

**An exploration of the influence of innovations on organizational performance:
A dynamic capabilities perspective**

Aristides MATOPOULOS

Engineering Systems & Management Group, School of Engineering & Applied Science,
a.matopoulos@aston.ac.uk

School of Engineering and Applied Science, Aston University, B4 7ET, Birmingham, United
Kingdom

Emel AKTAS

Logistics, Procurement and Supply Chain Management, emel.aktas@cranfield.ac.uk

Cranfield University, Cranfield School of Management, College Road, Cranfield, MK43
0AL, United Kingdom

Abstract

This research explores the impact of dynamic innovation capabilities on firm performance, investigating how alliances and networks improve the focal firm's capabilities. We examine four innovation capabilities and their effect on profitability, performance, and growth of companies in the food industry. Drawing on the extant literature on innovation and dynamic capabilities theory, we develop six hypotheses to explain the relationship between different innovation capabilities and firm performance. We test the proposed research model and hypotheses using partial least squares structural equation modeling (PLS-SEM) with primary data from the food industry in Greece. Results indicate that dynamic innovation capabilities play a crucial role in improving profitability, growth, and overall firm performance through ordinary innovation capabilities. This study provides critical insights into innovation

capabilities in the food industry. These insights are significant because prior studies have not investigated the relative effects of different innovation capabilities on profitability, growth, and overall firm performance, particularly the interrelationships between dynamic and ordinary innovation capabilities. The generalization of the study results may be limited due to the sample size.

Keywords: Innovation, Dynamic Capabilities, PLS-SEM, Food industry, Greece

1. Introduction

From Schumpeter's (1934) innovation in product, process, customer, input, and organization to Daft's (1978) organizational innovation or some years later to Damanpour's (1991) administrative innovation, the multi-faceted view of innovation has been well recognized in the literature. More recently, researchers such as Roberts & Amit (2003), for example, have proposed channel innovation, while Birkinshaw et al. (2008, p.825) expanded the capability of a firm to innovate to include management innovation. All these different innovations have resulted from specific innovation capabilities or mixes of them that are needed to develop a particular innovation (Forsman, 2011; Boly et al., 2014). By innovation capability, we refer to the firm's ability to continuously transform knowledge and ideas into something beneficial to the firm and its stakeholders (Lawson & Samson, 2001).

Despite the increased interest in identifying and conceptualizing different innovation capabilities, comparatively little research has been conducted on the interrelations between innovation capabilities and the effect on organizational performance. Damanpour's (1989), Subramanian & Nilakanta's (1996), and Oke's (2007) research focused on service organizations (e.g., libraries, banks). Limited work has been done in the manufacturing/processing sector (Lee & Kang, 2007; Kimer et al., 2009; Gunday et al., 2011; Wu et al. 2016), where the results only partly support the idea that the innovation capability matters in organizational performance. Also, in all the above research efforts, the focus was

on the relationship between a few innovations and a single performance aspect, but perhaps more importantly, a firm's capability to innovate was narrowly viewed and linked only to new things but not necessarily organizational performance.

In this chapter, we take an expanded, value-oriented view of innovation which links innovation to new value created for customers instead of new products or processes (Chen et al., 2011). We shed light on the mediating effects of certain innovation capabilities on others and performance aspects (i.e., growth, profitability, and overall performance). Hence, we essentially address the following research questions:

1. How can different innovations be explained under Dynamic Capabilities Theory?
2. What are the interrelations among different innovation capabilities?
3. How do different innovation capabilities affect organizational performance?

To address these questions, we view innovation as a capability and develop a model that builds on Dynamic Capabilities Theory which is a well-suited theory to the study of innovation (Lawson & Samson, 2001). Unlike the Resource-Based View (Barney, 1991), which assumes that differences across firms are due to differences arising from having access to firm-specific resources (valuable, rare, inimitable, and non-substitutable resources); the dynamic capabilities framework (Teece & Pisano, 1994; Teece, 2007) advocates that in addition to resources firms need processes (e.g., product development) to manipulate them into value-adding strategies (Lee & Kelley, 2008). Antecedents to innovation capability can therefore be found not only at the firm but also at the network level (Rothaermel & Hess, 2007), as alliances and networks can improve the focal firm's capabilities by providing potential information and resource advantage (Powell et al., 1996; Kogut, 2000), which also justifies the three research questions presented earlier.

We also use a specific domain, the food industry, as our means to understand the

interrelations between different innovation capabilities and the impact on organizational performance. There are two main reasons behind this choice. Firstly, because the industry has strong links with various food (e.g., suppliers in all stages of the food chain) and non-food sectors (e.g., chemicals, food technology, packaging, machinery) all with different characteristics (Menrad, 2004); it is possible that innovation may come from outside the firm's boundaries. Secondly, the speed of product innovation in the industry has changed dramatically in the last decades (in response to shrinking product life cycles). Every year between 5,000 and 10,000 "new" products are offered to the market in Australia, New Zealand, and the UK, and in the USA, this figure amounts to 18,000 a year (Bruin & Jongen, 2003; Winger & Wall, 2006, Gov.UK, 2014). These characteristics are what make the food industry a good candidate for exploring the scope of developing alternative capabilities to innovate.

This chapter's contribution to the literature is threefold: First, it offers an operationalization of different innovation capabilities using the concept of value-based innovation and distinguishes dynamic innovation capabilities and ordinary innovation capabilities. Second, it explores the link between dynamic and ordinary capabilities and performance in the field of innovation, adding to the not so vast body of literature with empirical evidence from the manufacturing/processing sector. Third, we demonstrate an application of PLS-SEM on empirical data. We model latent constructs representing dynamic and ordinary capabilities of the organization as higher-order constructs and test the relationships between them on a sample from the food industry. Hence, our chapter also shows the use of higher-order PLS-SEM applied to dynamic capabilities and firm performance.

We begin our chapter by reviewing the literature on innovation from a capabilities perspective and linking this to the different innovations. Next, we present our research model and proposed hypotheses followed by the research methodology and the results. We finally

synthesize our findings and discuss research and managerial implications.

2. Theoretical framework

2.1 Innovation as a capability

Capabilities can be distinguished as ordinary (or operational) or dynamic (Collis, 1994; Winter, 2003; Helfat et al., 2007). Even though the line between the two is blurry, ordinary capabilities could be seen as lower order which “*enable a firm to perform an activity on an ongoing basis using the same techniques on the same scale to support existing products and services for the same customer population*” (Helfat & Winter, 2011: p. 1244). On the other hand, dynamic capabilities have the capacity to sense (which means identifying and assessing opportunities outside the company), to seize (mobilizing resources to capture value from those opportunities), and to maintain competitiveness (through enhancement and reconfiguration of tangible and intangible assets) (Teece, 2007). According to Lawson and Samson (2001), dynamic capabilities emphasize management capabilities and inimitable combinations of resources that cut across many functions (e.g., R&D, product and process development, manufacturing) of the company and essentially expand the firm’s boundaries.

Analogously the capability of a firm to innovate includes both ordinary and dynamic elements. A firm's capability to innovate across products, processes, or solutions could be classified as ordinary because it is driven by the company and is based on the same / similar techniques and practices (e.g., new products are primarily variations of existing ones). On the contrary, the capability of a firm to innovate “outside its comfort zone” by creating non-traditional channels or by finding new ways of working together with external partners or by building new alliances could be classified as dynamic as it requires a search for new knowledge and information outside the firm (i.e., sensing capabilities) which represents a high degree of change and uncertainty (Lee & Kelley, 2008; Wu et al., 2016).

In the following sections, we analyze the capability of a firm to innovate by considering four main innovations based on Sawhney et al. (2006) and Chen et al. (2011): network-oriented innovation, customer-oriented innovation, offering-oriented innovation, and operations-oriented innovation. An analysis of what is included in each innovation, also supported by literature, is provided below. We close this section with a summary of profitability, growth, and overall performance as the aspects of performance that are expected to improve as firms become more innovative in their network, offerings, operations, and customer relations.

2.2 Network-oriented innovation

Network-oriented innovation builds on the fact that value can be created outside the firm through relationships with external partners (Jacobides et al., 2006; Debruyne, 2014; Kim & Lui, 2015). These external partners are not only related to the distribution *channels* used by the company but also to the overall business ecosystem. For example, network-oriented innovation can be achieved by creating new ways to manage direct and indirect traditional channels of distribution as well as by creating non-traditional channels where traditional intermediaries are assigned new roles (Chen et al., 2011). But network-oriented innovation may also be the result of identifying new ways of working together with partners in the supply chain or by building new alliances or partnerships, or even by establishing new outsourcing arrangements with partners (Rothaermel & Hess, 2007).

2.3 Customer-oriented innovation

Customer-oriented innovation focuses on the *relationship* and the *interaction* built with the customer, which may result in a better understanding of customers' expectations and an improved overall customer experience. Customer-oriented innovation may come in different forms. Moore (2004) ties innovations to the product life cycle, Sawhney et al. (2006) consider pricing innovation, whilst other researchers refer to innovation in *communication*, which

improves understanding customer segmentation. Debruyne (2014), for example, discusses how KLM, with its online frequent flier communities, tap into various customer segments on an ongoing basis and improve its customer experience. Often customer-oriented innovation may be the result of identifying and creating new ways to communicate with customers or new ways to promote a firm's products and services.

2.4 Offering-oriented innovation

Offering-oriented innovation builds around the unique functionality of the product or service, but at the same time, does not treat products as stand-alone solutions. Often products are parts of a wider end-to-end solution to customers' problems, either because they are combined with services or because they are combined with unique functionalities (Teece, 2007). Offering-oriented innovation is often a result of the use of shared *platforms* or sets of technologies and tools that provide either a cost advantage in the development of new products or speed advantage. Indeed, through offering-oriented innovation, firms can increase product variety and meet diverse customer needs while maintaining cost and process efficiencies. In the innovation literature, this concept has been well recognized. For example, Wheelwright & Clark (1992) describe how "product platforms" can meet the needs of different customers simply by modifying, adding, or subtracting various features. Sood & Tellis (2005) also identify platform innovation, whilst Sawhney et al. (2006) consider *solution* innovation. More recently, Gawer & Cusumano (2013, p. 4) refer to external platforms, which "serve as foundations upon which a larger number of firms can build further complementary innovations, in the form of specific products, related services or component technologies". In the food industry, there have also been examples of offering-oriented innovation. International Flavors and Fragrances (IFF), for example, is a global supplier of specialty flavors to the food industry and has built a toolkit that enables its customers to modify flavors

for themselves, which IFF then manufactures (Von Hippel, 2005).

2.5 Operations-oriented innovation

Operations-oriented innovation takes a more inward view of innovation by focusing on how work is done and hence on the significant improvement (not just lower-level changes) of a firm's *processes*, resulting in lower-cost offerings and superior economic value. Operations-oriented innovation can be achieved by employing new processes and methods or new mechanisms (e.g., purchasing input materials and services) or using advanced information technologies to restructure and simplify the supply chain and the associated processes.

Regarding process innovation, Davenport (1993) was one of the first strong advocates of their essential role, followed by Pisano (1997). Pisano's "Development Factory" work explored the effect of process development in the pharmaceutical sector, highlighting its importance on innovation performance. For some authors (Hamel, 2006; Birkinshaw et al., 2008), process innovation is very much related to *management* innovation, which may refer to implementing new management practices to improve organizational efficiency or change the organizational structure of the firm. Examples of management innovation include Toyota's lean production system or General Electric's six sigma (Mol & Birkinshaw, 2012).

We argue that looking at innovation from these four different perspectives is important because it helps the company to understand whether there are interdependencies among the four different innovations and how they are likely to be affecting each other.

2.6 Profitability, overall performance, and growth

According to Damanpour et al. (2009), the adoption of innovation is a means towards organizational change and adjustment of external and internal functions to respond to environmental demands, operate efficiently and effectively, and maintain or improve

performance. It is accepted widely, and there has been supporting evidence in the literature that innovation positively influences the performance of firms, both large companies, and SMEs. Walker's (2004) review of 30 empirical studies from 1984 to 2003 also showed that innovation influences performance positively. Organizational performance refers to how well a firm achieves its goals. Past research has measured organizational performance using primarily financial indicators such as return on investment (ROI), market share, and profit margin (Li et al., 2006; Sánchez & Pérez, 2005). This has been particularly the case in the innovation literature, where the sales (or turnover) generated from innovations has been one of the most common measures of business performance (Griffin, 1997). In this research, in addition to market-based indicators (e.g., market share growth, sales growth, new customers), we include the traditional, well-established, and widely used accounting-based measures (e.g., profitability, return on sales; see Rangus & Slavec, 2017). This, coupled with managers' perceptions of the organization's overall performance, provides a more rounded view.

3. Research model and hypotheses

We explain below the construction of these hypotheses.

3.1 Network-oriented innovation and operations-oriented innovation

Networks and partnerships with suppliers play an important role in improving a firm's processes by improving or adapting existing processes or by developing new ones. From a dynamic capabilities point of view, such networks and partnerships with suppliers enable the firm to sense and seize opportunities outside its boundaries. The research by Nishiguchi & Ikeda (1996) on the Japanese automotive industry has shown that much of the process innovation achievements were at the OEM level, and the improvements of supply chain practices in the industry in the nineties was the result of suppliers being equipped with an impressive range of self-developed technologies which in turn increased their ability to

innovate and to be operationally flexible and adaptable. More recently, research by Roy et al. (2004), Lee et al. (2011), and Yam et al. (2011) has supported that supplier involvement and alliances with external firms are the routes to generating process innovation. This is particularly important for sectors that small and medium-sized enterprises dominate. Avermaete et al.'s (2004) research on the food industry revealed, for example, that suppliers of equipment were the primary sources of process innovation in small food manufacturing firms. Based on the above, our hypothesis is that:

H1. Network-oriented innovation positively affects operations-oriented innovation.

3.2 Network-oriented innovation and offering-oriented innovation

In recent years, alliances and networks have become an integral part of a firm's business environment, particularly regarding innovation development. From a dynamic capabilities point of view, network-oriented innovation can improve the sensing capability of the firm and enable the firm to acquire capabilities outside the firm (McEvily & Marcus, 2005). A company should constantly monitor its own industry and outside its industry for product technology to increase product innovativeness (Kotabe & Scott Swan, 1995). Cohen et al.'s (2000) investigation of Saturn's success in the nineties concluded that the firm's impressive performance in offering excellent after-sales service resulted from a differently-designed service supply chain strategy executed by channel partners (dealers). On the same subject, Cousins et al.'s (2011) research showed that interaction and technical exchange with suppliers had a significant positive effect on product development performance. Hence, the following hypothesis follows:

H2. Network-oriented innovation positively affects offering-oriented innovation.

3.3 Customer-oriented innovation and operations-oriented innovation

The notion that firms can improve their processes and introduce new management practices by having better relationships and by interacting better with their customers is gaining attention in innovation studies. Indeed, information systems and technology do support process innovation (Khosrow-Pour, 2006; Tarafdar & Gordon, 2007). But also more recently, Lin et al.'s (2010) examination of 107 Taiwanese computer manufacturers on the effects of Customer Relationship Management (CRM) systems on innovation capabilities revealed that the adoption of technology-based CRM has positive effects on manufacturers' operations. We, therefore, hypothesize that:

H3. Customer-oriented innovation positively affects operations-oriented innovation.

3.4 Customer-oriented innovation and offering-oriented innovation

The role of customers and their contribution to innovation processes and new product offerings have been well-supported in the literature (O'Hern & Rindfleisch, 2009; Fitjar & Rodríguez-Pose, 2013). In dynamic capability terms, customers, through search activities, are amongst the first to sense the potential for new offerings (Teece, 2007). According to Foss et al. (2011), firms gain from being orientated toward, perhaps even working directly with, their customers and other users of their products. Food manufacturers, for example, draw heavily on market information from customers for developing innovations (Stewart-Knox & Mitchell, 2003). Hoyer et al. (2010, p. 283) argue that consumers take an active and central role as participants in the new product design process because "*they are now able to easily communicate these ideas to the company through Internet websites, e-mail, and social networks*". In other words, the improved relationship and the interaction built with the customer will result in a better understanding of customers and lead to improvements in

offerings. As a result, the following hypothesis is proposed.

H4. Customer-oriented innovation positively affects offering-oriented innovation.

3.5 Operations-oriented innovation, profitability, growth, and overall performance

The literature has well documented the relationship between operations-oriented innovation and profitability, growth, and overall performance. The research by Geffen & Rothenberg (2000) on the performance of the US automobile assembly plants revealed that partnerships between original equipment manufacturers (OEMs) and their suppliers improve manufacturing operations and help meeting production quality and cost goals subsequently supporting OEM's growth. Davenport (2013) argues that through process innovation, firms can support low-cost producer strategies passing the savings on to customers, which can further increase growth. Similarly, Camisón & Villar-López (2014) showed that organizational innovation favors the development of technological innovation capabilities. More recently, Lin et al. (2016) study of Chinese firms showed that management innovation facilitates changes, including technical innovation. Hence, the following hypotheses follow:

H5a. Operations-oriented innovation positively affects profitability.

H5b. Operations-oriented innovation positively affects overall performance.

H5c. Operations-oriented innovation positively affects growth.

3.6 Offering-oriented innovation, profitability, growth, and overall performance

The research by Langerak & Hultink (2005) investigated the impact of new product development on profitability in 233 manufacturing firms, showing that it indeed enhanced speed and profitability and, hence, firm's financial performance. Eggert et al.'s (2011) survey

of German mechanical engineering companies suggested that when companies with high product innovation activity also offered services that support the product, this directly increased firm profitability. A similar positive relationship was found in Gemser & Leenders's (2001) research of two Dutch manufacturing industries, namely home furniture and precision instruments, but also in Wright et al.'s (2005) work, where it was found that product innovation has a positive effect on performance in hostile environments. In a more recent survey of 451 Spanish firms by Jiménez-Jiménez & Sanz-Valle (2011), the data also revealed a positive impact of innovation (including product innovation) on performance. As a result, we hypothesize the following:

H6a. Offering-oriented innovation positively affects profitability.

H6b. Offering-oriented innovation positively affects overall performance.

H6c. Offering-oriented innovation positively affects growth.

Figure 1 shows the proposed research model describing the interactions between various innovation capabilities as well as growth, profitability, and overall performance.

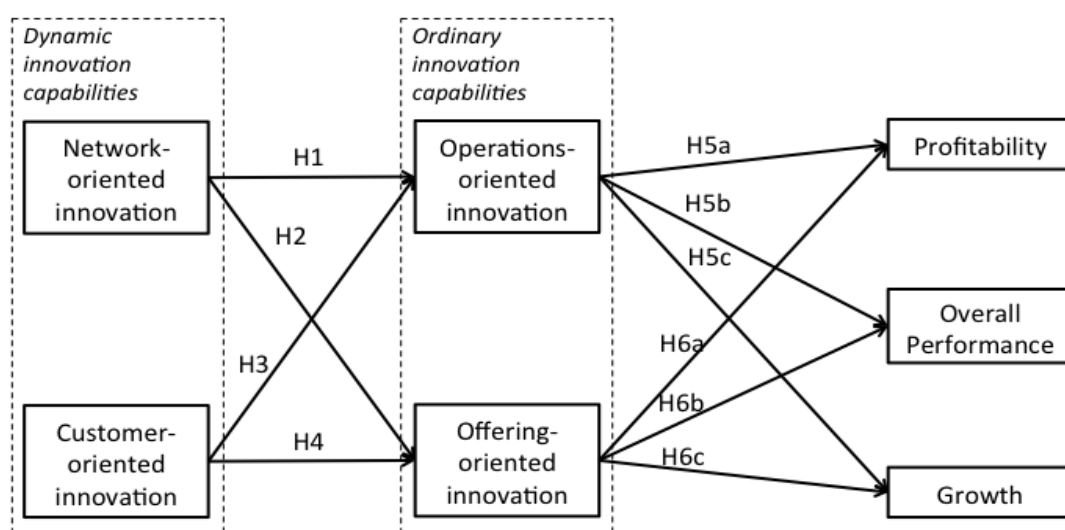


Figure 1 The proposed research model and hypotheses

The model presented in Figure 1 suggests a cause-and-effect relationship between the constructs that are to the left of the other constructs, i.e., network-oriented and customer-oriented innovations lead to operations-oriented and offering-oriented innovation, then operations-oriented offering-oriented innovations result in higher profitability, overall performance, and growth. In dynamic capability theory terms, we argue that network-oriented and customer-oriented innovations are dynamic capabilities that affect ordinary (offering-oriented and operations-oriented) innovation capabilities.

4. Research methodology

In this research, we draw data from the food and drink manufacturing sector in Greece, one of the country's largest and most important industries. **Food** processing is a critical sector in Greece, accounting for 10% of employment, holding the most significant share in terms of the value of production (19.8%) and gross value added (24.4%). In comparison, it ranks second in turnover (19.7%) (IOBE, 2017). The Greek food industry has traditionally played a central role in processing agricultural raw materials and providing food supply to the nation. Most of the food manufacturing companies (approximately 14000) are family-based, with more than 97 percent of Greek enterprises categorized as “micro” (fewer than ten people employed and an annual turnover under €2 million) (IOBE, 2017). Many specialize in the production of food from local agriculture. The importance of the sector for the economy and the reliance of the sector on micro companies makes the food sector in Greece a good proxy for studying the development of innovation capabilities and the impact on performance.

4.1 Data collection

We adopted the survey used for different innovations and performance by Chen et al. (2011).

The constructs network-oriented innovation, customer-oriented innovation, operations-oriented innovation, offering-oriented innovation, and overall performance were assessed on a seven-point Likert scale with statements where respondents chose between strongly disagree, disagree, somewhat disagree, neither disagree nor agree, somewhat agree, agree, and strongly agree. Growth and profitability were also assessed on a seven-point Likert scale where respondents assessed their growth and profitability with respect to their competitors using comparators much worse, worse, moderately worse, neutral, moderately better, better, and much better. The survey tool is given in Appendix A.

At the beginning of the research, we established a database of 1,200 food manufacturers and processors operating in the sector through industry associations. These companies operated in nine different sub-sectors: meat and meat products, processed fish and marine products, processed fruits and vegetables, fats and oils, dairy products, flour and grain mill products, fresh and processed salads and dressings, bakeries, snack and confectioneries, drinks and beverages.

The primary data collection started in October 2010 and finished in February 2011. Before commencing primary data collection, the data collection tool was piloted in September 2010 with two companies and one of the senior managers of the association of exporters, the majority of the members of which are food companies. The companies participated in this pilot voluntarily. Following the piloting of the data collection tool, some of the wordings and definitions were rephrased because the data collection tool was based on literature in English but was administered in Greek. Initially, the data collection tool was prepared in English and then translated to Greek. Then the Greek version was translated back to English to assure consistency of concepts and underlying ideas and to minimize differences in meaning. So multiple rounds of translations took place to ensure the data question tool was valid, i.e., the meaning of the questions in English and Greek was the same. In the pilot stage, the scales did

not change. Some of the definitions for the types of innovation were further clarified for potential participants.

Questionnaires were sent through a link to an online survey. There were three rounds of data collection. The participants received the first reminder about three weeks after sending the survey link. The second reminder was sent in about three weeks following the first reminder. There was a third and final reminder, which was sent approximately three weeks after the second reminder.

The survey included 37 questions, including questions about the company. The average time to complete the questionnaire was 25 minutes. The companies were given a phone call in January to facilitate the collection of responses. The participants were also given the opportunity to receive the results of the survey. Moreover, there was a prize, a gift card of \$150.00 value, for the participants. At the end of the data collection, 154 questionnaires were returned with a response rate of 13%. After removing responses with missing values, data from 96 companies were used in the Partial Least Squares Structural Equation Model (PLS-SEM).

Table 1 presents the sectors represented in the sample, with bakeries, snacks, and confectioneries having the highest frequency of responding companies, followed by processed foods and vegetables. There were also 11 companies; participants responded they did not belong to any of the listed food subsectors.

Table 1 Food sub-sectors represented in the sample

Sector	Frequency	Percentage
Bakeries, snacks, and confectioneries	26	27.1
Processed fruits and vegetables	17	17.7
Dairy products	11	11.5
Drinks and beverages	11	11.5
Meat and meat products	10	10.4
Fats and oils	6	6.2

Processed fish and marine products	4	4.2
Other	11	11.5

Our survey participants had roles in sales, production, marketing, R&D, procurement, and logistics departments. Most of them held roles in sales, production, and marketing, which are the three departments highly involved in developing and introducing new products to the market together with the R&D department. These participants were directors or managers of their departments because they would be in a position to answer questions about innovation and organizational performance. It should be noted that not all companies that were represented in the research had a dedicated R&D department for developing new products.

Table 2 presents the years the company has been in operation at the time of data collection, and more than half of the companies represented in the research were relatively recently established with less than 20 years in operation. This also can be read as an indicator of the dynamism in the Greek food sector.

Table 2 Participant companies' years in operation

Sector	Frequency	Percentage
Up to 20 years	49	51.0
20 to 40 years	30	31.2
40 to 60 years	11	11.5
60 to 80 years	2	2.1
More than 80 years	4	4.2

4.2 Higher order partial least squares models

Hierarchical constructs can be defined as constructs that involve more than one dimension (Wetzels et al., 2009). Higher-order constructs allow for more theoretical parsimony and reduce model complexity (MacKenzie et al., 2005). This is regarded as theoretical utility as the theory requires general constructs consisting of specific dimensions or facets (Edwards,

2001). Partial least squares structural equation modeling allows for conceptualization of a hierarchical model through repeated use of indicator variables (Tenenhaus et al., 2005).

In this research, we conceptualize network-oriented innovation as a higher-order construct comprising chain and channel innovation. In a similar vein, customer-oriented innovation involves innovation in communication, relationship, and interaction with customers.

Operations-oriented innovation involves innovation in management and processes, whereas offering-oriented innovation involves innovation in platforms and solutions. While network-oriented, customer-oriented, operations-oriented, and offering-oriented innovation constructs are second-order constructs, constructs related to profitability, performance, and growth of firms are first-order constructs since they do not involve other latent constructs.

5. Results

The analyses were performed with SmartPLS 3 (Ringle et al., 2014) on a 64-bit MacBook Pro with Intel Core i7 2.2 GHz processor and OS X version 10.9.4. We present in the following subsections the measurement model and the structural model and interpret the findings from these models.

5.1 The measurement model

In our PLS model, we assume all latent variables are measured by reflective indicators, and this assumption requires reflective indicators to have a strong mutual association, i.e., they will be highly correlated. This is because reflective measurement assumes that the latent variable is the cause of reflective indicators. Another requirement is that reflective indicators should not load higher on another construct than their own construct.

Common method variance. We checked the common-method variance to ensure the data

had no issues regarding the response bias since each organization was represented by a single respondent (Prajogo & McDermott, 2014). Following on from Prajogo & McDermott (2014), we checked the number of factors extracted from the 37 indicators in a principal component analysis and found seven factors were extracted in the unrotated solution. These seven factors explained 72% of the variation in the data. We also forced only one factor to be extracted from the data, which resulted in 36% of the variation being explained. Hence, the common-method variance did not pose a significant problem.

Indicator reliability. In the case of reflectively measured constructs, loadings above 0.70 indicate that the construct explains over 50% of the indicator's variance (Sarstedt et al., 2014). Table A.1 in Appendix A provides an overview of the constructs and their corresponding indicators with loadings. According to our assessment of the indicator reliability, all 66 indicators, which are all reflective, have loadings above 0.70 (Table A.1). Hence, the indicators in the measurement model show satisfactory reliability levels.

Internal consistency reliability. The composite reliability scores above 0.70 are considered “satisfactory to good” in line with Jöreskog's (1971) and Hair Jr et al. (2013). The measurement model's internal consistency reliability is achieved owing to composite reliability scores of 0.891 and higher (Table 4, composite reliability column).

Convergent validity. A construct is expected to explain the variance in its items. The average variance extracted (AVE) scores show the convergence of each construct with its measurement items. The AVE score is calculated using the mean of squared loadings for all indicators associated with a construct. It should be 0.50 or higher, meaning that the construct explains at least 50% of the variance in its indicators. The AVE scores in Table 3 (column average variance extracted) are higher than the critical threshold value of 0.50, supporting the measures' convergent validity.

Table 3 Composite Reliability and Average Variance Extracted

Constructs	Composite Reliability	Average Variance Extracted
Chain	0.907	0.765
Channel	0.904	0.760
Communication	0.910	0.772
Customer Oriented	0.928	0.587
Growth	0.957	0.882
Interaction	0.940	0.839
Management	0.899	0.748
Network Oriented	0.899	0.599
Offering Oriented	0.920	0.592
Operations Oriented	0.902	0.606
Overall Performance	0.913	0.779
Platform	0.927	0.761
Process	0.905	0.760
Profitability	0.891	0.804
Relationship	0.920	0.793
Solution	0.921	0.745

Discriminant validity. Discriminant validity determines the extent to which a construct is empirically distinct from other constructs. The Fornell-Larcker (1981) criterion compares the square root of the AVE of each construct with the inter-construct correlations with all other constructs. Table 4 shows that the square root of the AVE of each construct exceeds the inter-correlations, supporting discriminant validity (Wetzels et al., 2009).

Table 4 Inter-correlations of the latent variables for first-order constructs

Construct	1	2	3	4	5	6	7	8	9	10	11	12
1. Chain	.874											
2. Channel	.573	.872										
3. Communication	.293	.295	.879									
4. Growth	.399	.267	.309	.939								
5. Interaction	.198	.202	.591	.169	.916							
6. Management	.329	.331	.436	.548	.393	.865						
7. Overall performance	.369	.298	.416	.685	.318	.499	.883					
8. Platform	.344	.391	.478	.270	.409	.274	.275	.872				
9. Process	.232	.259	.533	.317	.587	.610	.363	.414	.872			
10. Profitability	.305	.302	.306	.698	.215	.551	.747	.251	.285	.897		
11. Relationship	.411	.338	.675	.437	.539	.402	.536	.642	.507	.396	.890	
12. Solution	.400	.293	.545	.339	.369	.302	.461	.573	.434	.374	.708	.863

Notes: Square root of AVE on diagonal.

5.2 The structural model

Once the measurement model requirements are satisfied in terms of the common method variance (the model does not suffer from this problem), indicator reliability (all measurement items have at least 0.7 or higher loadings), internal consistency reliability (all composite reliability scores are above 0.7), convergent validity (all AVE are above 0.5), and discriminant validity (all inter-construct correlations are smaller than the square root of the construct's AVE), we continue with the structural model. The structural model fit statistics are as follows: Root Mean Square Error of Approximation (RMSEA) = 0.099 and Standardized Root Mean Square Error = 0.08.

Predictive relevance (R^2 and Q^2). Predictive relevance is established by the coefficient of determination (R^2), cross-validated redundancy (Q^2), and the path coefficients. Figure 2 shows the predictive power of endogenous constructs with R^2 values reported inside blue circles. The R^2 values in Figure 2 are moderate for operations-oriented ($R^2 = 0.398$) and offering-oriented ($R^2 = 0.525$) innovation and comparably weak for profitability ($R^2 = 0.250$), overall performance ($R^2 = 0.287$) and growth ($R^2 = 0.259$). However, all R^2 values are significant ($p < 0.01$) and considering the antecedents of these constructs, it is possible to conclude R^2 value is satisfactory. We used blindfolding to evaluate the model's predictive relevance for each endogenous construct. We ran the blindfolding procedure with an omission distance of seven. Cross-validated redundancy values for all five endogenous constructs were well above zero (Operations-oriented innovation: 0.216; Offering-oriented innovation: 0.302; Profitability: 0.188; Overall performance: 0.206; Growth: 0.217), providing support for the model's predictive relevance.

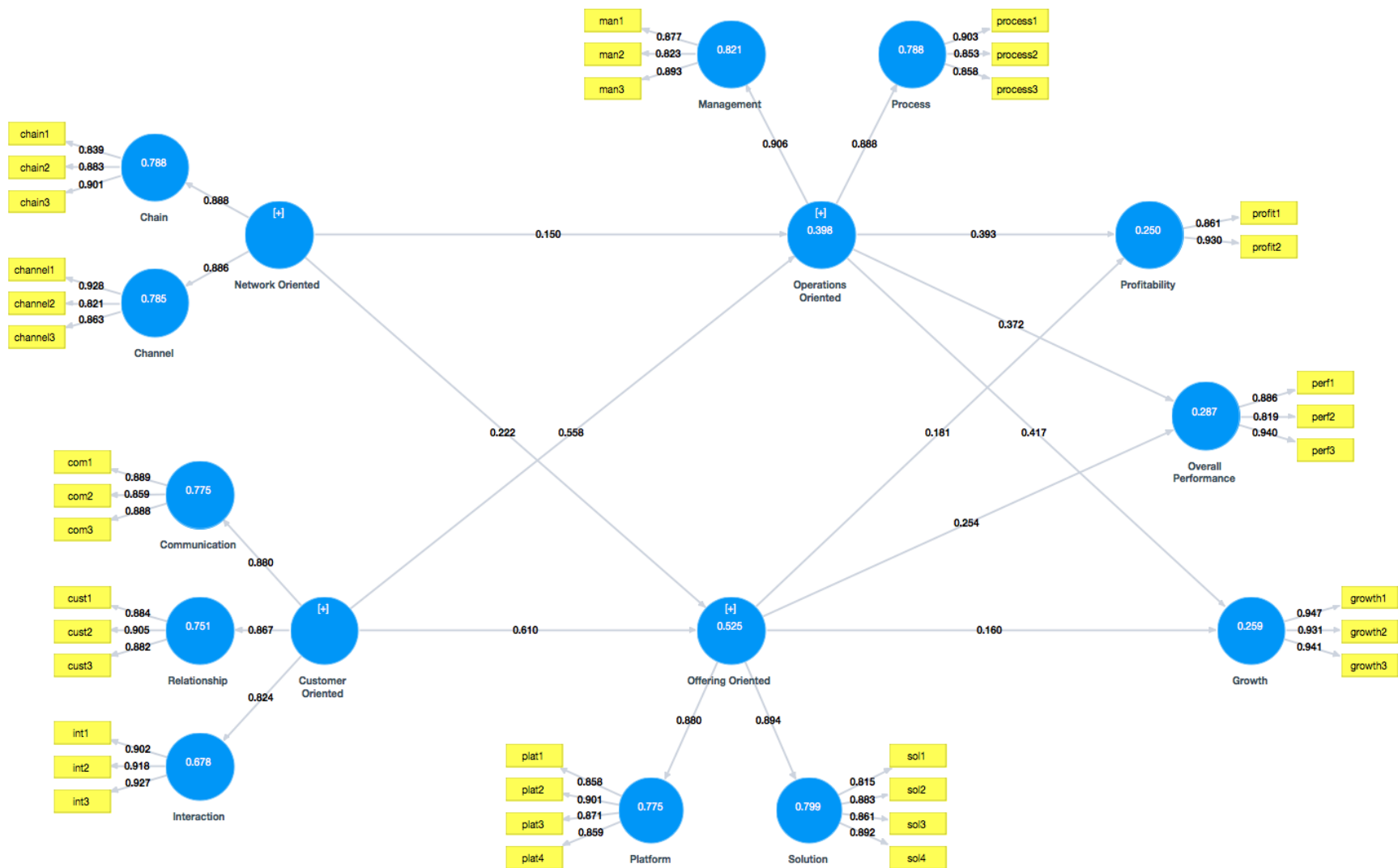


Figure 2 Theoretical model and analysis results

To check the significance and relevance of the structural model, we ran the bootstrapping procedure (96 cases, 5000 samples, no sign changes option) and found that nine of ten structural relationships (Table 5) are significant ($p < 0.10$).

Table 5 Significance and relevance of path coefficients

Hypothesis	Path coefficient
H1: Network Oriented -> Operations Oriented	0.150*
H2: Network Oriented -> Offering Oriented	0.222**
H3: Customer Oriented -> Operations Oriented	0.558***
H4: Customer Oriented -> Offering Oriented	0.610***
H5a: Operations Oriented -> Profitability	0.393***
H5b: Operations Oriented -> Overall Performance	0.372***
H5c: Operations Oriented -> Growth	0.417***
H6a: Offering Oriented -> Profitability	0.181*
H6b: Offering Oriented -> Overall Performance	0.254***
H6c: Offering Oriented -> Growth	0.160

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-sided test)

The results in Table 5 highlight the important role of customer-oriented innovation on operations-oriented and offering-oriented innovation with significant and relatively strong path coefficients (0.558 and 0.610, respectively). Table 5 also shows the role of operations-oriented innovation in achieving profitability, overall performance, and growth with significant and moderately strong path coefficients (0.393, 0.372, and 0.417, respectively). Surprisingly offering-oriented innovation has a significant effect on profitability and overall performance but not on growth.

6. Discussion

The results support all the hypotheses but one, namely, *H6c: Offering-oriented innovation positively affects growth*, and they provide new insights into the impact of different innovation capabilities on three aspects of organizational performance, i.e., profitability, growth, and overall performance. These insights are particularly significant because prior studies have not investigated the relative effects of different innovation capabilities on profitability, growth, and

overall firm performance, in particular, the interrelationships between dynamic and ordinary innovation capabilities (H1-H4).

The results show that dynamic (network-oriented and customer-oriented) innovation capabilities have a positive impact on ordinary (operations-oriented and offering-oriented) innovation capabilities. Positive and significant path coefficients suggest that firms can improve their ordinary innovation capabilities through progress in dynamic innovation capabilities. This is in line with the recent findings of Macher & Mowery (2009) and Protogerou et al. (2012) on the impact of dynamic capabilities on operational capabilities. In a similar vein, operations-oriented innovation has a positive and significant impact on profitability, overall performance, and growth, whereas offering-oriented innovation has a positive and significant impact on profitability and overall performance. There was no evidence to support a positive relationship between offering-oriented innovation and growth, which may be investigated again in a similar context with different data.

Second, these results are important because they show the relationship between different innovation capabilities, which are higher-order constructs comprised of multiple latent constructs. The study shows successful implementation of higher-order PLS in innovation capabilities in terms of the data analysis tool. It is possible to hypothesize each different innovation capability as reflected on the lower order constructs, reported in Figure 2. Although different innovation capabilities and their impact on firm performance have been addressed in previous research concerning dynamic capabilities, no research has investigated the interaction between dynamic and ordinary innovation capabilities as explanatory constructs for firm performance. Similar use of PLS-SEM can be found in Wilden et al. (2013), where the authors test how competitive intensity and organizational structure influence the effects of dynamic capabilities on firm

performance.

7. Conclusion

The findings of the study suggest that there are cause-and-effect relationships between different innovation capabilities as hypothesized. In other words, network-oriented and customer-oriented innovations lead to operations-oriented and offering-oriented innovation, which positively affects firm performance. The results showed that customer-oriented, operations-oriented and offering-oriented innovation were significant drivers of profitability, performance and growth. The effect of network-oriented innovation on operations-oriented and offering-oriented innovation was positive. It is important to recognize the vital role of operations-oriented innovation as a driver of firm profitability, overall performance, and growth and the important role customer-oriented innovation plays in operations-oriented and offering-oriented innovation.

7.1 Theoretical contribution

Research on innovation in the food industry has taken a rather “traditional”, narrow view by placing enormous emphasis on a firm’s capabilities to innovate across products and/or processes (Trail & Meulenberg, 2002; Baker, 2007; Karantininis et al. 2010; Matopoulos & Bourlakis, 2011, Baregheh et al. 2012). In this research, we moved away from the traditional firm-based product/process innovation debate using Chen et al.’s (2011) value-based view of innovation as the basis for describing and classifying innovation capability, linking innovation to new value created for customers.

Based on this approach, we sought to understand the link between dynamic and ordinary innovation capabilities and their influence on organizational performance. The findings of the

study provide, in broad terms, empirical support to the notion that dynamic innovation capabilities impact on operational innovation capabilities which in turn have a significant effect on performance. The study contributes to the ongoing debates on the nature of dynamic capabilities (e.g., Eisenhardt & Martin, 2000; Easterby-Smith et al. 2009; Wilden et al. 2013) and on the link between dynamic capabilities and ordinary capabilities, and the role and performance consequences of dynamic capabilities (Cepeda & Vera, 2007; Protogerou et al., 2012).

Concerning the first debate, our research helps to clarify the nature of dynamic capabilities in the context of innovation, bridging these two fields together. The integration of these two fields helps to realize that dynamic capabilities do not have to be viewed only as firm-level capabilities (Pavlou & El Sawy, 2011). Dynamic capabilities could be the way to approach innovation, providing more depth to the explanation of non-firm-driven innovation and its impact on firm-based innovation.

As for the link between dynamic and ordinary capabilities, very few empirical analyses have attempted to explore their performance effects; so, our research provides support for the arguments of Macher & Mowery (2009) and Protogerou et al. (2012) that dynamic capabilities have a significant but indirect effect on organizational performance.

7.2 Managerial Implications

The goal of the chapter was to expand the view of a firm's capability to innovate and to explore the interrelations among different innovation capabilities and their influence on organizational performance. We argue that in the food sector, but also in other sectors with similar characteristics, where for example, the level of research and development (R&D) expenditures is not as high as in traditional manufacturing (e.g., electronics or automotive) and where new

products emanate mainly from variations of older ones (Wijnands et al., 2007), there is a bigger need to expand the pool of innovation capability so as to include non-firm-based innovation capabilities. What is more important is to understand the impact of these different innovation capabilities on profitability, growth, and overall performance. This could be of particular importance not only for SMEs but also for larger firms where resources are also scarce, and the outcome of traditional R&D-based innovation is not always translated into new value for the customer. Finally, this research may be of value for firms coming from smaller economies (like the Greek economy, which belongs in the economic periphery of the European Union). In such contexts, innovation capabilities may be an answer to the complex problem of economic downturn, and perhaps companies should be focusing on their dynamic innovation capabilities in the first place to entertain higher profitability, overall performance, and growth.

7.3 Limitations

Despite its contributions, the study presents some limitations. First, the data used was provided by a single respondent in each firm, in most cases the sales / production manager. Another limitation of the research is the origin of the data. Although we believe, for the reasons described in the introduction, that the food industry is ideal for exploring the interrelationships between different innovation capabilities, exploring other sectors will help generalize the results further. In a similar vein, the research needs to be extended to an international context (e.g., United States, Northern Europe, and the Far East) to check whether culture and local / national food supply chain configurations lead to different findings. Also, it is probably worth exploring whether the different innovation capabilities are independent or mutually exclusive.

Finally, an online questionnaire with an average completion time of 25 minutes could explain the

38% of responses being lost due to missing data. In fact, we were aware of the length of the survey, but to be able to answer the research question, a survey at such length was needed. Our sample size was 96; greater insights could be gained by expanding this to a larger sample so that subcategories of the sector can be analyzed and compared in terms of the innovation capabilities and the effect on performance.

Acknowledgments

The authors wish to thank Jiyao Chen for his thorough and helpful feedback on an earlier version of this manuscript.

References

- Avermaete, T., Viaene, J., Morgan, E. J., Pitts, E., Crawford, N., and Mahon, D. (2004), "Determinants of product and process innovation in small food manufacturing firms", *Trends in Food Science & Technology*, Vol. 15 No. 10, pp. 474–483.
- Baker, D. K. (2007), New product introductions in the food industry – results from a Danish survey. Technical report, Institute of Food and Resource Economics, Copenhagen. Report No: 189.
- Baregheh, A., Rowley, J., Sambrook, S., and Davies, D. (2012), "Food sector SMEs and innovation types", *British Food Journal*, Vol. 114 No. 11, pp.1640–1653.
- Barney, J. (1991), "Firm resources and sustained competitive advantage", *Journal of Management*, Vol. 17 No. 1, pp. 99–120.
- Birkinshaw, J., Hamel, G., and Mol, M. J. (2008), "Management innovation", *Academy of Management Review*, Vol. 33 No. 4, pp. 825–845.
- Boly, V., Morel, L., Assielou, N., and Camargo, M. (2014), "Evaluating innovative processes in french firms: Methodological proposition for firm innovation capacity evaluation", *Research Policy*, Vol. 43 No. 3, pp. 608-622.
- Bruin, S. and Jongen, T. R. (2003), "Food process engineering: the last 25 years and challenges ahead", *Comprehensive Reviews in Food Science and Food Safety*, Vol. 2 No. 2, pp. 42–81.
- Camisón, C., and Villar-López, A. (2014). "Organizational innovation as an enabler of technological innovation capabilities and firm performance. *Journal of Business Research*, Vol. 67 No. 1, pp. 2891-2902.
- Cepeda, G., and Vera, D. (2007), "Dynamic capabilities and operational capabilities: A knowledge management perspective", *Journal of Business Research*, Vol. 60 No. 5, pp. 426-437.
- Chen, J., Sawhney, M. and Guth, W. (2011), The Value-Oriented View of Innovation: Defining and Measuring Business Innovation, *Academy of Management Meeting*, San Antonio, Texas.
- Chesbrough, H.W. (2003), *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press, Boston, MA.
- Cohen, M. A., Cull, C., Lee, H. L., and Willen, D. (2000), "Saturn's supply-chain innovation: high

- value in after-sales service", *Sloan Management Review*, Vol. 41 No. 4, pp. 93–101.
- Collis, D. J. (1994), "Research note: how valuable are organisational capabilities?", *Strategic Management Journal*, Vol. 15 (S1), pp. 143–152.
- Cousins, P. D., Lawson, B., Petersen, K. J., and Handfield, R. B. (2011), "Breakthrough scanning, supplier knowledge exchange, and new product development performance", *Journal of Product Innovation Management*, Vol. 28 No. 6, pp. 930–942.
- Daft, R. L. (1978), "A dual-core model of organisational innovation", *Academy of Management Journal*, Vol. 21 No. 2, pp. 193–210.
- Damanpour, F. (1991), "Organisational innovation: A meta-analysis of effects of determinants and moderators", *Academy of Management Journal*, Vol. 34 No 3, pp. 555–590.
- Damanpour, F., Szabat, K. A., and Evan, W. M. (1989), "The relationship between types of innovation and organisational performance", *Journal of Management Studies*, Vol. 26 No. 6, pp. 587– 602.
- Damanpour, F., Walker, R. M., and Avellaneda, C. N. (2009), "Combinative effects of innovation types and organisational performance: a longitudinal study of service organisations ", *Journal of Management Studies*, Vol. 46 No. 4, pp. 650–675.
- Davenport, T. H. (2013), *Process innovation: reengineering work through information technology*, Harvard Business Press, Boston, MA.
- Debruyne, M. (2014), *Customer Innovation: Customer-centric Strategy for Enduring Growth*, Kogan Page Publishers, London.
- Edwards, J. R. (2001), "Multidimensional Constructs in Organisational Behavior Research: An Integrative Analytical Framework", *Organisational Research Methods*, Vol. 4 No. 2, pp. 144–192.
- Eggert, A., Hogreve, J., Ulaga, W. and Muenkhoff, E. (2011), "Industrial services, product innovations, and firm profitability: a multiple-group latent growth curve analysis", *Industrial Marketing Management*, Vol. 40 No. 5, pp. 661–670.
- Eisenhardt, K. M., and Martin, J. A. (2000), "Dynamic capabilities: what are they?", *Strategic Management Journal*, Vol. 21 No. 10–11, pp. 1105–1121.
- Easterby-Smith, M., Lyles, M. A., and Peteraf, M. A. (2009), "Dynamic capabilities: current debates and future directions", *British Journal of Management*, Vol. 20 (s1), pp: S1–S8.
- Fitjar, R. D., and Rodríguez-Pose, A. (2013), "Firm collaboration and modes of innovation in Norway", *Research Policy*, Vol. 42 No. 1, pp. 128–138.
- Forsman, H. (2011), "Innovation capacity and innovation development in small enterprises. A comparison between the manufacturing and service sectors", *Research Policy*, Vol. 40 No. 5, pp. 739–750.
- Foss, N. J., Laursen, K., and Pedersen, T. (2011), "Linking customer interaction and innovation: the mediating role of new organisational practices", *Organisation Science*, Vol. 22 No. 4, pp. 980– 999.
- Gawer, A. and Cusumano, M. A. (2014), "Industry platforms and ecosystem innovation", *Journal of Product Innovation Management*, Vol. 31 No. 3, pp. 417–433.
- Geffen, C. A. and Rothenberg, S. (2000), "Suppliers and environmental innovation: the automotive paint process", *International Journal of Operations and Production Management*, Vol. 20 No. 2, pp. 166–186.
- Gemser, G. and Leenders, M. A. A. M. (2001), "How integrating industrial design in the product development process impacts on company performance", *Journal of Product Innovation Management*, Vol. 18 No. 1, pp. 28–38.
- GOV.UK (2014), Food product innovation: A background paper. available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/274441/food-product-innovation-a-background-paper.pdf.

- gov.uk/government/publications/food-and-drink-in-the-uk-investment-opportunities/ food-and-drink-in-the-uk-investment-opportunities, (accessed: 19 February 2014).
- Griffin, A. (1997), "Pdma research on new product development practices: updating trends and benchmarking best practices", *Journal of Product Innovation Management*, Vol. 14 No. 6, pp. 429–458.
- Gunday, G., Ulusoy, G., Kilic, K., and Alpkan, L. (2011), "Effects of innovation types on firm performance", *International Journal of Production Economics*, Vol. 133 No. 2, pp. 662–676.
- Hair Jr, J. F., Hult, G. T. M., Ringle, C., and Sarstedt, M. (2013). *A primer on partial least squares structural equation modeling (PLS-SEM)*, SAGE Publications, Incorporated, CA.
- Hamel, G. (2006), "The why, what, and how of management innovation", *Harvard Business Review*, Vol. 84 No. 2, pp. 72-83.
- Helfat C.E., Finkelstein S., Mitchell, W., Peteraf, M.A., Singh, H., Teece D.J., and Winter SG. (2007), *Dynamic Capabilities: Understanding Strategic Change in Organisations*. Blackwell Publishing: Malden, MA.
- Hoyer, W., Chandy, R., Dorotic, M., Krafft, M. and Singh, S. S. (2010), "Consumer Co-creation in New Product Development", *Journal of Service Research*, Vol. 13 No. 3, pp. 283-296.
- Jacobides, M. G., Knudsen, T., and Augier, M. (2006), "Benefiting from innovation: Value creation, value appropriation and the role of industry architectures", *Research Policy*, Vol. 35 No. 8, pp. 1200-1221.
- Jiménez-Jiménez, D. and Sanz-Valle, R. (2011), "Innovation, organisational learning, and performance", *Journal of Business Research*, Vol. 64 No. 4, pp. 408-417.
- Jöreskog, K. G. (1971), "Statistical analysis of sets of congeneric tests", *Psychometrika*, Vol. 36 No. 2, pp. 109–133.
- IOBE, (2017). Food and drink industry: Facts and figures 2016 (in Greek), available at http://iobe.gr/research_dtl_en.asp?RID=140, (last accessed 18 May 2017).
- Karantininis, K., Sauer, J., and Furtan, W. H. (2010), "Innovation and integration in the agri-food industry", *Food Policy*, Vol. 35 No. 2, pp. 112–120.
- Khosrow-Pour, M. (2006), *Cases on Information Technology and Business Process Reengineering*, Idea Group, Hershey, PA.
- Kim, Y. and Lui, S.S., (2015), "The impacts of external network and business group on innovation: Do the types of innovation matter?" *Journal of Business Research*, Vol. 68, No. 9, pp.1964-1973.
- Kirner, E., Kinkel, S., and Jaeger, A. (2009), "Innovation paths and the innovation performance of low-technology firms—An empirical analysis of German industry", *Research Policy*, Vol. 38 No. 3, pp. 447-458.
- Kogut, B. (2000), "The network as knowledge: generative rules and the emergence of structure", *Strategic Management Journal*, Vol. 21 No. 3, pp. 405–425.
- Kotabe, M. and Scott Swan, K. (1995), "The role of strategic alliances in high-technology new product development", *Strategic Management Journal*, Vol. 16 No. 8, pp. 621–636.
- Langerak, F. and Hultink, E. J. (2005), "The impact of new product development acceleration approaches on speed and profitability: Lessons for pioneers and fast followers", *IEEE Transactions on Engineering Management*, Vol. 52 No. 1, pp 30-42.
- Lawson, B., and Samson, D. (2001), "Developing innovation capability in organisations: A dynamic capabilities approach", *International Journal of Innovation Management*, Vol. 5 No. 3, pp. 377-400.
- Lee, S. M., Lee, D., and Schniederjans, M. J. (2011), "Supply chain innovation and organisational performance in the healthcare industry", *International Journal of Operations and Production*

- Management*, Vol. 31 No. 11, pp. 1193–1214.
- Lee, K. and Kang, S.-M. (2007), "Innovation types and productivity growth: Evidence from Korean manufacturing firms", *Global Economic Review*, Vol. 36 No. 4, pp. 343–359.
- Lee, H. and Kelley, D. (2008), "Building dynamic capabilities for innovation: an exploratory study of key management practices", *R&D Management*, Vol. 38 No. 2, pp. 155–168.
- Lin, H. F., Su, J. Q., & Higgins, A. (2016). "How dynamic capabilities affect adoption of management innovations", *Journal of Business Research*, Vol. 69, No. 2, pp. 862-876.
- Lin, R.-J., Chen, R.-H. Kuan, K. and Chiu, S. (2010), "Customer relationship management and innovation capability: an empirical study", *Industrial Management & Data Systems*, Vol. 110 No. 1, pp. 111 – 133.
- MacKenzie, S. B., Podsakoff, P. M., and Jarvis, C. B. (2005), "The Problem of Measurement Model Misspecification in Behavioral and Organisational Research and Some Recommended Solutions", *Journal of Applied Psychology*, Vol. 90 No. 4, pp. 710-730.
- Macher, J. T., and Mowery, D. C. (2009), "Measuring dynamic capabilities: practices and performance in semiconductor manufacturing", *British Journal of Management*, Vol. 20 (s1), pp. S41-S62.
- Matopoulos, A. and Bourlakis, M. (2011), "Identifying innovation strategies: insights from the Greek food manufacturing sector", *International Journal of Innovation and Regional Development*, Vol. 3, No. 2, pp.159–173.
- McEvily, B. and Marcus, A. (2005), "Embedded ties and the acquisition of competitive capabilities", *Strategic Management Journal*, Vol. 26 No. 11, pp. 1033–1055.
- Menrad, K. (2004), "Innovations in the food industry in Germany". *Research Policy*, Vol. 33 No. 6, pp. 845-878.
- Mol, M. and Birkinshaw, J. (2012), Relating management innovation to product and process innovation: private rents versus public gains. In Pitsis, T., Simpson, A., and Dehlin, E., editors, *Handbook of Organisational and Managerial Innovation*, pages 13–35. Edward Elgar Publishing Limited.
- Moore, G. (2004), "Darwin and the demon" *Harvard Business Review*, Vol. 82 No. 7/8, pp. 86–92.
- Nishiguchi, T. and Ikeda, M. (1996), *Suppliers' process innovation: understated aspects of Japanese industrial sourcing*, In Nishiguchi, T., editor, *Managing Product Development*, pages 206–230. Oxford University Press, New York, Oxford.
- OECD (2014). OECD competition assessment reviews: Greece, available at: <http://dx.doi.org/10.1787/9789264206090-en>, (accessed 22 July 2014).
- O'Hern, M. and Rindfleisch, A. (2009), *Customer Co-Creation: A Typology and Research Agenda*, in Review of Marketing Research, Vol. 6, Naresh K. Malholtra, ed. Armonk, NY: M.E. Sharpe, pp. 84-106.
- Oke, A. (2007), "Innovation types and innovation management practices in service companies", *International Journal of Operations and Production Management*, Vol. 27 No. 6, pp. 564–587.
- Pavlou, P. A., and El Sawy, O. A. (2011), "Understanding the elusive black box of dynamic capabilities", *Decision Sciences*, Vol. 42 No. 1, pp. 239-273.
- Pisano, G. P. (1997), *The Development Factory: Unlocking the Potential of Process Innovation*, Harvard Business Press, Boston, MA.
- Powell, W. W., Koput, K. W., and Smith-Doerr, L. (1996), "Interorganisational collaboration and the locus of innovation: Networks of learning in biotechnology", *Administrative Science Quarterly*, Vol. 41 No. 1, pp. 116–145.
- Prajogo, D., and McDermott, C. M. (2014), "Antecedents of Service Innovation in SMEs:

- Comparing the Effects of External and Internal Factors", *Journal of Small Business Management*, Vol. 52 No. 3, pp. 521 – 540.
- Protopogrou, A., Caloghirou, Y., and Lioukas, S. (2012), "Dynamain capabilities and their indirect impact on firm performance", *Industrial and Corporate Change*, Vol. 21 No. 3 pp. 615-647.
- Ringle, C. M., Wende, S., and Becker, J.-M. (2014), Smartpls 3.0. <http://www.smartpls.com>.
- Rangus, K., & Slavec, A. (2017). The interplay of decentralization, employee involvement and absorptive capacity on firms' innovation and business performance. *Technological Forecasting and Social Change*, pp. 195-203.
- Roberts, P. W. and Amit, R. (2003), "The dynamics of innovative activity and competitive advantage: the case of Australian retail banking, 1981 to 1995", *Organisation Science*, Vol. 14 No. 2, pp. 107–122.
- Rothaermel, F. T., and Hess, A. M. (2007), "Building dynamic capabilities: Innovation driven by individual-, firm-, and network-level effects", *Organisation Science*, Vol. 18 No. 6, pp. 898-921.
- Roy, S., Sivakumar, K., and Wilkinson, I. F. (2004), "Innovation generation in supply chain relationships: a conceptual model and research propositions", *Journal of the Academy of Marketing Science*, Vol. 32 No. 1, pp. 61–79.
- Sánchez, A. M. and Pérez, M. P. (2005), "Supply chain flexibility and firm performance: a conceptual model and empirical study in the automotive industry", *International Journal of Operations and Production Management*, Vol. 25 No. 7, pp. 681–700.
- Sarstedt, M., Ringle, C. M., Smith, D., Reams, R., and Hair, Jr., J. F. (2014), "Partial least squares structural equation modeling (PLS-SEM): A useful tool for family business researchers", *Journal of Family Business Strategy*, Vol. 5 No. 1, pp. 105 – 115.
- Sawhney, M., Wollcott, R., and Arroniz, I. (2006), "The innovation radar: A 360-degree view of business innovation", *MIT Sloan Manage Review*, Vol. 47 No. 3, pp. 75–81.
- Schumpeter, J. A. (1934), *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*, Volume 55, Transaction Publishers.
- Sood, A. and Tellis, G. J. (2005), "Technological evolution and radical innovation", *Journal of Marketing*, Vol. 69 No. 3, pp. 152–168.
- Stewart-Knox, B. and Mitchell, P. (2003), "What separates the winners from the losers in new food product development?" *Trends in Food Science & Technology*, Vol. 14 No. 1, pp. 58–64.
- Subramanian, A. and Nilakanta, S. (1996), "Organisational innovativeness: exploring the relationship between organisational determinants of innovation, types of innovations, and measures of organisational performance", *Omega*, Vol. 24 No. 6, pp. 631–647.
- Tarafdar, M. and Gordon, S.R. (2007), "Understanding the influence of information systems competencies on process innovation: a resource-based view", *Journal of Strategic Information Systems*, Vol. 16 No. 4, pp. 353-392.
- Teece, D. and Pisano, G. (1994), "The dynamic capabilities of firms: an introduction". *Industrial and Corporate Change*, Vol. 3 No. 3, pp. 537–556.
- Teece, D. J. (2007), "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance", *Strategic Management Journal*, Vol. 28 No. 13, pp. 1319–1350.
- Tenenhaus, M., Vinzi, V. E. Chatelin, Y-M., and Lauro, C. (2005), "PLS Path Modeling", *Computational Statistics and Data Analysis*, Vol. 48 No. 1, pp. 159-205.
- Traill, W. B. and Meulenbergh, M. (2002), "Innovation in the food industry", *Agribusiness*, Vol. 18 No. 1, pp.1–21.
- Von Hippel, E. (2005), *Democratizing Innovation*. MIT press, MA.

- Walker, R. (2004), Innovation and organisational performance: evidence and a research agenda. Advanced Institute of Management Research Working Paper, (002).
- Wetzels, M., Odekerken-Schroder, G., and Van Oppen, C. (2009), "Using PLS path modeling for assessing hierarchical construct models: guidelines and empirical illustration", *Management Information Systems Quarterly*, Vol. 33 No. 1, pp. 177-195.
- Wheelwright, S. C. and Clark, K. B. (1992), "Creating Project Plans to Focus Product Development", *Harvard Business Review*, Vol. 70 No. 2 pp. 70-82.
- Wijnands, J., Banse, M., van Berkum, S., and Poppe, K. (2007), The external environment of the food industry. In Wijnands, J., van der Meulen, B., and Poppe, K., editors, *Competitiveness of the European Food Industry: An economic and legal assessment*. European Communities, Italy. available at http://ec.europa.eu/enterprise/sectors/food/files/competitiveness_study_en.pdf, (accessed 26 August 2014).
- Wilden, R., Gudergan, S. P., Nielsen, B. B., and Lings, I. (2013), "Dynamic capabilities and performance: strategy, structure and environment", *Long Range Planning*, Vol. 46 No. 1, pp. 72-96.
- Winger, R. and Wall, G. (2006), Food product innovation: A background paper, available at <http://www.fao.org/docrep/016/j7193e/j7193e.pdf>, (accessed 10 June 2014).
- Winter, S. G. (2003), "Understanding dynamic capabilities", *Strategic Management Journal*, Vol. 24 No. 10, pp. 991-995.
- Wright R.E., Palmer J.C. and Perkins, D. (2005), "Types of product innovations and small business performance in hostile and benign environments", *Journal of Small Business Strategy*, Vol. 15 No. 2, pp. 33-44.
- Wu, H., Chen, J. and Jiao, H., (2016), "Dynamic capabilities as a mediator linking international diversification and innovation performance of firms in an emerging economy", *Journal of Business Research*, Vol. 69, No. 8, pp. 2678-2686.
- Yam, R., Lo, W., Tang, E. P., and Lau, A. K. (2011), "Analysis of sources of innovation, technological innovation capabilities, and performance: An empirical study of Hong Kong manufacturing industries", *Research Policy*, Vol. 40 No. 3, pp. 391-402.

Appendix A Data collection tool and indicator loadings

Table A.1 Constructs and corresponding indicators with their loadings

Constructs / indicators	Loading
<i>Chain innovation</i>	
We have employed new mechanisms for sourcing our input materials and services.	0.839
We have found creative ways to improve the efficiency of our supply chain.	0.883
We have introduced new procurement methods in our supply chain.	0.901

Constructs / indicators	Loading
<i>Channel innovation</i>	
We have created new ways to manage our direct and indirect channels of distribution.	0.928
We have created new self-service distribution channels.	0.821
We have changed the role of the intermediaries we use in our channels.	0.863
<i>Network-oriented innovation (higher-order component)</i>	
We have employed new mechanisms for sourcing our input materials and services.	0.778
We have found creative ways to improve the efficiency of our supply chain.	0.733
We have introduced new procurement methods in our supply chain.	0.813
We have created new ways to manage our direct and indirect channels of distribution.	0.837
We have created new self-service distribution channels.	0.722
We have changed the role of the intermediaries we use in our channels.	0.753
<i>Communication innovation</i>	
We lead our competitors in new ways to promote our products and services.	0.889
We are recognized for the creative ways we have developed our brands.	0.859
Our products and brands are positioned in a way that clearly differentiates them from competitors.	0.888
<i>Interaction innovation</i>	
Compared to our closest competitors, we have created a better customer experience at every stage in the buying cycle.	0.902
We lead our competitors in managing customer interactions with our company.	0.918
We have created a single face for interacting with customers through different channels.	0.927
<i>Relationship innovation</i>	
We have successfully identified new customer segments.	0.884
We have found creative ways of segmenting our customers.	0.905
We successfully serve customer needs that our competitors have not identified.	0.882

Table A.1 Constructs and corresponding indicators with their loadings - continued

Constructs / indicators	Loading
<i>Customer-oriented innovation (higher-order component)</i>	
We lead our competitors in new ways to promote our products and services.	0.774
We are recognized for the creative ways we have developed our brands.	0.768
Our products and brands are positioned in a way that clearly differentiates them from competitors.	0.778
Compared to our closest competitors, we have created a better customer experience at every stage in the buying cycle.	0.752
We lead our competitors in managing customer interactions with our company.	0.791
We have created a single face for interacting with customers through different channels.	0.771
We have successfully identified new customer segments.	0.762

We have found creative ways of segmenting our customers.	0.749
We successfully serve customer needs that our competitors have not identified.	0.751
<i>Management innovation</i>	
We have implemented new management practices to improve organizational efficiency.	0.877
Compared to our closest competitors, our organizational design allows us to respond more quickly to new opportunities and threats.	0.823
We have introduced new methods of organizing work responsibilities.	0.893
<i>Process innovation</i>	
We have restructured internal business processes to significantly reduce operating costs.	0.903
We lead our competitors in improving the efficiency of our internal business processes.	0.853
We have changed our internal operating processes in the past three years.	0.858
<i>Operations-oriented innovation (higher-order component)</i>	
We have implemented new management practices to improve organizational efficiency.	0.738
Compared to our closest competitors, our organizational design allows us to respond more quickly to new opportunities and threats.	0.798
We have introduced new methods of organizing work responsibilities.	0.809
We have restructured internal business processes to significantly reduce operating costs.	0.812
We lead our competitors in improving the efficiency of our internal business processes.	0.758
We have changed our internal operating processes in the past three years.	0.750
<i>Platform innovation</i>	
We have found new ways to use common sets of technologies to develop our products and services.	0.858
Our shared platform allows us to introduce new products and services faster than our competitors.	0.901
Our shared platform gives us significant cost advantage in developing new products and services.	0.871
We have created proprietary platforms to sustain our competitive advantage.	0.859

Table A.1 Constructs and corresponding indicators with their loadings - continued

Constructs / indicators	Loading
<i>Solution innovation</i>	
We have combined products and services to create integrated solutions for our customers.	0.815
We lead our closest competitors in creating integrated solutions for our customers.	0.883
We provide an entire solution for the end-to-end problems of our customers.	0.861
We lead our competitors in offering customized solutions for customers.	0.892
<i>Offering-oriented innovation (higher-order component)</i>	
We have found new ways to use common sets of technologies to develop our products and services.	0.728
Our shared platform allows us to introduce new products and services faster than our	0.814

competitors.	
Our shared platform gives us significant cost advantage in developing new products and services.	0.793
We have created proprietary platforms to sustain our competitive advantage.	0.732
We have combined products and services to create integrated solutions for our customers.	0.725
We lead our closest competitors in creating integrated solutions for our customers.	0.807
We provide an entire solution for the end-to-end problems of our customers.	0.743
We lead our competitors in offering customized solutions for customers.	0.805
<hr/>	
<i>Profitability</i>	
Profitability	0.861
Return on sales	0.930
<hr/>	
<i>Performance</i>	
The overall performance of the business met expectations last year.	0.886
The overall performance of the business last year exceeded that of our major competitors.	0.819
Top management was very satisfied with the overall performance of the business last year.	0.940
<hr/>	
<i>Growth</i>	
Market share growth	0.947
Sales growth in existing markets	0.931
New customer acquisition	0.941
<hr/>	