demand for training and cultural change, the lack of skilled auditors and consultants, the lack of employees motivation and human resources (Simon *et al.*, 2012a).
Another research stream addresses IMS evolution and maturity over the years. Simon *et al*. (2012b) found that firms' IMS level reaches one of two "poles"; meaning that, firms either fully integrate their MSs or abandon MS integration in the long term (von Ahsen, 2014; Gianni and Gotzamani, 2015). Furthermore, Zeng *et al*. (2011) stressed that "related experience" measured by both "years of implementing IMS" and "experience of implementing ISO 9000" influences IMS benefits. In a similar vein, Arifin *et al*. (2009) proposed an IMS maturity metric - called "readiness level" - comprised of the organization's awareness, the employees' knowledge and competency level, the management of the organization's information, the management commitment, the documentation and the awareness of the certification status. Domingues *et al*. (2014) understand IMS maturity via certain constructs, i.e. the "top management integrated vision", the "integration level classification" and the "audit typology".

2.3. Human resources within integrated management systems

Several researchers emphasized the human resources impact on management systems integration. Simon *et al*. (2012b) stress that integration of human resources increases over time within an integrated management system. Simon and Bernardo (2014) adopt a resource-based view and highlight the benefits and barriers of integration related to human resources, with culture building, awareness enhancement, top management commitment, motivation, communication and collaboration being the enablers of successful integration. Karapetrovic (2002) and Renzi and Cappelli (2000) contend that the degree of integration depends on the hierarchy level in such a way that management systems are completely integrated at the top management and shop-floor (operational) level whereas they remain mostly function-specific and independent at the middle management level. Particularly, across within food SMEs the plant or production manager is often assigned the quality management tasks, as well (Psomas *et al.*, 2013).
Bernardo *et al*. (2010) identified a different level of the audit human resources *integratability* between the internal and the external or third-party audits, since it seems more feasible for technically skilled employees to be trained as MS internal auditors, as well. Thus, sector- and activity- specific expertise is assured jointly with the auditing competence. On the other hand, as far as the external auditors are concerned, it is a costly and complex task for a certification body to assure availability of skilled auditors for every aspect of activity on demand. In line with this, Nowicki *et al.*, 2013) claim that in the food industry the external auditors' multiple competence is limited to maximum two management systems. Renzi and Cappelli (2000) extend the skills' requirement as a counter-integrating factor of both the internal and the external audits grounding their argument with the case of a mineral water plant where the external audits are non-integrated and the internal audits are integrated in methodology (at procedural level) but kept separate in practice, i.e. at organizational and operational level (Renzi and Cappelli, 2000).

2.4. Integration of the environmental management system

Integration-related research is focused on the disciplines of quality and the environment. In fact, the very concept of the integrated management system was based on the possibility of the harmonised adoption of the two respective management standards (Karapetrovic and Jonker, 2003). In a similar vein, Karapetrovic and Willborn (1998) introduce the system's view to allow the *cohesion* of the quality and environmental and other management systems into one integrated "supra" business system. Griffith and Bhutto (2008) identify the environmental quality system within construction firms contextualizing IMS into a framework of environmental performance. However, up to date the impact of integration on the development of environmentally sustainable strategies remains unclear (Abad *et al.*, 2014). When viewed from the supply chain perspective the environmental management integration is considered to yield both a competitive advantage and more efficient processes by "understanding the conversion of raw materials into finished goods" (Handfield *et al.*, 2005).

Particularly in the food sector, environmental management has become part of the food safety and quality agenda, due to the impact of pesticides, nitrogen and phosphate concentration in water and soil to both food safety and the environment (Grekova *et al.*, 2014). The integration of the EMS into the Performance Management System (PMS) using the Balanced Scorecard (BSC) in a large food manufacturing firm shows how the environmental standard may assist to the performance appraisal by applying integration principles (Länsiluoto and Järvenpää, 2012). Nestlé factories use a TQM framework complemented by environmental and social performance aspects to evaluate the quality, safety, cost, flexibility and sustainability of suppliers' processes (Hamprecht *et al.*, 2005).

2.5. Food sector

Food processing across the agri-food chain interacts with the environment in many ways, such as the consumption of resources and the production of waste. However, many food manufacturers show a low perception level of their activities' impact on the environment, mainly due to the lack of environmental knowledge and awareness and the confusion between hygienic and environmental management practices (Massoud *et al.*, 2010). Djekic *et al.* (2014) studied seven Serbian dairy plants and found only one of them with an environmental MS in place.

Dairy factories consume water and energy and produce large amounts of wastewater with a high organic load (González-García *et al.*, 2013; Lagodimos *et al.*, 2007). Potential environmental problems of cheese making result from the lack of a managing system for the whey, part of which is removed and substituted by warm water during curd washing, and in a lesser extent, from brine used in the salting step (Ferragut and Trujillo, 2008). Boudouropoulos and Arvanitoyannis (1999) predicted a rising ISO 14001 standard uptake in the food industry, since relative environmental issues, such as wastewater treatment, can be effectively managed by adopting the standard. Moreover, Augustin *et al.* (2013) claim that "minimizing waste at all points across the entire supply chain will be a hallmark of a sustainable dairy industry in the future".

Regarding health hazards emanating from cheese making being an open process, such as the pathogenic bacteria from raw milk, hygienic conditions of installations must be controlled and adequate personnel training needs to be performed following the Hazard Analysis of Critical Control Points (HACCP) principles (Ferragut and Trujillo, 2008). The International Organisation for Standardization (ISO) formalized safety management in the food chain through the release and revision of sector-specific standards, guidelines and prerequisite programmes (see Table 1).

Table 1 – ISO standards and guidelines for food safety management

Standard code	Title / Content
ISO 22000:2005	Food safety management systems - Requirements for any organization in the food chain
ISO/TS 22002-1:2009	Prerequisite programmes on food safety – Part 1: Food manufacturing
ISO/TS 22002-2:2013	Prerequisite programmes on food safety – Part 2: Catering
ISO/TS 22002-3:2011	Prerequisite programmes on food safety - Part 3: Farming
ISO/TS 22003:2013	Food safety management systems - Requirements for bodies providing audit and certification of food safety management systems
ISO 22004:2014	Food safety management systems - Guidance on the application of ISO 22000
ISO 22005:2007	Traceability in the feed and food chain - General principles and basic requirements for system design and implementation
ISO/TS 22002-4:2013	Prerequisite programmes on food safety - Part 4: Food packaging manufacturing

2.5.1. Food traceability

Food scares nowadays enhance the need for transparency. Moreover, the intense impact of information diffusion assuring health, safety and traceability has led the food processing industry to monitor and record the use of critical substances, such as additives (Ionescu-Somers and Steger, 2008). Food traceability refers to "all stages in the food supply chain so that the product can be checked for safety and quality control, traced upward, and tracked downward at any time required" (Bosona and Gebresenbet, 2013). From the consumers' perspective "traceability helps to build trust, peace of mind, and increase confidence in the food system" (Aung and Chang, 2014). Particularly, regarding dairy products consumers it is stressed that traceability is anticipated to address sustainable development concerns about animal welfare, ethical production methods and environmental issues (Augustin *et al.*, 2013). Zhang *et al.* (2010) reflect the streamlining of the IMS with traceability when they suggest integrating internal traceability with MSs, meaning food safety (hygiene) management, quality management and environmental management, within a production unit.

2.5.2. Size of food organizations

Size seems to influence integration, since small companies have limited internal resources, both financial and human, to adopt food safety, quality and environmental standards (Grekova *et al.*, 2014; Karaman *et al.*, 2012; Vladimirov, 2011). In this vein, Karipidis *et al.* (2009) propose the release of an intermediary quality management standard to be adopted by small companies. In particular, as regards the wastewater effluent treatment, it is common that small scale cheese mills have no specific equipment for whey processing and, thus, whey stream is sent together with the wastewater for treatment (González-García *et al.*, 2013). The influence of local business and social structures to small firms is also highlighted (Bourlakis *et al.*, 2014; Grekova *et al.*, 2014). Local sourcing and selling is also linked to the increased profit-margin of micro-manufacturers (Bourlakis *et al.*, 2014). Comparing micro, small and medium-sized firms Bourlakis *et al.* (2014) contend that small firms excel in sustainability performance. Medium-sized firms are found to be closer to the

large firms in terms of environmental practices (Grekova *et al.*, 2014). As regards traceability, it is argued that micro and small food producing and processing companies lack financial capacity, traceability information and knowledge to implement it (Bosona and Gebresenbet, 2013; Bourlakis *et al*., 2014).

2.5.3. Management systems integration in the food sector

Empirical evidence shows that about 80% of the food companies in Spain implemented first a QMS, which facilitated the introduction of the FSMS (Escanciano *et al.*, 2014). In the same survey Escanciano *et al.* (2014) found that 32% of the participating firms were ISO14001 certified, as well, with almost 95% of them having their MSs integrated either totally (73.2%) or partially (21.2%). De Oliveira Matias *et al.* (2013) contend that the integrated adoption of the food safety and occupational health and safety (OHS) standards enhances both the food safety and the prevention of occupational risks in a complementary manner, since the measures taken for food hazards mitigation coincide with the occupational hazards preventive actions. Likewise, several researchers highlight the increased compatibility of the occupational health and safety with the environmental management norm (Kraus and Grosskopf, 2008; Salomone, 2008; Sampaio *et al.*, 2012).
Due to their prior experience and the compatibility of quality and food safety standards, ISO 9001 adopters are expected to be the first to integrate food safety within their quality system (Fotopoulos *et al.*, 2010). In the years before the launch of the ISO 22000:2005 standard, Aggelogiannopoulos *et al.* (2007) refer to the benefits of integrating HACCP principles into the ISO 9001 based quality management framework to the organisational performance and the required paperwork. In the same vein, Efstratiadis and Arvanitoyannis (2000) stress that HACCP as a part of a quality system not only manages to provide safety to the products, but also assure a better and more effective implementation of the "whole quality system". Similarly, Christaki and Tzia (2002) argue that quality and safety are both important in wine production, since quality assurance throughout the whole winemaking process is significant for the consumer acceptability, while safety assurance is necessary for the protection of human health.
It is noteworthy that, in the extant body of food IMS research, which follows the release and spread of the food safety standard (ISO 22000:2005), the focus on food safety management is missing. Fresner and Engelhardt (2004) understand the IMS as a step towards sustainable development and merely refer to the assignment of hygienic tasks to a brewery's environmental manager and the adoption of certain food safety practices, such as raw materials supply from integrated control farming. In a similar vein, Weyandt et al. (2012) from the social responsibility perspective, underline IMS positive impact on aquaculture sustainable development and competitiveness. Asif *et al.* (2010) used within and cross-case analysis on four big enterprises in the pharmaceutical, textile, automobile and dairy industry, where some sector-related differences are identified, yet not discussed in detail. The research gap is even more emphasized when a sugar manufacturing unit integrates quality and environmental MSs omitting food safety MS (Satolo *et al.*, 2013). Furthermore, only a single agri-food IMS model has been proposed so far (Proto *et al.*, 2013). In summary, the scope and strategy in IMS food case studies are listed in Table 2. With respect to the sequence of implementation, in the majority of the cases, QMS is implemented either first followed by the EMS or concurrently with the EMS, in accordance with the respective generic IMS findings (Bernardo *et al*., 2009). It is also worth noting that research on food IMS is mainly located in European Countries following the ISO 22000 certification growth rate, which is higher in Europe (ISO, 2014). Kerhadia and Warriner (2013) provide an exception to this "rule" with their study of a warehouse IMS implementing quality and food safety MSs in compliance with the Food Safety

Modernization Act in North America. However, the food manufacturer's perspective is still missing, since this exemplary case addresses the logistics actors' involvement in the food supply chain.

Table 2 - Integration strategies in the food industry

Authors	Country	Field of activities	Integration strategy
Asif et al., 2010a; Asif et al., 2010b	Pakistan	Dairy plant	QMS-EMS-OHSMS HACCP
Bernardo et al., 2013	Greece (2)	Food and beverages Food	QMS-EMS-OHSMS-FSMS EMS-QMS-FSMS
Claver et al., 2007	Spain	Farming cooperative	QMS-EMS-EFQM-BRC*
Fresner and Engelhardt, 2004	Austria	Brewery	first QMS, then EMAS and ISO 14001
ISO, 2008	Spain	Beverages	QMS-EMS-FSMS
Kheradia and Warriner, 2013	Canada	Warehouse	FSQMS
Länsiluoto and Järvenpää, 2012	Finland	Food manufacturing	QMS-EMS-PMS
Nowicki et al., 2013	Poland (4)	Bakery and confectionery/ Beverage cans and bottles/ wet spices/ soluble coffee	QMS-FSMS-BRC* QMS-FSMS QMS-EMS-OHSMS-BRC-IFS*-FSMS QMS-HACCP-IFS
Renzi and Capelli, 2000	Italy	Mineral water	QMS-EMS
Proto et al., 2013	Italy	Processed tomatoes	QMS-FMS-BRC-IFS
Satolo et al., 2013	Brazil	Sugar and ethanol	First QMS and then EMS / IMS after several years

(*): BRC (British Retail Consortium) and IFS are retailers' food safety and quality standards

2.5.4. Management systems implementation in the Greek food sector

Greek food manufacturing companies are mostly small sized (Fotopoulos *et al.*, 2010) and family owned (Psomas *et al.*, 2013; Psomas and Kafetzopoulos, 2015). However, size limitation does not discourage Greek food plants to improve by adopting quality and food safety MS standards, e.g. ISO 9001 and ISO 22000/HACCP (Psomas *et al.*, 2013). Aggelogiannopoulos *et al.* (2007) study the adoption of the ISO 9001 standard at a small winery arguing that safe production and supply of food commodities can be assured by a systematic and organizational structure and controlling activities, processes, procedures and resources according to the standards which constitute the basis for the quality and hygiene systems, such as HACCP principles and ISO 9000 and 14000 series.
Particularly, with respect to Greek dairy plants, the majority is found to be micro and small-sized and ISO 22000 certified (Psomas and Kafetzopoulos, 2015).
Kafetzopoulos *et al*. (2013) research on the effective - not merely complying - adoption of both the ISO 9001 and the ISO 22000 standards and substantiate synergies and positive impact on the food business competitive performance. Furthermore, Kafetzopoulos *et al*. (2014) highlight human resource impact - in terms of expertise, training, involvement and

commitment - on the continuous improvement of the quality MS and on food companies' operational performance.

Drawing on the contingency approach, the IMS context, as outlined above, generates the following research questions:

RQ1: Does the sector have any impact on the IMS features?
RQ2: Does the firm size have any impact on the IMS features?

3. Research methodology

Case study approach is selected to serve the purpose of this research, since it allows the verification, illustration and building of theory based on both primary (empirical) and secondary (literature) data (Claver *et al.*, 2007). Furthermore, this research uses a single case to enable the in-depth understanding of a complex phenomenon, such as integration, through direct observation without experimental control or manipulation considering both temporal and contextual dimensions (Meredith, 1998). Contextual framework is established by reviewing literature through a contingency lens, "which ensures an excellent fit of the case study design and the underlying theory" (Schneider et al., 2014). Moreover, research questions focus on the key contingency factors. Within the aforementioned research framework the steps followed are depicted in Figure 1.

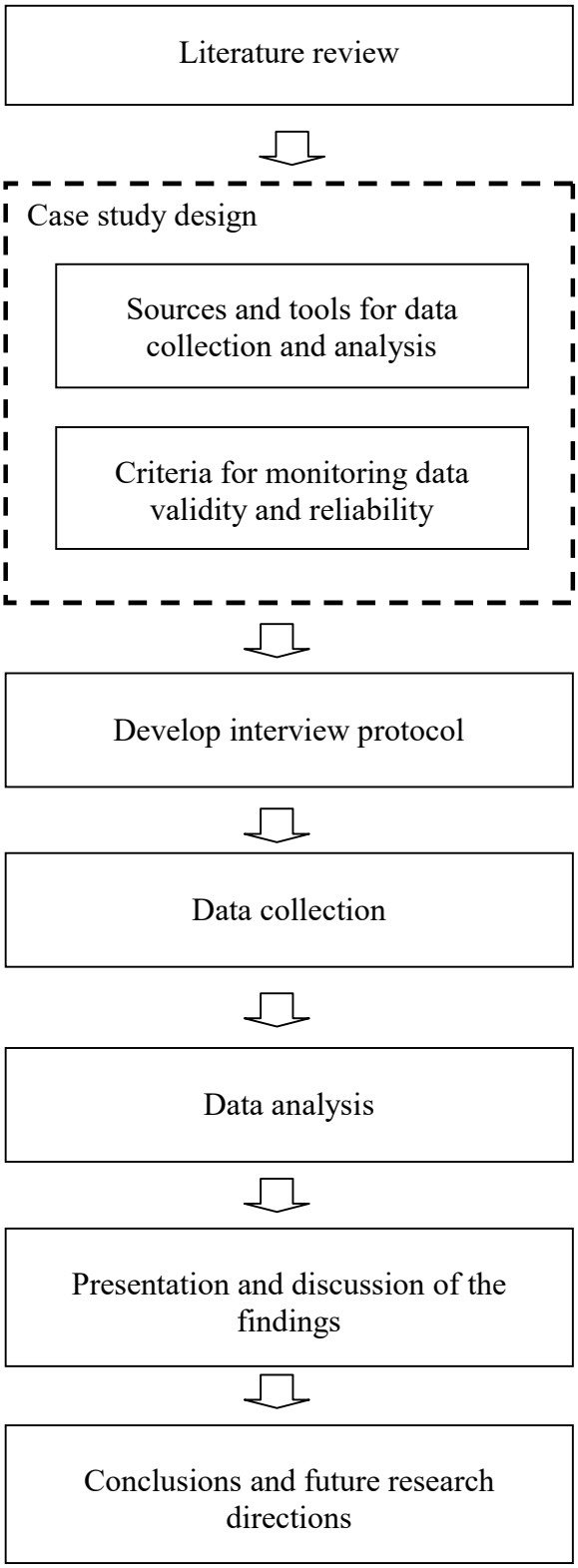

Figure 1. Case research stages (Adapted from Satolo et al., 2013)

Construct validity reflects the extent to which a study investigates what it claims to investigate, or in other words, the achieved level of reality's accurate observation (Gibbert and Ruigrok, 2010). Thus, within this research framework construct validity is assured via triangulation of methodological perspectives and the establishment of a clear chain of evidence (Yin, 2003). The internal validity of this research is defended through making inferences and juxtaposing the empirically observed patterns to the ones identified in prior research (Eisenhardt and Graebner, 2007; Yin, 2003). Regarding the external validity of this research, it should be noted that case research aims at the analytic, not the statistical, generalization of its findings by investigating "decisions, programs, the implementation process, and the organizational change" (Yin, 2003).

3.1. Data collection

Data was drawn from multiple sources, i.e. interviews, documents and records, and observations on-site, to ensure triangulation (Miles and Huberman, 1994). A semi-structured interview protocol was used for the field research (Table 3). The questions were adapted from the case research protocol of Asif *et al.* (2010). Using existing questions enables the "replicability" or reliability of research and the comparability of results (Bryman and Bell, 2007). Furthermore, questions are addressed to employees of different hierarchy levels and areas of responsibilities to reduce "elite" bias (Miles and Huberman, 1994). The researchers used prompts to direct the conversation and to keep the interview focused on the research topic. To ensure that the research framework was made clear to the interviewees and valid answers would be obtained, a set of initial questions was posed with regard to the purpose of the study, the interview procedure, and the overall research content (see Table 3).

Table 3. Semi-structured interview protocol (Adapted from Asif *et al*., 2010)

Introduction (scope and objectives):
• Describe the purpose • Establish trust (confidentiality terms) • Explain key terms (e.g. IMS, standards, management systems etc.)
Introductory questions
• Has the purpose of this study been made clear to you? • Have the steps of this interview been made clear to you? • Do you have any questions regarding the interview process?
Interview main part (scope and objectives):
• Inquire about position in the firm • Discuss involvement in the IMS • Ask the basic questions • Investigate each participant's role • Investigate the usage of different types of management systems and their value for the organization • Investigate the influence of various factors which facilitate or challenge IMS development • Ask further details of the overall IMS experience • Focus on the contingency-related issues. *(Flow of questions, terminology/wording used and interview duration may vary among participants. Interviewees will be urged to expand on certain topics that might need clarification.)*

Questions addressed to managers

- What MS types does the organisation employ (for the management of quality, food safety, health and safety, environment, social responsibility, etc.)?
- What is your motivation for integration of MSs?
- Did any of the interested parties request the IMS?
- What do you think is the most important factor in the decision to carry out integration of MSs?
- What are the essential features of this MS?
- How did you organize the integration of MSs?
- Who was/were involved in the integration process?
- Why … (person/team/department) was/were involved in the integration process?
- What strategy/means/tools were used for MS integration? Why?
- What is the starting point in the integration process? What are main steps in the integration process? Can you give me a few examples?
- What other options were available for MS integration?
- What sources of advice were sought for integration purposes?
- How do you measure the IMS performance?
- What are the indicators of effective MS integration? Could you please give me a few examples of these indicators?
- How do you determine the degree of integration at various organisational levels?
- Do you think the size of your company affected IMS performance in any way? If yes, how?
- Do you think there are any particular sector (food industry)-specific motives, benefits, difficulties with regard to the IMS? Please explain.

Questions addressed to shop floor employees

- Employed in this company/position since …?
- Please mention your job description/ main activities/ daily tasks assigned?
- Why in your opinion the new management system was deployed?
- Do you think it was absolutely necessary to implement this system? Why do you think so?
- Was your feedback/involvement solicited in the integration process?
- What is the impact of the new system on the technical aspects of your work in terms of compliance to control limits and managerial expectations?
- What are the social implications (teamwork, inter-departmental conflicts, behavioural changes, motivation)?
- What types of operational benefits did you receive from the new system? Which are the most important of these benefits?
- What is the most prominent change after the introduction of the new system?
- What are the drawbacks of the new system? Are there any unanticipated / undesirable outcomes?
- Do you think the size of your company affected IMS performance in any way? If yes, how?
- Do you think the sector (food industry) is responsible for any particular motives, benefits, difficulties with regard to the IMS? Please explain.

Closing section (scope and objectives):

- Discuss any additional remarks and/or questions raised and conclude.
- Thank the interviewee for his/her willingness to participate.

Closing questions:

Is there any other topic or concern in this context that you might wish to add or discuss?

A total of nine participants provided data input. The profiles of the interviewees are summarized in Table 4. In terms of their MS experience, six of the interview participants

had more than five years' MS experience, while the remaining participants had MS experience of one to four years. Senior management interviews (n=2) lasted approximately 60-90 minutes and middle/low-level management interviews (n=7) lasted approximately 30–45 minutes. Data was gathered on the IMS features with relation to the contingency factors. In addition to the interview protocol, the research framework (Figure 1) and the IMS contingency and content analysis as reviewed in literature also facilitated the researchers through the data collection phase.

Table 4. Interviewees' profile

Code No	***Position in the company***	***Years of MS experience***	***Role in the IMS / decision level***
1	Medium-level (production) manager	12	Food safety and quality control manager / tactical
2	Senior manager (Assistant director)	6	FSMS-QMS manager / strategic
3	Senior manager (Director)	15	IMS manager / strategic
4	Shop-floor employee	2	Food operations
5	Shop-floor employee	8	Food safety and quality / operational
6	Driver	2	Food operations
7	Administration employee	4	IMS maintenance / operational
8	Administration & production (packaging) control	7	IMS maintenance & food operations control / tactical
	Production manager assistant	9	Quality control – food safety operations/ operational-tactical

Interviews' and observations' data was collected through taking notes while the information was filtered by relevance to the IMS features. Repeated contact with the company by phone and e-mails was additionally used to clarify any points that were missed during the visits. The interview discussions were transcribed into text and analysed with the techniques of qualitative content analysis. Literature background on technical and managerial topics related to the case was reviewed in order to avoid any possible misinterpretations and, hence, to increase validity of data (Maxwell, 2005). Documentary evidence is used to supplement the data gathered via interviews and fieldwork (Myers, 2008).

4. Case findings

The case company is a small dairy mill processing around 25 tons of milk per week. Prior to its current ownership, the firm was a family business. The company is currently certified to the ISO 9001:2008 and the ISO 22000:2005 standards. Its products are certified by AGROCERT, which is the national standardisation and certification body for agricultural products and processes.

4.1. Integration scope and strategy

The new owner's expertise in the food sector and, particularly, in the quality management field was the critical factor for the top management's commitment to the quality and food safety MS. Both the top management and the employees confirm that the firm's culture and the operating conditions have been quality-oriented since the ownership transition. Hence, quality management is considered of strategic importance for the firm and, as

expected, the QMS was found to be implemented and certified first. However, the integration of the two systems did not follow the sequence of their implementation. More specifically, the IMS documentation was based on the ISO 22000 standard's requirements. The interviewees attributed this reverse prioritization to the food safety significance and the long established HACCP principles. Moreover, the bureaucratic burden of the FSMS is regarded by the participants as "mandatory", since it is audited by the authorities, as well, whereas QMS's bureaucracy is characterized as "100% voluntary". Case company is certified to both the ISO 9001 and ISO 22000 standards and has already completed two three-year certification cycles. With respect to the scope's expansion top management plans to implement and integrate an environmental management sub-system, since it anticipates to gain competitive advantage by being a front-runner in creating a three-dimensional IMS.

4.2. Integration methodology and level

Following prior research, the case IMS advancement level is estimated in terms of objectives, processes and resources. Objectives are fully integrated, as evidenced by the IMS policy document and confirmed by the senior managers. The procedures are integrated based on the common elements of the standards. The employees that were assigned to prepare and keep track of the IMS documents and records were not aware of any externally sourced or customized model adopted to integrate the MSs. Management review is conducted twice a year for the food safety MS whereas for the quality MS only once a year. As far as the audits are concerned, on the one hand, the internal audits are conducted twice a year by a single team in conformance with the IMS documentation (common manual, common procedure) following a unified plan and producing a single report. On the other hand, the external audits are scheduled by different auditors in different time frames addressing the requirements of the two separate standards. Summarizing, based on the documents, the records and the interviews data the MSs are found partially integrated. Resources are understood in the framework developed by Barney (1991) and adapted from Savino and Batbaatar (2015) as physical (know-how, IT systems and assets, location, proximity to raw materials), human (knowledge, experience, relationships), and organizational (structure, systems, operations). The resource integration level is analyzed in the following paragraphs.

4.3. Integration of audits

As mentioned above, the internal audits are performed jointly for both systems. More specifically, the auditing team, the timetable, the process and the reports were unified. Particular importance was given to the IMS training. Quoting shop-floor employees: "*we attended training courses and devoted time during our working hours to familiarize with the integration concept*". Medium-level managers confirmed that "*training concentrated on the understanding of the two MSs as a single, dynamic system identifying challenges, synergies, and opportunities for improvement*". With regard to the external audits, top management reported that the agri-food authorities, being unfamiliar with integration, acknowledged the merging of food safety with quality principles as a source of risk shifting focus and weakening the efficiency and effectiveness of the food safety processes. Thus, the IMS triggered more frequent and intensive audits. In addition, the multiple public auditing bodies that share responsibilities in the agri-food chain are found to detect conflicted non-conformities. In this context, multiple flowcharts of the same processes are included in the system's records to comply with the contradicting requirements. In general,

it is clear that the company needs to respond reactively to the governmental audits, since continuous improvement actions often prove far apart from the authorities' perspective.

4.4. Integration of human resources

The IMS documentation is updated by two appointed administration employees. All related documents are collected and processed on a weekly basis. The procurement and production personnel operate quality and food safety tasks in an integrated way following the respective integrated work instructions. The production manager is assigned the responsibilities of the quality and food safety manager, as well. The IMS manager reported that because of the work overload the IMS performance is not properly assessed. Moreover, certain MS standards principles, such as continuous improvement, are not adequately addressed either due to lack of expertise or lack of time. According to the top (senior) managers, the IMS-oriented organizational culture fosters the development of specific employees' skills - keeping the employee turnover ratio low - to counterweigh the limited available resources. However, drawing from the collected data it is substantiated that the lack of a dedicated human resource department maintains internal communication at an informal level and, hence, impedes the evaluation of the employees' improvement needs and satisfaction.

4.5. Benefits and difficulties

The interviewees reported better understanding of the processes, improved internal communication and organizational structure, and enhanced corporate image. With regard to integration barriers, when inquired about the possibility of embedding the environmental MS into the quality-food safety IMS, the executives highlighted the limited resources and the lack of state funding as the main withholding factors. In general, senior executives perceive that the IMS performs at a high level. However, they were not able to provide any supporting evidence. Moreover, any relative documentation was missing to substantiate quantified IMS results.

4.6. Food traceability

In the framework of a state-subsidized project, a barcode traceability system was installed with the aid of an IT consultant. This system was acknowledged as a major improvement step by both the executives and the shop-floor employees having replaced a huge amount of paperwork by an electronic data base. The resulting tracing of batches of milk and other raw materials made processes more transparent and established trust with the authorities. It is worth noting that this measure was initially considered a cause for production slowdown, since it not only required the adoption of a different perspective in collecting information but had to be accompanied by precise identification of tracking nodes backwards to the bulk milk production, as well. The installed traceability system was seen as a means to manage not only food safety, but quality, as well. For instance, the production manager, who is also food safety and quality control manager, identified the food traceability system as an opportunity to control the quality of the packaging material coming from different suppliers.

4.7. Integration of the environmental management system

Currently, the highly saline organic waste flows directly to the wastewater treatment plant. According to the interviewees the waste treatment is proven inadequate to handle the

specific load and properties of the wastewater. Top management traced several problems in the operation of the waste treatment that range from the original design of the treatment plant to the input of waste. Measures, such as reuse through condensation, recycling, and modifications in the plant are recognized as potential mitigation solutions. However, senior managers emphasize that the cost of equipment, transportation and operation impedes the improvement measures due to the small size of the company and the current economic situation.

A view of the firm operations is provided in the following figure (Fig. 2) depicting the inputs, the management and production processes and the outputs of the dairy plant. It is evidenced, that the internal production processes are already managed within the established integrated quality and food safety MS. Moreover, raw materials are introduced into the production line through the input management processes. Outputs are forwarded to the next links of the supply chain through the dedicated management processes of the established IMS. The interactions of the firm's activities with the environment are also charted. Energy, water and packaging resources need to be managed by the environmental dimension of the "evolved" IMS. Moreover, the environmental impacts of the plant's by-products and waste are expected to be mitigated within the "evolved" IMS, as well.

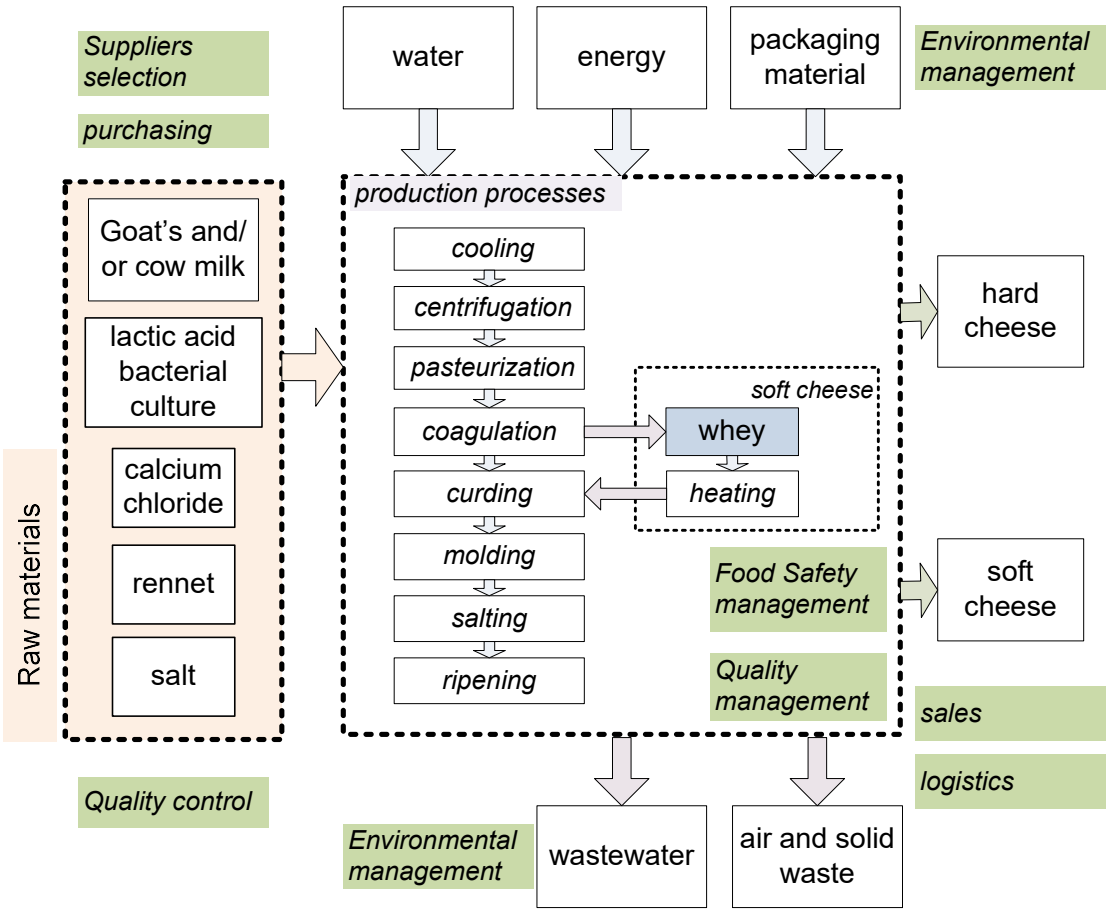

Figure 2 – Dairy plant: inputs, processes, outputs

Compiling the case findings, most of the IMS features are to some extent contingent on the food sector and/or the small size of the company. Table 5 summarizes sector and size effects on the case IMS features.

Table 5–IMS contingencies in a small food organization

IMS features	*Description*	*Sector effect*	*Size effect*
Scope and strategy	FSMS first – QMS second	Food safety is of top priority. Regulatory and institutional enforcement of food safety requirements	No size differentiation found.
Integration level	MSs partially integrated (single policy and manual, separate management reviews, semi-integrated procedures)	Focus on food safety management Food traceability identified as MS linking factor	Limited resources and less need to integrate certain procedures, due to small scale.
Audits	Internal audits fully integrated External audits non-integrated	Lack of skilled food safety and quality IMS auditors Lack of IMS knowledge by food state authorities	Internal positive effect: Less employees - easier coordination, multi-tasking Internal negative effect: lack of audit training resources
Human resources	Fully integrated (single food safety-quality manager)	Food industry requires high technical and knowledge expertise.	Multiple tasks assigned to a single employee due to limited resources (small firm) Lack of a human resource department
Physical resources	Non-integrated	Food traceability IT and knowhow demand	Outsourcing
Operational resources	Non-integrated	Food-specific operations, high-load waste treatment cost	Resource short-comings due to firm size limitations (lack of pollution control equipment and limited maintenance investments)
Motives	External and internal	External: mandatory compliance with food regulations and standardized requirements	External: Stakeholder pressure lower in small firms. Internal: IMS culture more easily diffused within small organizations.
Benefits	Improved food traceability Improved environmental perspective	IMS perspective enhances food traceability Integrated managerial view of inputs-processes-outputs highlights IMS benefits in food companies	IMS within and across firms enhances supply chain perspective and, hence, fosters cross-firm synergies and economies of scale.
Difficulties	Bureaucratic burden	Red tape procedures and legislation are strict on food companies and increase audit complexity	Environmental MS integration postponed due to size limitations (limited resources)

5. Discussion

The shift in culture and operations, which followed the proprietorship transition in this case, is supported by prior research findings of quality and food safety management limitations due to family-ownership in dairy plants (Karaman *et al.*, 2012; Vladimirov, 2011). Top management commitment is identified as the primary integration driver, in line with pertinent research (Sampaio *et al.*, 2012). Moreover, corporate management culture encompassing innovation and the anticipation to gain competitive advantage motivated the firm to integrate, as elsewhere highlighted (Simon and Petnji Yaya, 2012; Wagner, 2009).

In this case the integration pattern is found identical to the most common as identified in literature, i.e. "QMS first and then other MSs" (Karapetrovic, 2002). However, sector specific prior experience and familiarity of the firm with the HACCP framework made it easier for the ISO 22000 standard to be used as the IMS foundation instead for the ISO 9001 standard. The fact that both standards follow the process approach made the two components of the IMS fully compatible and fusible. However, compatibility issues may arise with the adoption of the ISO 14001 standard, since this is based on the PDCA cycle (Karapetrovic, 2003). The IMS maturity (Domingues *et al*., 2014; Zeng *et al*., 2011) measured by continuing MS certification and sustained top management commitment is expected to overcome such drawbacks.

The integration method seems to be operations-oriented, since the documentation is based on the common elements of the standards. Yet, the IMS improvement actions are based on decisions taken at the strategic level and aimed at addressing both the internal weak points and stakeholder needs. This indicates a holistic view of the IMS, which is ensured by a strategic systems approach in compliance with prior research (Asif *et al.*, 2010). However, there are certain weak points that need to be addressed, such as the reactive approach to the authorities' post-audit requirements.

As far as the human resources are concerned, it seems that - in contrast to prior research findings (Karapetrovic, 2002; Renzi and Capelli, 2000) - in this case middle management is integrated, as well. However, this is not necessarily a sign of a higher integration level, since it is probably due to the low resources availability of a small company. Thus, many different tasks are appointed to a single person despite the lack of specific skills required.

Apart from the lack of human resources, limitations in other resources, such as time and cost for the IMS adoption and training, are among the integration barriers encountered, in line with prior research (Simon *et al*., 2012a). Moreover, in this case, the low level of integration awareness by the regulatory authorities appears to have caused a bureaucratic burden to the company being obliged to deal with conflicted audits. Furthermore, having to reach out for help to solve the traceability problem the company faced size-related barriers, that all boil down to limited resources. This understanding, along with the positive experience gained by the outsourcing, may contribute to the successful implementation of the next integration step. In line with prior research (Claver *et al*., 2007; Grekova *et al*., 2014), it is found, also in this case, that environmental management requires legislative and technical knowledge background and expertise that a small company has to outsource, probably in cooperation with other food processors.

As regards the IMS expansion, in the case under study the significance of the environmental impacts is recognized. However, the progress towards the adoption of environmental measures seems rather slow. Certain sector-related barriers are detected, in line with prior research (Claver *et al*., 2007), such as the lack of dairy waste treatment equipment and waste reduction measures, i.e. whey protein reclamation and biogas energy

recovery. These shortcomings, given the small company size, need to be addressed via cross-firm synergies (Grekova *et al*., 2014). As such, business networks and logistics outsourcing would enhance quality management and reduce the waste treatment and recycling cost due to economies of scale (Bourlakis *et al*., 2014; Gotzamani *et al*., 2010).
From the institutional perspective, this dairy mill, like all other food organisations, has to comply with different authorities' regulations and satisfy the needs of various stakeholders. In this case, the integrated management approach has proven useful in addressing those diverse requirements in a synergistic way. However, it is evidenced that IMS performance is evaluated in a qualitative, rather perceptive way. In order for the firm to acquire a clear view of the IMS continuous improvement, performance has to be quantified through the setting and monitoring of objectives and indices (Claver *et al.*, 2007; Van der Spiegel *et al*., 2005).
In sum, the case company addresses the needs of its customers and food inspection bodies while gradually raising its environmental awareness. However, another significant stakeholder, the employee, seems to be neglected. The harmonized adoption of the occupational health and safety management norm (Occupational Health and Safety Assessment Series - OHSAS 18001:2007) into the existing IMS would enhance its excellence in risk mitigation (Santos *et al.*, 2013). Furthermore, the integration of health and safety, energy and environmental practices may foster a triple bottom line perspective towards corporate sustainability in the food industry (Olajire, 2012).
As regards traceability, the transition from the paper-trailed to the IT-based tracking and tracing system improved productivity and regulatory compliance bridging quality and food safety management aspects. This system may further assist to the tracing of environment-related aspects of food processes, i.e. herbicides used in farming, animal feed, water quality, in line with previous research (Hamprecht *et al.*, 2005; Zhang *et al.*, 2010).
Audit-wise, the case findings underscore the impact of the authorities' audits of compliance to the highly complex food regulatory framework. In this context, voluntary standards' third-party audits seem to work only complementary. Furthermore, the integrated internal audits are unable to assure compliance, since the training and expertise needs of internal auditors are costly and difficult for the company. Thus, the small firm size challenges IMS improvement, in compliance with prior research (Grekova *et al.*, 2014; Karaman *et al.*, 2012; Karipidis *et al.*, 2009; Vladimirov, 2011).
From the environmental perspective, the company under study being fully aware of the dairy effluents' highly polluting load seeks sustainable solution for the management of its waste. This contradicts with the low level of environmental awareness of food manufacturers, particularly of the small ones, which is emphasized by researchers (see e.g. Karaman *et al.*, 2012; Massoud *et al.*, 2010). Regardless of the degree of awareness, additional support is needed for the small food companies, such as the standards "adjustment" depending on firm size (Karipidis *et al.*, 2009), state funding and cross-organizational collaboration (see e.g. Fotopoulos *et al.*, 2010).

6. Conclusions and future research directions

This research focuses on sector-oriented IMS using a contingency approach. Therefore, an IMS within a small food company is analysed. Following a structured literature review case findings are interpreted within a particular sector- and size- determined context. As a result, certain relative constraints are found to influence integration. More specifically, a small food company operates under strict regulatory and limited resource conditions. Thus, the IMS is seen as a means to cope with challenges and sustain. Internal factors, such as organizational culture and top management commitment, are found to foster IMS towards improving business performance. On the other hand, sector- and size-specific difficulties

are met in the audits and resource allocation. Multiple auditors with different levels of IMS awareness and lack in sophisticated corporate know-how and funding are the main difficulties encountered. In addition, food waste asks for costly environmental measures. Prior research suggests that collaborative initiatives of food companies similar in size and activity address such shortcomings. It is underlined that despite the competitive market conditions, food producers are, unlike other manufacturers, strongly attached to all upstream and downstream parties along the agri-food supply chain. Integration of management systems within and across organizations may provide the foundation for intra- and inter-organizational relationships. Moreover, certain sector-dependant particularities, as the increased audit complexity and food traceability, are identified in this case study. Furthermore, traceability with and across food chain actors is identified as an IMS catalyst. However, further research from the supply chain perspective would contribute to the understanding of the way this streamlining potential can be exploited. The case findings may be applied in other food business settings, yet with caution. A study on multiple cases of different size within food sector is proposed to enhance the strength of these findings. In Greece, where food companies - mostly small and medium-sized - own a big market share, this case provides significant insights for managers to achieve sustainable competitive advantage particularly under the current economic downturn.

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