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# Assessing Lean adoption in food SMEs: Evidence from Greece

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## Abstract

**Purpose** – The purpose of this paper is to determine the current state of the Lean principles adopted by food small and medium-sized enterprises (SMEs).
**Design/methodology/approach** – The case study approach was undertaken in order to gain insights into Lean adoption. Nine Greek food SMEs certified according to the ISO 9001 quality management system (QMS) and the ISO 22000 food safety management system (FSMS) were approached. Interviews were conducted with the chief executive officers and the company managers in charge of the QMS or FSMS, based on a structured questionnaire.
**Findings** – The food SMEs participating in the present study adopt Lean principles to a high extent. However, there is room for further improvement.
**Research limitations/implications** – The fact that the data collected suggests subjective business evidence and not objective as well as the fact that only two representatives of each of the nine food SMEs were conducted, comprise the main limitations of the present study. So, the results should be considered with caution, as far as the Lean adoption in the Greek food sector is concerned. Based on these limitations, future research suggestions can be made.
**Practical implications** – Based on the present study, suggestions can be made regarding the successful adoption of Lean principles, not only for the sample SMEs but also for the whole of the food sector. More specifically, by determining the strengths and weaknesses of the food SMEs' efforts to adopt Lean, suitable managerial initiatives can be undertaken by these companies as well as the whole sector to fully adopt Lean and derive the respective benefits.
**Originality/value** – The paper provides insights into the adoption of Lean principles in the Greek food sector. This is the first study in the field of Lean that has been carried out in the Greek food SMEs.

**Keywords** Greece, Lean principles, Food SMEs

**Paper type** Research paper

## Introduction

The rise of global trade, increased competition, greater product variety, and shorter product life cycles have made the business world complex and dynamic (Azadegana *et al.*, 2013). Companies operate not only in this volatile business environment but also in an environment where financial crisis dominates (Chavez *et al.*, 2015). The global market has been hit hard by recession, which has adversely affected almost every industry, whether it belongs to the services or manufacturing sectors, for the last eight years (Singh *et al.*, 2009). As a result of this recession, organizations and researchers have been forced to come up with solutions to decrease production costs and use more available resources (Chavez *et al.*, 2015). Lean thinking may be the answer to this predicament, as it is a management philosophy that leads to cutting costs through the reduction of waste and nonvalue-adding activities from a firm's operations (Yang *et al.*, 2011; Manville *et al.*, 2012; Keyser and Sawhney, 2013). Literature and practices have documented various quantitative (improvement in production lead time, processing time, cycle time, setup time, inventory, defects and scrap, and overall equipment effectiveness) and qualitative benefits of lean implementation (improved employee morale,

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effective communication, job satisfaction, standardized housekeeping, team decision-making) (Bhamu and Sangwan, 2014).

While there is an increasing amount of anecdotal and empirical evidence in favor of lean in the manufacturing environment, there is still a gap in the literature concerning not only the manufacturing sector but also the service sector (Gupta *et al.*, 2016). Furthermore, the need for further developing lean theory through the process of case study research design in these sectors is highlighted in the literature (Jasti and Kodali, 2014; Leite and Vieira, 2015; Fullerton *et al.*, 2014). Except for literature emphasis in the manufacturing sector, lean also is prevalent in large enterprises (LEs). However, it was supported that small- and medium-sized enterprises (SMEs) also could benefit from lean implementation (Leite and Vieira, 2015; Pepper and Spedding, 2010).

Lean in small businesses is based on a perception that it is expensive, requiring a great deal of support delivered over a long time period, and it is related with dubious benefits (Chaplin *et al.*, 2016, p. 132). The degree to which lean could be implemented in SMEs needs to be further researched (Jasti and Kodali, 2014; Rymaszewska, 2014; Wiengarten *et al.*, 2015; Hu *et al.*, 2015), and the promotion of its use appears as a challenge for the researchers (Wanitwattanakosol and Sopadang, 2012). In addition, only a limited number of studies have focused on the adoption of lean principles within SMEs in the food sector (Dora *et al.*, 2014; Lopes *et al.*, 2015). The food sector is the largest sector within most developed economies, and the organizations within this sector are subject to a variety of regulatory, customer, and market pressures that necessitate the development of robust quality systems (Grigg and Walls, 2007).

In order to fill the above-mentioned literature gaps, the present study first focuses on lean theory and practice contributing to the existing body of literature related to manufacturing and service industries, as research, especially in the service sector, is still at a nascent stage. Second there is a dearth of research that focuses on lean in SMEs and particularly in the food sector. Thus, this study goes beyond previous literature reviews by critically evaluating key themes of lean implementation in food SMEs. Finally, to the best of the author's knowledge, this is the first study in the lean field that focuses on the Greek food business environment where financial crisis dominates.

The rest of the paper is structured as follows: in the first part, reviewing the literature, the lean principles are presented and the respective research question is formulated. The methodology of a research study carried out in Greek food SMEs is then described. This is followed by a presentation of the study findings. In the next part, the results are discussed and the final conclusions and practical implications are presented. Finally, the limitations of the study and future research recommendations are presented.

## Literature review and research question

### *Lean thinking*

The success achieved primarily by Toyota and then by several organizations worldwide has led many companies to start a lean project (Bortolotti, Boscari and Danes, 2015). Thus, lean is nowadays a popular concept in the developed world and in some countries in the developing world (Ghosh, 2012). However, every organization's lean journey starts under different circumstances, so there is no unique recipe or directive to follow that guarantees success (Bhasin, 2012).

Lean is described from two points of view-either from a philosophical perspective related to guiding principles that emphasize the softer side of lean, taking a long-term perspective and a focus on collaboration, or from the practical perspective of a set of management practices, tools, or techniques such as kanban, equipment layout, and batch size reduction (Bhamu and Sangwan, 2014; Marodin and Saurin, 2013; Wiengarten *et al.*, 2015). The principles and practices of lean are strongly interrelated, creating an integrated socio-technical system whose main objective is to eliminate waste by concurrently reducing or minimizing supplier,

customer, and internal variability (Marodin and Saurin, 2013). In other words, lean practices are effective in operationalising lean principles (Saurin *et al.*, 2011).

The majority of researchers acknowledge that the transformation process to a lean system requires the introduction of its principles not only at the shop-floor level but also in the company culture and organizational structure (Papadopoulou and Ozbayrak, 2005). Thus, lean should be viewed as a holistic approach that transcends the boundaries of the shop floor (Bhasin, 2012). According to Carlborg *et al.* (2013), the lean literature includes important recurring issues that can be summarized into six lean principles: define value, define value stream, flow, pull, standardization, and perfection. Waterbury (2015), relying also on the literature, mentioned the following five principles of lean: value, value stream, flow, pull, and perfection. In addition, Netland *et al.* (2015) stated that the main lean principles include JIT, total quality management (TQM), continuous improvement, total preventive maintenance (TPM), and human resource management.

Taking the above principles into consideration, it is obvious that successfully implementing lean is a complex task. It is worth noting that lean has led to disappointing efforts for many organizations, as they have not obtained the desired results (Bhamu and Sangwan, 2014; Agus and Hajinoor, 2012; Chavez *et al.*, 2015). Lean also has caused confusion and difficulty when it is addressed outside of the manufacturing context (e.g. automobile, electrical and electronics, machinery, etc.) or outside of the larger organizations (Stone, 2012) because, as noted, large manufacturing organizations have predominately embarked upon this idea. In the early twenty-first century, the benefits of adopting a lean approach have become accepted in the service sector as well (Gupta *et al.*, 2016). Therefore, lean is increasingly applied to a wide range of service operations such as construction, airlines, healthcare, banking, education, software, information technology, fast food, housing and care services, legal services, and public services (Alsmadi *et al.*, 2012; Moyano-Fuentes and Sacristan-Dıaz, 2012; Waterbury, 2015). Researchers have attempted theoretically to transfer lean management principles, techniques, and tools to the service environment. Malmbrandt and Ahlstrom (2013) reviewed the instruments assessing lean in manufacturing with an eye toward using them in services. Thus they determined the following lean principles: define value from the customer's perspective, map processes to identify waste; make those actions that create value flow without interruptions; standardize work, level, and balance workloads; ensure a high level of quality in processes; strive for zero defects; ensure that all activities are pulled by the customer in a just-in-time fashion; visualize processes and performance results; develop multifunctional employees; and pursue continuous improvement. Along the same line, Leyer and Moormann (2014) refer to eight principles that represent the main aspects of the lean philosophy: understanding customer needs, establishment of value streams, creating flows within the value streams, application of the pull approach, striving for perfect value creation, leadership style, individual responsibility, and continuous improvement culture. Gupta *et al.* (2016), making an extent paper review on lean service, concluded that lean principles could be applied in services, though there is lack of standard models/frameworks, highlighting an area for future research.

The literature reveals no specific consensus among authors with regard to the main lean principles, which an organization should adopt in order to be transformed to a lean enterprise and to reap the benefits. Alsmadi *et al.* (2012) stated that future empirical studies should incorporate all the elements of lean philosophy, which are applicable in both manufacturing and pure service operations. Indeed, a holistic view is missing in many reported cases, as the implementers use only one or two lean principles (Mazzocato *et al.*, 2010).

*Lean to SMEs in food sector*

According to the European Commission (2003), the category of micro-, SMEs is made up of enterprises that employ fewer than 250 persons and have an annual turnover not exceeding

EUR50 million and/or an annual balance sheet total not exceeding EUR43 million. SMEs are the backbone of the Greek economy. SMEs make up 85 percent (763,486 dated in 2014) of private employment, and more than 50 percent is concentrated in micro-enterprises (zero to-nine employees). Greek SMEs also provide more than half the total number of jobs (1,426,840) as compared with the rest of Europe, where it is about 30 percent. Greek SMEs profoundly and disproportionately have suffered more than LEs from the prolonged recession in the last five years (www.gsevee.gr). Lean philosophy may be a solution to recover their problems and become more competitive in the European environment.

However, the adoption of lean principles in SMEs is not widespread mainly due to the fear of high implementation cost and uncertain future benefits (Bhamu and Sangwan, 2014). Rose *et al.* (2013) focusing on lean manufacturing practices in SMEs suggested that implementing lean practices would help SMEs to gain full benefits, i.e., reduction in inventory, lead time, setup time, etc. Lean also can support food firms to reduce nonvalue-added time, to decrease waste and associated costs, to simplify processes, to increase the percentage of value-adding activities, to improve operational performance, and, as a concrescence, to obtain customer satisfaction and ensure firm sustainability (Heymans, 2015; Boston Consulting Group, 2015).

However, SMEs are likely to face serious difficulties while attempting to copy the original lean system as proposed by Toyota (Peter and Lanza, 2011). Hence, it is necessary for SMEs to adjust the whole process, accordingly tailoring it to their specific requirements and capabilities (Rymaszewska, 2014). SMEs are more selective than LEs in the range of tools that are adopted in a Lean implementation effort, maybe because of financial constraints that are in excess of their budgets (Hu *et al.*, 2015; Mathur *et al.*, 2012; Rose *et al.*, 2014).

Similarly, Dombrowski *et al.* (2010) highlighted that, due to resource constraints (financial, time, and technical), SMEs should select and evaluate the most adequate methods and tools that can be adopted in their business environment. Except resource restrictions, another difficulty to lean implementation in SMEs is related to the degree of influence on demand, due to the high level of the variability and volatility in raw materials and prices (Rymaszewska, 2014). SMEs' limited power on their supply chain partners forces them to be more operational than using a strategic focus and restripe lean applicability to the supply chain level (Pettersen, 2009). The inter-organizational aspects of lean were neither easily applicable nor appropriate for most food-related companies, but internal adoption of lean practices were found appropriate, as it provides the necessary tools to small- and medium-sized food enterprises in order to analyze and eliminate unnecessary inventories and other forms of waste along the supply chain (Lehtinen and Torkko, 2005; Cox and Chicksand, 2005; Simons and Zokaei, 2005). The success of implementation of lean initiatives also considers management commitment and its dedication to the lean philosophy (Achanga *et al.*, 2006). However, SMEs are characterized by lack of dedicated managerial and technical experts as well as by poor employment training and educational programs (Bednarek and Nino Luna, 2008; Matt and Rauch, 2013). SMEs also want to see fast results rather than to perceive the lean adoption as a long-term investment, thus reducing the possibility of abandoning the process too early and losing the chance for reaping the benefits (Rose *et al.*, 2013). Additional barriers in the lean implementation, which are related with the special characteristics of the food sector, are high perishability of products and complicated and large batch processes (Dora *et al.*, 2014).

These potential barriers to lean adoption can be equalized by supporting factors, which are based on the specific conditions of SMEs. Seitz (2003) supported that SMEs are more able to implement lean philosophy compared with the LEs because of their notable characteristics, which stem from the fact of being SMEs. Specifically, SMEs are considered to be more flexible in terms of changing their processes and more agile, as they have the ability to respond quicker to changing consumers' requirements (Floyd and McManus, 2005). In addition, SMEs can provide personalized products or service compared with LEs,

which are based on mass production (Deros *et al.*, 2006). This is more important for food industry companies because their consumers are constantly tempted to try new products, thus increasing complexity in production. Rymaszewska (2014), in addition to the above supporting factors of lean adoption by SMEs, referred to faster communication between hierarchical business levels, quicker decision-making processes by innovative and young managers, more unified organizational culture, and more empowered employees.

Taking into consideration the above obstacles and the supporting factors as well as the particular SMEs' structure and characteristics, researchers have proposed conceptual frameworks for lean implementation in SMEs. Specifically, Achanga *et al.* (2012) proposed a framework that helps SMEs managers to forecast the probable relative cost of implementing lean manufacturing, to project up front what it anticipates to achieve, to make assessments on the firm capabilities and the capacity of its resources, or to realize their degree of lean need. Anand and Kodali (2009) presented a quite complicated comprehensive framework, which consisted of 65 lean practices. These practices were divided into concepts, principles, practices, competitive priorities, stakeholders, and functions of an operations department. Rose *et al.*'s (2013) theoretical framework comprised of SMEs' commitment, feasible lean practices (multifunction employees, teamwork, 5S, quality circle, quality control, visual display, and standardization-consumed least investment), external support, and performance. However, Rose *et al.*'s model lacks a universal application among SMEs, as it is specialized in the automotive industry. The proposed framework also was not validated by empirical evidence. Pingyu and Yu (2010) supported that SMEs, in order to implement lean thinking, should feature the following four organizational points of view: attention and involvement of senior managers, good communication platforms, learning organizations, and establishment of performance evaluation systems.

Bearing in mind the purpose of the present study, the research proposals suggested by many authors and the above review of the literature, the following research question is formulated and examined through the present study in the Greek food sector:

*RQ1.* What is the extent to which the Lean principles are adopted by food SMEs companies?

## Methodology

### *Data-collection approaches*

According to Jasti and Kodali (2014), the most popular empirical research methodological approach in the field of lean is the case study, although the field of lean implementation in SMEs lacks multiple case studies (Hu *et al.*, 2015). Moreover, the majority of the lean studies in the food sector is based on the case study approach in order to concentrate on lean manufacturing techniques (Dora *et al.*, 2014). Rymaszewska (2014) and Matt and Rauch (2013) also used detailed case studies, which serve as a basis for their analysis to answer the same research question of the present study. Thus, the case study approach was selected in order to answer the research question of the present study.

A structured questionnaire was used as the data collection method, since it is the most preferred method in the Lean field, not only in the survey research studies but also in the case studies (Jasti and Kodali, 2014). More specifically, the assessment of the adoption of Lean principles was based on the instrument developed by Malmbrandt and Ahlstrom (2013, pp. 1160-1165) which consists of a set of nineteen distinct statements describing Lean principles which in turn reflect respective Lean practices. The authors reviewing the existing literature on assessing the adoption of Lean principles in manufacturing, developed a number of desirable characteristics for assessing Lean adoption in the services sector. However, Lean principles with regard to TPM as well as supplier involvement (which are mostly derived from a manufacturing context) (Marodin and Saurin, 2013) are not fully reflected in the instrument of Malmbrandt and Ahlstrom (2013). Thus, these principles and

practices were included in the present study's instrument, in order to fully depict Lean philosophy and be appropriate for both manufacturing and services companies. The question items referring to TPM (Bortolotti, Boscari and Danes, 2015; Nawanir *et al.*, 2013; Dora *et al.*, 2014) and supplier involvement (Mund *et al.*, 2015; Piercy and Rich, 2015; Bortolotti, Boscari and Danes, 2015) are based on relative literature.

The questionnaire was pre-tested with academicians and practitioners to ensure all items were clearly understood with no ambiguity (Wang *et al.*, 2015). Respondents were asked to indicate the level of the adoption of Lean principles that reflect respective practices. The adoption level of the Lean principles was indicated based on the following five-point Likert scale: level 1 – no adoption, level 2 – general awareness, level 3 – systematic approach, level 4 – on-going refinement, and level 5 – exceptional approach. Each questionnaire statement included also some clarifications explaining the main key words (see an example in Appendix).

*Sample*

The criterion for selecting the food companies that would participate in the present study was experience in quality management. Quality management is considered to be an integral part of the internal lean practices (Chavez *et al.*, 2015), while TQM also is considered to be among the main lean manufacturing bundles (Furlan *et al.*, 2011). Particularly, TQM and lean manufacturing have much in common, and TQM, based on lean strategies, is similar to numerous improvement approaches and can be a tool to support and create synergy for inducing a more competitive market among companies (Anvari *et al.*, 2011, p. 1585). Thus, it was expected that organizations having ample experience in quality management would be more likely to be aware of lean thinking. It was decided that companies certified to the ISO 9001 quality management system (QMS) as well as to the ISO 22000 food safety management system (FSMS) for more than ten years would be included in the population of companies that would participate in the present study. Chiarini (2011) indicated that the implemented project based on lean principles and tools also should be dealing with ISO 9001. Companies that started with ISO 9001 have smoothly added to it the lean philosophy because the standardization of documentation, processes mapping, data collection, process auditing, and the goal of customer satisfaction are important to both. The study of Panwar *et al.* (2015) on assessing the level of lean implementation also was based on ISO 9001 certified companies.

Based on the above criterion, nine organizations were randomly selected through the data base of ICAP (the largest business information and consulting firm in Greece). The study of Longoni *et al.* (2013) was based on ten case organizations, while the studies of Poksinska *et al.* (2013) and Wang *et al.* (2015) were based on five and two organizations, respectively. So, the number of case organizations analyzed in the present study is deemed appropriate. The company chief executive officers (CEOs) or the company manager in charge of implementing the QMS or the FSMS was conducted in order to accomplish the survey instrument. Although perceptual measures are subjective, these kinds of measures are frequent in the literature (Hallgren and Olhager, 2009). The respondents involved in the Lean studies of Longoni *et al.* (2013), AL-Najem *et al.* (2013) and Dora *et al.* (2014) were also CEOs, while the studies of Longoni *et al.* (2013) and Bortolotti, Danese, Flynn and Romano (2015) were also based on the perceptions of the company quality manager. Given the sensitivity of the material under investigation, confidentiality was a key factor in ensuring "open and honest" dialogue, thus, some of the data have been disguised and no individuals have been named. The companies have not been named due to the sensitivity of the findings and they are coded as Company A, B, C, D, E, F, G, H, I.

The demographic profile of the participants in this survey and the descriptive information of their firms are detailed in the Table I. Six of the food companies participating

| Type of classification | Category | Number of respondents |
|---|---|---|
| Gender | Male | 9 |
| | Female | 0 |
| Age | 18-24 years | 0 |
| | 25-34 years | 1 |
| | 35-44 years | 2 |
| | 45-54 years | 4 |
| | 55-64 years | 2 |
| Education | Received a post-graduate qualification | 6 |
| | Completed tertiary education | 3 |
| Position | CEO | 2 |
| | Quality manager | 7 |
| Experience in quality | Less than two years | 1 |
| | 2-5 years | 2 |
| | 6-10 years | 4 |
| | More than 11 year | 2 |
| Size in number of employees | 101-250 | 1 |
| | 51-100 | 2 |
| | 11-50 | 6 |
| | 1-10 | 1 |
| Type of business | Manufacturing | 6 |
| | Services | 3 |

**Note:** $n = 9$

**Table I.**
Demographic profile of the respondents and descriptive information of their firms

in the present study belong to the manufacturing sector while the remaining three belong to the services sector. All the responding food SMEs employ fewer than 250 employees. The participated CEOs and the company managers are all highly educated and experienced. It is worth noting that the vast majority of the sample companies are export oriented.

## Results

In this section the findings of the present study per company are presented (Table II).

### *Company A*

Company A is a process manufacturing company which has been producing all types of rice products and pulses since 1955. It is an export oriented company, promoting its products not only in Europe but also in the USA. Lean principles with regard to waste identification, creating flows within the value streams, standardization, proactive planning, quality management, pull-just in time, continuous improvement, TPM and supplier involvement are highly adopted in most areas and processes by this company. The remaining principles of Lean are systematically and moderately approached by this company (Figure 1).

### *Company B*

Company B is a food retailer operating since 1990. There are many branches of this retailer all over Greece. Lean principles with regard to customer value and waste identification, creating flows within the value streams, connecting processes-cellular manufacturing, standardization, quality management, pull-just in time, the use of visual signals to facilitate work, multifunctional employees and structured problem solving are highly adopted in most areas and processes by this company. Surprisingly, suppliers and customers are not fully involved in the company processes, not giving feedback for improvement work. The remaining principles of Lean are systematically and moderately approached by this company (Figure 1).

| Lean principles | No adoption | General awareness | Systematic approach | On-going refinement | Exceptional approach |
|---|---|---|---|---|---|
| Customer value | | E | A | B, C, D, G, H, I | F |
| Customer involvement | E | A, B | H | D, F, G, I | C |
| Identify waste. Value stream mapping | E | G | C, F, H, I | A, B | D |
| Flow. Workplace design for flow | | E | G, H, I | A, C, F | B, D |
| Connecting processes-cellular manufacturing | | E | A, G | B, D, F, H | C, I |
| Standardization. Standardized tasks | | | F | A, C, D, E, G, H | B, I |
| Formalization of work standards | | B, E | C, H | A, D, F, G, I | |
| Level and balance workloads | | E | B, D, F, G, | C | A |
| Proactive planning | | | H, I | | |
| Quality/zero defects. Built-in quality | | | C, E | D, F, G, H, I | A, B |
| Pull scheduling-just in time | D | C, E | G, H | B, F, I | A |
| Visualization. Visual signals | D, E | G | A, F, H, I | B, C | |
| Visualization of information | E | D, G | A,B | F, H, I | C |
| Visualization of improvements | E | B, D, F, G | A, C, H, I | | |
| Multifunctional employees. Employees measure and follow up work | D, F | | A, E | B, C, G, H | I |
| Multifunctional teams | D, E, F | H | B, I | A, C, G | |
| Continuous improvement. Employee participation in improvement work | E | | B, C, F | H | A, D, G, I |
| Focus of improvement work | | C, E | A | B, D, F, G, H, I | |
| Structured problem solving | | E, H | A, C, F, I | D, G | B |
| Sustaining improvements | | E | A, B | C, D, F, G, H, I | |
| Total Preventive Maintenance (TPM) | | E | B, C | A, D, F, G, H, I | |
| Supplier involvement | | B, C, E | | A, D, F, G, H, I | |

**Source:** Malmbrandt and Ahlstrom (2013)

**Table II.** Lean principles adoption of the SMEs sample

*Company C*

Company C is a wholesaler which has been providing a variety of traditional and organic products (e.g. pasta, olive oil, olives, beans, honey, pulses, and beverages, etc.) in Greece and abroad for ten years now. Lean principles with regard to customer value and involvement, creating flows within the value streams, connecting processes-cellular manufacturing, standardization, proactive planning, the use of visual signals to facilitate work, visualization of performance results and finally the use of multifunctional teams and employees are highly adopted in most areas and processes by this company. Surprisingly, the pull scheduling-just in time and supplier involvement are only slightly considered by this service company. It is worth noting that the identification of waste, quality management, continuous improvement efforts and TPM are systematically and moderately taken into consideration by the company managers (Figure 1).

*Company D*

Company D is a process manufacturing company which has been producing olives, olive oil and olive paste since 1964. The products are distributed both in the Greek market and the international market including not only Europe but also the USA, Canada and Japan. This company is among the leaders of the extra virgin olive oil manufacturers in the Greek market. The majority of the Lean principles are highly adopted in most areas and processes by this company. However, lean principles with regard to pull scheduling-just in time, the use of visual signals to facilitate work, the visualization of performance results and finally the use of multifunctional employees and teams are hardly adopted at all by this company (Figure 1).

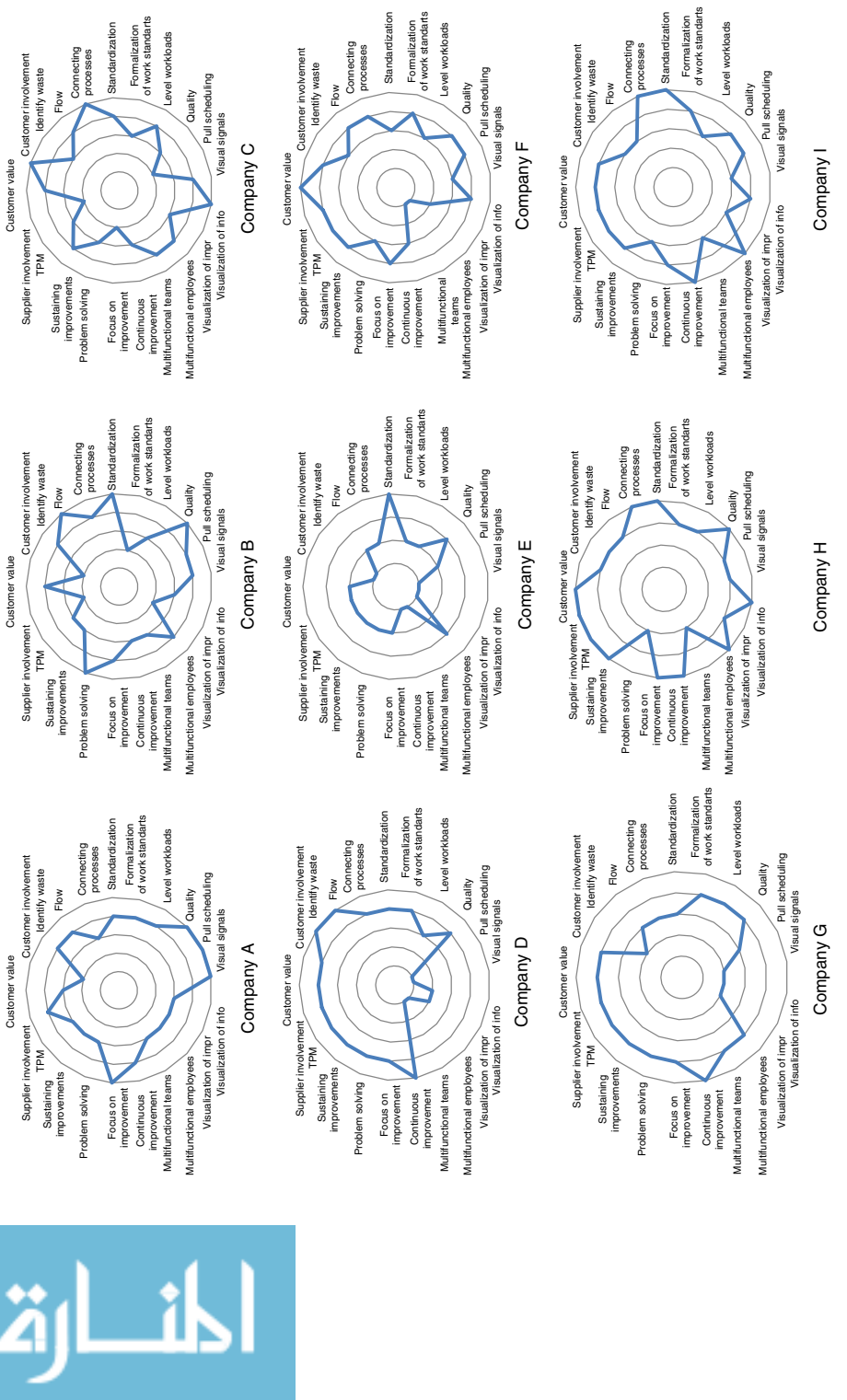


**Figure 1.**
Level of lean principles adoption per participated SMEs

*Company E*
Company E deals with the marketing of olives and olive oil and was founded in 1965. The company operates not only in the Greek market but has already taken its first steps in the markets abroad. It is surprising that half of the Lean principles (such as customer value and waste identification, visualization, multifunctional teams and continuous improvement) are not adopted at all by this company, while the remaining half are only slightly adopted. This means that the company managers have a general awareness of these principles and that their adoption is in its infancy (Figure 1).

*Company F*
Company F is a process manufacturing company which has been producing olives, olive oil and olive paste since 1995. It has developed an extended distribution network that supports the international distribution of its products. It is worth noting that 82 percent of the company sales are in the international market including Europe, Asia, the USA, Canada, Brazil, Australia, etc. Lean principles with regard to the identification of customer value, customer involvement, creating flows within the value streams, connecting processes-cellular manufacturing, quality management, pull scheduling-just in time, visualization of performance results, sustaining improvements and supplier involvement are highly adopted in most areas and processes by this company. The remaining principles of Lean are systematically and moderately approached by this company. By contrast, the use of multifunctional employees and teams are not adopted at all by this company (Figure 1).

*Company G*
Company G is a process manufacturing company which has been producing and trading olives since 1965. It supplies both the domestic and the international market (USA, Germany, Belgium Australia, UK and Spain). Lean principles with regard to the identification of customer value, customer and supplier involvement, standardization, quality management, the use of multifunctional employees and teams and sustaining improvements are highly adopted in most areas and processes by this company. Except for visualization (of information and improvements) and value stream mapping which the managers of this company generally are simply aware of, all the remaining Lean principles proposed are systematically and moderately approached by this company (Figure 1).

*Company H*
Company H is the only chocolate manufacturing company in Greece with a complete cocoa and chocolate production process, from cocoa bean to the end product. It produces various chocolate products and cocoa powder. It supplies not only the domestic market but also exports to the following markets: North America-USA and Canada, Eastern and Western Europe, Countries of the Middle East, Southeast Asia and Japan and Australia. Lean principles with regard to the identification of customer value, connecting processes-cellular manufacturing, standardization, quality management, visualization, the use of multifunctional employees, continuous improvement, sustaining improvement, TPM and supplier involvement are highly adopted in most areas and processes by this company. The remaining principles of Lean are systematically and moderately approached by this company. It is worth noting that only the structured problem solving and the use of multifunctional teams are slightly adopted by this company (Figure 1).

*Company I*
Company I is a manufacturing company which was established in 1980 and produces meat products, sausages, burgers, pizzas, salads, chicken products, ready meals and the Greek

Feta cheese. The company has three meat processing plants (one of which is located in Romania), eleven distribution centers in Greece and four in Romania. It supplies not only the domestic market but also exports to the following markets: Europe, the USA, Mexico, Australia, South Africa, China, Russia, etc. Lean principles with regard to the identification of customer value, supplier and customer involvement, connecting processes-cellular manufacturing, standardization, quality management, pull scheduling-just in time, visualization of performance results, the use of multifunctional employees, continuous improvement, sustaining improvement and TPM are highly adopted in most areas and processes by this company. The remaining principles of Lean are systematically and moderately approached by this company. It is worth noting that no Lean principle is slightly adopted (Figure 1).

The findings of the case studies presented above reveal an optimistic view regarding Lean adoption in the food sector (Figure 2). The majority of the Lean principles are highly adopted by most of the SMEs participating in the present study, according to the perceptual opinion of the company representatives. More specifically, principles with regard to the identification of customer value, customer involvement, creating flows within the value streams, connecting processes-cellular manufacturing, standardization, quality management, the use of multifunctional employees, continuous improvement, sustaining improvement, TPM and supplier involvement are highly adopted in most areas and processes by the majority of the food SMEs studied. These principles are fundamental to Lean philosophy. However, Lean principles with regard to the identification of waste, proactive planning, visualization and structure problem solving are systematically and moderately approached by the majority of the food SMEs studied. It is also worth noting that pull scheduling-just in time is not widely used by the sample SMEs. From the above it is evident that there is room for further improvement in the degree to which the Lean principles are adopted.

## Discussion and conclusion

The high level of adoption of Lean by food SMEs is justified given not only the external macro and micro business environment where the companies operate but their internal business environment. The unprecedented financial crisis under which the Greek companies have been operating for more than six years now and its consequences such as the continuous drop in the gross domestic product, the increased taxation and the capital controls from the banking system which strongly restrict companies in doing business, have negatively influenced the food companies' growth. Moreover, the increase in global

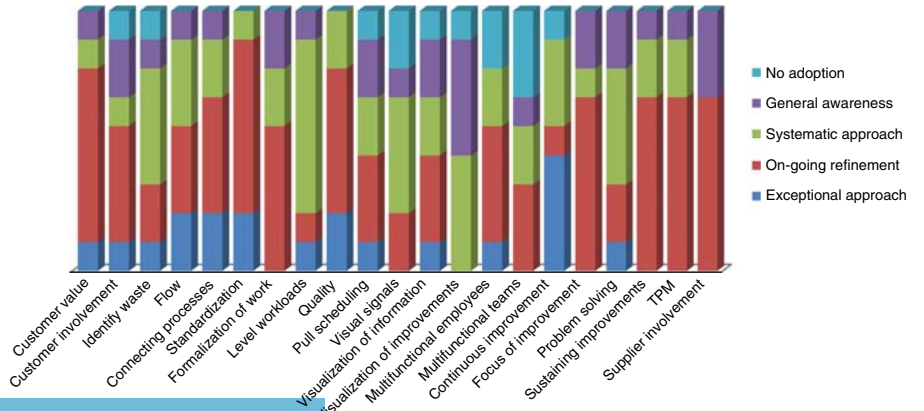


**Figure 2.**
Level of lean principles adoption

competition makes food companies strive to survive. Under such difficult circumstances it is imperative that food SMEs make efforts to reduce cost and all unnecessary activities that make no sense to the customers and add no value to the product and the services provided to them. This can be certainly achieved through Lean implementation, which places great emphasis on the customer (Manville *et al.*, 2012). By contrast, Thomas *et al.* (2014) by studying manufacturing SMEs in the UK found no evidence to support the fact that the 2008 recession had increased company awareness of the need to adopt Lean Six Sigma in order to reduce waste and hence operational costs.

As far as the external micro business environment meaning the food business environment is concerned, the rapid reduction in domestic demand and the increase in domestic competition in the food sector (due to the financial crisis) have also made Greek SMEs more intensely seek ways to avoid anything redundant, including cost. Moreover, the cooperation of the food SMEs with customers from abroad (since the majority of the sample case organizations are export oriented), may have also impelled them to move their traditional management system toward Lean.

However, it is not only the external but also the internal business environment that has made Greek food SMEs look for new management systems based on which they could gain more with less. More specifically, the food SMEs selected to participate in the present study have ample experience in implementing quality management and food safety management. The fact that the sample SMEs have been implementing QMS and FSMS for more than ten years now, may have motivated them to adopt more advanced management systems. In other words, the implementation of the QMS and FSMS may have made the food SMEs lay the foundations for moving forward in implementing Lean.

Comparing the level of Lean adoption in the food manufacturing SMEs with that in the food service SMEs, some interesting insights are also evident. More specifically, the present study findings reveal that the manufacturing companies outperform service with regard to the adoption of the following Lean principles: the identification of customer value, identification of waste, proactive planning, quality management, pull scheduling-just in time, continuous improvement, sustaining improvement, TPM and supplier involvement. By contrast, the service companies outperform manufacturing only with respect to the use of visual signals. Based on the characteristics of an industrial and services business environment, the above determined differences are justified.

Contrary to the Greek case organizations approached through the present study, the food-processing SMEs from Belgium, Hungary and Germany studied by Dora *et al.* (2014) do not deploy Lean to a high extent. However, similar to the Greek food SMEs, in the European food SMEs studied by Dora *et al.* (2014) the Lean principles with regard to TPM, employees and customers are widespread, while pull scheduling-just in time is not widely used. Similar to the Greek food SMEs participating in the present study, the UK-based food company studied by Bamford *et al.* (2015) adopts the Lean principles related to continuous improvement and employees to a high extent. Contrary to the Greek SMEs, the Lean principle of waste elimination is widely adopted by the British food company. The Greek food companies participating in the present study, outperform the Malaysian food industrial small companies studied by Manzouri *et al.* (2013), in terms of implementing Lean. It is worth mentioning that both the Greek and the Malaysian food companies have been implementing a QMS and a FSMS, however, it seems that only the Greek food SMEs based on these quality systems have already laid the foundations for moving their management system toward Lean.

## Practical implications

Based on the present study findings, useful managerial implications arise not only for the food SMEs participating in the present study but also for the whole food sector, whether

manufacturing or services. The food SMEs' journey toward Lean is characterized by many strengths and fewer weaknesses. For example, fundamental Lean principles with regard to creating flows within the value streams, connecting processes-cellular manufacturing and TPM are highly adopted by the Greek sample SMEs. This does not mean that there is no room for further improvement in the level to which these principles are adopted and the respective practices are implemented. On the other hand, Lean principles with regard to the identification of waste, visualization and pull scheduling-just in time are the weak points of the adoption of Lean by the sample food SMEs. So, the food SMEs should invest in educational seminars, attending international conferences, consulting experts in the field and benchmarking successful Lean organizations in order to enhance the level of Lean adoption and make their Lean journey sustainable. Many employees from all company operations should be involved in these supporting practices. It is worth noting that food SMEs not adopting Lean principles to the extent that the sample companies do, can benefit from the case studies presented in this study and look for ways to start their Lean journey. So, food SMEs can lay the foundations for being competitive in the current global scenario that is characterized by an economic downturn.

## Limitations and future research suggestions

Many research studies suffer from limitations and the present study is no exception. The present study is based on subjective not objective business evidence. In other words, the data collected regarding the current state of Lean adoption was based on the perceptual opinions of both the company CEO and the manager responsible for the QMS or the FSMS. So, a bias may be present regarding the subjective assessment of the adoption of Lean principles. Moreover, more company executives as well as employees were not included in the company representatives in order to collect more data for analysis. So, it is suggested future research take into consideration the opinions of a representative sample of company managers and employees from all operations in order to gain more insight into Lean adoption. Future research should also be based on objective business evidence (reviews of company documentation files) as well as on direct observations throughout the company (e.g. of process mapping and problem solving workshops). The present study was based on companies with ample experience in quality management. However, it is worth assessing the level of Lean adoption in food companies with less experience in quality management.

Given that the present study is the first attempt to diagnose the status of Lean adoption in the Greek food business environment, it is suggested that a research survey study be carried out through a large sample of manufacturing and service SMEs. Focusing only on the manufacturing or services sector is also suggested. In doing so, the findings of the present study can be confirmed or refuted. Such a study should include not only SMEs but also large food companies. Longitudinal studies are also suggested in order to examine the status of Lean adoption in a post crisis period. Finally, it is also recommended future research on food companies be conducted in other countries.

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## Appendix. Example of question item

In each of the statements concerning customer value, please select one level/item (with italic letters explanation is given regarding key words):

- No real effort to understand customer value.
- Start searching for ways to understand customer value, but informal approach at varying levels in different areas of the organization.
- Most areas in the organization are actively discussing what customer value is, and which activities add to that or not.
- Most employees can see and describe what activities are value adding or not for the customer and in their own work they can identify what part of their activities add to customer value and which do not.

- Exceptional, innovative approach to identification of customer value, recognized as best practice. Customer value has been redefined and is constantly challenged. All employees can see what part of their activities add to customer value and which do not.

*Explanation*

*Customer value – value that customers are willing to pay for.*

*Value analysis is another means of synchronising the activities of design with those of manufacturing for the purpose of producing a higher quality, lower cost product.*

*The design engineer assesses the characteristics of the product, the customers who will buy it and how they will use it in light of the company's strategic goals.*

*Value analysis also allows managers to comprehensively analyze the costs of each manufacturing step to identify the steps that have the most critical effects on cost so they can figure out how to make them less expensive.*

*Understanding the customer – The organization must understand its customers' needs and requirements and ensure production is in line with customers' orders and demands, as Lean is about creating the value that customers are willing to pay for, with any excess considered waste.*

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