

Information and communication technologies as development tools for second-tier cooperatives

ADORACIÓN MOZAS-MORAL*, ENRIQUE BERNAL-JURADO**,
DOMINGO FERNÁNDEZ-UCLÉS*, MIGUEL JESÚS MEDINA-VIRUEL***

DOI: 10.30682/nm2004e

JEL codes: M15; O32; Q13

Abstract

The Spanish olive oil sector is the world leader in terms of olive oil production. This sector primarily comprises companies in the social economy, especially cooperatives, which account for more than 75% of production. The emergence of second-tier cooperatives has enabled the implementation of one of the recurring recommendations by scholars, namely enhancing the commercialization of olive oil through greater concentration and integration of supply. This improved commercialization is made possible in part by the greater capacity of these companies to invest in information and communication technologies (ICTs) and human capital specialized in managing these ICTs. The use of the Internet gives these companies access to a market of unparalleled dimensions. In light of this situation, this study examines the factors that explain a higher level of online sales activity by these firms. To do so, fuzzy-set qualitative comparative analysis (fsQCA) is used. The results show that age, size, the management's ICT training, social network activity, and outsourced ICT management are associated with greater online sales of olive oil by second-tier cooperatives.

Keywords: Olive oil, Second-tier cooperatives, Information and communication technologies (ICTs), fsQCA.

1. Introduction

The olive grove is a true native crop of the Mediterranean basin. The principal produce of olive groves consists of olive oil and table olives, which are staples of the Mediterranean diet. Global olive oil production is experiencing continued growth, linked not only to a steady increase in olive grove surface area but also to an increase in the area of irrigated land and to

the introduction of improvements in technology (Parras *et al.*, 2013). On the demand side, although the benefits and attributes of olive oil are driving consumption of this product, olive oil represents only 4% of total consumption of oils and fats worldwide (Vilar and Cárdenas, 2016). This sector is nonetheless strategic because of its major role in the agricultural sector of the main olive-oil-producing countries. However, there is

* Department of Business Organization, Marketing and Sociology, University of Jaén (Spain).

** Department of Economics, University of Jaén (Spain).

*** Department of Statistics, Econometrics, Operational Research, Business Organization and Applied Economics, University of Cordoba (Spain).

Corresponding author: dfucles@ujaen.es

still much to improve to increase the profitability of this sector, which faces serious commercial problems on account of its lack of orientation to the end market. The predominant sales format among producers is bulk sales, which has prevented them from capturing a large amount of the additional value created by the commercialization of bottled oil.

The tools that have emerged under the umbrella concept of the Internet, together with these technologies' growing penetration in society, have changed the rules of the market. The sheer scope of the Internet today and the changes that the Internet has driven in consumer habits are phenomena that have not gone unnoticed by organizations (Martín *et al.*, 2019). Information and communication technologies (ICTs) provide organizations with numerous advantages, including streamlining business activities, allowing better coordination of an organization's human resources, and encouraging communication and learning (Vázquez *et al.*, 2019). However, commerce is where the effects of ICTs have been most noticeable and where ICTs can help organizational development the most (Kaplan and Haenlein, 2010; Mozas *et al.*, 2016). Indeed, the costs of information, negotiation, and guarantees have been slashed by the use of ICTs, enabling firms to provide consumers with a more economical, personalized, and streamlined service (Karoui *et al.*, 2015; Stephen and Toubia, 2010).

The Spanish olive oil sector primarily comprises companies from the social economy, particularly cooperatives, which make up 75% of production. Despite this leading role, the main problem for virgin olive oil producers has been for years their distance from the end market. However, the rapid and profound changes that are occurring around this sector, including the disappearance of intervention mechanisms as a result of reforms to the Common Agricultural Policy, increasing foreign competition, and the dominance of the major distributors, mean that it is becoming increasingly necessary to leave this passive attitude behind. The literature shows the importance of following a path that is oriented toward the end market to make this activity profitable. The emergence of second-tier cooperatives enables the implementation of one

of the recommendations by scholars of this area, namely improving the commercialization of this product through concentration and integration (i.e., by strengthening the business side of this sector).

Given this background, this study aims to identify the factors that explain higher online sales by oil producers. Fuzzy-set qualitative comparative analysis (fsQCA) is used to do so. This paper has the following structure. Following this introduction, the contextual framework is established, and the propositions of the study are presented. Next, the technical characteristics of the study are described in the method section. Following this, the results are presented. Finally, the conclusions of the study are discussed.

2. Theoretical framework

2.1. State of play in the olive sector

Throughout this section we will analyze the olive sector and the main problems it faces. In addition, we will study the cooperative sector as the main producer of olive oil in Spain and how ICTs have helped to reduce organizational and commercial problems, as well as to improve this sector's competitiveness.

Undoubtedly, one of the biggest events that have occurred in the olive oil sector worldwide is the increase in production (Parras *et al.*, 2013). In this sense and according to data from the International Olive Oil Council (IOC, 2019c; 2019d), if we compare the 1990/91 campaign where 1,453,000 tons were produced with the 2018/19 campaign where 3,131,000 tons have been produced worldwide, we will conclude that production has doubled and that the forecasts for the future show a constant increase. If we focus on the analysis of the countries responsible for this increase, we can say that traditionally, olive cultivation for oil production was located in the countries of the Mediterranean basin, but there are more and more territories that, without having an olive growing tradition, are acquiring greater importance (Mozas *et al.*, 2015).

According to Vilar and Cárdenas (2016), the number of hectares destined to the cultivation of oils and fats in the world amounts to

231,000,000, which is 26% of the total arable land in the world, of which 11,316,000 hectares are used exclusively for the cultivation of 1,500 million olive trees (72% are mountain and hill), located mainly in the Mediterranean basin (79%). Annually, there is an increase in the surface area of olive groves that represents 1% per year (between 34 and 45 million seedlings, which means 154,000 new hectares) (Vilar and Cárdenas, 2016).

On the other hand, and focusing on consumption, according to information provided by the IOC (2019a; 2019b) the growth trend stands out, in parallel with the evolution described for production. Secondly, the data show that it is, above all, the greater demand for this product in traditionally non-consuming countries that justifies this trend. In this sense it should be noted that if production was located basically in the Mediterranean basin, in consumption countries are diversifying. The most important, after Spain and Italy, is the United States with consumption of more than 10.6% of production in the 2018/19 season. The first four countries account for 50.8% of world consumption and the first 10 countries for 70.7%. Some of these countries have shown very significant annual increases, such as Brazil, Japan, China, Australia and Canada, making them strategic markets.

Exports are not only necessary but also essential, especially for Spain (the leading producer) where an average of around 500,000 tons has been consumed in recent years but 1,500,000 tons are produced. ICTs have positioned themselves as tools that help companies in the export process (Bernal *et al.*, 2019). These tools enable companies to compete in a wider market, at a lower cost and with greater commercial possibilities, being one of the most important options to increase the profitability of productive resources and, therefore, improve their economic results (Medina *et al.*, 2016).

On the other hand, it should be noted that in three of the main European producing countries (Spain, Italy and Greece), consumption has been reduced by 425,000 tons from the 2000/01 to the 2018/19 season (IOC, 2019b). In fact, in the 2000/01 marketing year, consumption in these three countries as a whole reached

1,579,800 tons, with consumption per country being 580,800 tons for Spain; 729,000 tons for Italy; and 277,000 tons for Greece. However, in the 2018/19 season consumption in these three countries fell to 1,155,000 tons. Consumption in the 2018/19 marketing year has been distributed as follows: Spain with 525,000 tons, Italy with 500,000 tons and Greece with 130,000 tons.

Increasing domestic consumption, especially in the main producing countries, is a strategy that must be carried out by producing and marketing companies. In this sense, ICTs play a fundamental role. We refer to the communication of the health benefits of olive oil consumption throughout life. The literature shows that ICTs are very powerful communication tools that are capable of transmitting information to the point of becoming viral (Medina *et al.*, 2016). This turns these platforms into particularly attractive sales channels for sectors such as the agro-food or the ecological sector, which have traditionally faced important commercial deficiencies related mainly to the scarcity of information and points of sale in the market (Fernández *et al.*, 2020).

Quality oils are preferred in international markets, since three quarters of what is exported are virgin olive oils and organic oils, products that fetch higher prices in foreign markets. In this respect, it should be noted that Spain is the main producer and exporter of organic olive oils in the world (Willer and Lernoud, 2019). In these products the use of ICTs is particularly relevant. This is because they are “experiential” agricultural products, in which the presence of elements that facilitate an intensive exchange of information, with respect to tangible and especially intangible aspects (symbols, tradition, culture, tourism or gastronomy, among others) can significantly enhance the perceived value of the product by the consumer (Stricker *et al.*, 2007). In the organic olive sector, which faces significant commercial problems related to the shortage of points of sale or consumer misinformation (Tsakiridou *et al.*, 2008), these shortcomings can be resolved by the use of ICTs (Fernández *et al.*, 2020).

On the other hand, production and consumption at a global level have a growing trend, so we can say that there is a certain link between production and consumption at an international

level. The data analyzed allows us to state that we are facing a thriving sector at the global level, with great potential for growth, backed by a quality product and beneficial to health, with the support of institutions and governments (Mozas *et al.*, 2015).

However, if the focus is on Spain, the situation is quite different (Mozas *et al.*, 2015). In the national market supply far exceeds demand, resulting in significant surpluses, which cause many problems at the national and international level (Mozas, 1999):

- The first of these is the fierce competition presented by the internal market. In fact, the existence of a large number of producers (more than 1,800 competing all in the same market), and few distributors, means that the bargaining power is in the distribution, so that the distributors impose the prices.
- The lack of integration in the producing companies, mainly cooperatives, causes the distribution sector to acquire the bargaining power.
- There are many private labels in distribution. In Spain, almost 70% of olive oil is sold under private labels (Alimarket, 2019), which means that the producer companies' own brands do not have a great impact, except in a few exceptions.
- There is no product differentiation. In spite of being a quality product, there are no great differences depending on the producer.
- The pressure exerted by the distribution and use of olive oil as a claim product (hook products, being a product of daily use) means that prices are low. In fact, in order to exercise greater control some distribution companies have been integrated backwards, so that they have their own production, their own oil mills and bottling plants.
- Finally, the prices generated in Spain have an international impact, with price falls that lead to a lack of profitability in the producing sector.

However, the main problem of the olive grove is the lack of profitability. Greater economic efficiency or greater differentiation in the perfor-

mance of activities in the value chain is what Porter (1985; 1990) indicated as competitiveness. Specifically, he indicated that “competitive advantage derives from the way in which firms organize and carry out discrete activities. In order to gain competitive advantage over its rivals, a firm must offer comparable value to the buyer, but carry out the activities more efficiently than its buyers (lower cost) or carry out the activities in a particular way that creates greater value for the buyer and leads to a premium (differentiation).”

In olive oils there is no differentiation from one producer to another and this is used by the large distributors to increase their bargaining power vis-à-vis the producers. The prices offered by the distribution to the producers are minimal, in many cases not even covering the production costs.

Miller and Jones (2010) indicated that a chain is only as strong as its weakest link and, therefore, the stronger the links, the safer the flow of products and services within the chain. In this sense, referring to the agricultural value chain of olive oils in Spain, the literature shows that the producing sector is the weakest link. There are several reasons that help us to justify this statement, although the main reason is the lack of concentration of the producing sector (about 1,800 producers only in Spain) that face the 7 main distributors in the Spanish market (Mercadona, Carrefour, Lidl, Día, Eroski, Auchan-Alcampo and El Corte Inglés) that according to the Alimarket report (2019) sell almost 70% of the oil in Spain under their own brands, highlighting, among them, Mercadona where 1 out of every 3 litres of oil bought by Spanish consumers is sold.

The producers, mainly cooperatives, began processes of business integration, giving rise to second grade cooperatives, as a means of trying to reduce the structural problems they had due to their small size. According to Mozas and Guzmán (2017), integration in the olive grove sector has led to a total degree of corporate integration in the Spanish olive grove sector of 27.47%, which means that there are still 1,305 marketing companies, compared to 7 companies that practically dominate distribution, so

that the total production volume managed in an integrated manner reached only 30% in 2017.

Despite the fact that the degree of concentration is 30%, this has been generated mainly by cooperative societies, creating second degree cooperatives that have incorporated professionalization and innovation in the agricultural, processing and marketing activity.

For years, many researchers have been committed to vertical integration and concentration as a way of strengthening these organizations and ensuring their survival (Vargas, 1995; Carrasco and Garrido, 1991; Martínez, 1990; Juliá, 1993; Bel Durán, 1996; Mozas, 1999; Torres *et al.*, 2000; Parras *et al.*, 2013). The existing second degree cooperatives in the sector have shown that integration makes possible:

- a higher degree of professionalization due to the differentiation of activities and the need for more specialized training among their staff;
- possibilities for further innovation through joint investments in the incorporation of new technologies;
- increased access to international markets;
- the achievement of economies of scale and scope;
- the reduction of risks as a result of business cooperation.

These companies have learned what nations have always known: “in a complex and uncertain world full of dangerous opponents, it is better not to go it alone” (Ohmae, 1989). Agricultural producers must respond to the challenge of meeting demands for higher quality products at competitive prices and obtaining greater competition in volatile markets. In order to be more competitive, agricultural products need to develop their value-added potential, whether through improving the quality of primary agricultural production or through processing and manufacturing before export (Islam and Xayavong, 2010). The use of tools that provide them with competitive advantages such as ICTs should not be forgotten. The theory of transaction costs explains the potential of ICTs in enterprises, providing multiple benefits in organizational performance and in the reduction of the different

types of costs that arise in the development of a transaction (Fernández *et al.*, 2016).

2.2. Propositions

Some characteristics of top managers have been frequently cited as determinants of business success (Medina *et al.*, 2016). Multiple studies have reported the top manager’s training as a determinant of an organization’s economic efficiency (Levie and Autio, 2011) because it can encourage a commitment to innovation and the implementation of more efficient organizational practices (Mozas *et al.*, 2016). Similarly, specific ICT training of the top manager is important for organizations to embrace these tools and improve their business performance (Nguyen and Barrett, 2006; Mozas *et al.*, 2018). This relationship owes to the fact that managers with ICT training are more aware of the importance of ICTs and dedicate more efforts to the proper use of these technologies and a commitment to innovation, all of which contributes to improving the firm’s economic efficiency (Kim and Jee, 2007). Based on these arguments, the following proposition may be formulated:

Proposition 1. The top manager’s ICT training boosts the organization’s online sales

The theories of economies of scale and economies of scope highlight the importance of organizational size when performing operational functions as efficiently as possible (Schneider, 2004). Numerous authors have defended the existence of positive relationships between efficiency and business size and between innovation and business size (Voulgaris and Lemonakis, 2013). In addition, studies in agricultural sectors have shown that organizational size is an explanatory factor of greater profitability (Castillo and García, 2013). The predominant organizational structure in the olive oil sector is that of the cooperative, and size plays a particularly prominent role in the grasping of opportunities in the environment based on criteria of profitability, innovation adoption, and efficiency (Gorgues *et al.*, 2019; Moyano and Fidalgo, 2001). Based on these arguments, the following proposition may be formulated:

Proposition 2. Organizational size in terms of the number of members affects the percentage of online sales

In the literature, there is a certain degree of controversy regarding the relationship between the age of an organization and its degree of innovation (Rowley *et al.*, 2016). One stream suggests that the age of the organization can be considered a trigger of its innovative activity (Díaz Díaz *et al.*, 2006). According to this view, when an organization adopts a certain technology, this starts a process of learning that leads to more effective exploitation of this technology (Fagerberg *et al.*, 2005). In the olive oil sector, previous research would suggest that there is a positive relationship between age and efficient use of technology (Mozas *et al.* 2016). This relationship owes to the experience that has been acquired: older firms have developed skills and competencies that improve their organizational performance (Bierly and Daly, 2007). Based on these arguments, the following proposition may be formulated:

Proposition 3. Older firms have a higher percentage of online sales

ICTs have the capacity to reduce transaction costs, improving the efficiency of a business's actions throughout the value chain (Evans and Wurster, 1997). Numerous studies concur that the degree of innovation, as well as a commitment to ICTs, improves productivity and organizational performance (Mozas *et al.*, 2016). Thus, the use of online social networks as a communication channel and relational marketing strategy improves organizational competitiveness and therefore increases the renown and performance of the firm (Wei *et al.*, 2013). These results occur, particularly when there is a strong focus on these online networks (Bernal *et al.*, 2019). Thus, firms with a commitment to these virtual platforms should achieve better commercial performance and increase their competitiveness (Jorge-Vázquez *et al.*, 2019). Based on these arguments, the following proposition may be formulated:

Proposition 4. The use of social networks boosts an organization's online sales

The internal management of innovation is considered an important factor for organizational development and for achieving competitive advantages (Gray, 2006). The presence of staff who are well trained and highly qualified at managing different applications offered by the Internet enables the efficient use and exploitation of these applications (Peansupap and Walker, 2006). Olive oil organizations, however, tend to lack internal staff who are trained and qualified ad hoc to manage these technologies (Fernández *et al.*, 2016). In such cases, scholars such as He *et al.* (2017) have suggested that outsourcing these functions is the best way of achieving better performance. Based on these arguments, the following proposition may be formulated:

Proposition 5. External management of ICTs increases the percentage of online sales

3. Population and method

Spain has approximately 40 organizations that are either second-tier cooperatives or business groups that market olive oil from the group of oil mills they represent. These are the largest vendors of olive oil and account for approximately one third of national olive oil production. Second-tier cooperatives make up the population of the study. A structured telephone survey was conducted, targeting the managers of each of these 35 entities (total population). Of these 35 entities, 27 responded, giving a response rate of 77.1%. The organizations represent 444 entities. These entities have more than 165,000 individual members, a combined turnover of more than 2 billion Euros, and more than 2,500 employees. Details of the fieldwork appear in Table 1.

Qualitative Comparative Analysis (QCA) was employed as the data analysis method in this study. Specifically, fuzzy-set Qualitative Comparative Analysis (fsQCA) was used to establish the technology-related and organizational conditions that, when combined, are associated with greater efficiency. QCA methodology, which is based on Boolean algebra, combines verbal, conceptual, and mathematical language, making it both qualitative and quantitative and lending it some of the advantages of both of these methodologi-

Table 1 - Details of the fieldwork.

<i>Fieldwork characteristic</i>	<i>Details</i>
Universe	Second-tier cooperatives that make and market olive oil
Geographical scope	Spain
Data collection period	July to December 2018
Size of universe	35 organizations
Participant organizations	27 organizations
Response rate	77.1%

Source: Compiled by the authors.

cal streams (Ragin, 1987). By applying QCA, it is possible to systematically analyze a data set to identify the causal patterns, in the form of relationships of necessity and sufficiency, between a set of conditions and an outcome of interest (Schneider and Wagemann, 2010). One of the advantages of this method versus regression analysis is that it can be used to establish links between subsets of conditions to explain relationships. FsQCA is one of the most widely used variants of QCA because it overcomes one of the main drawbacks and criticisms of the earliest form of QCA (crisp-set qualitative comparative analysis), namely its strictly dichotomous approach (Sehring *et al.*, 2013).

FsQCA provides one or more *antecedent combinations* that are sufficient for a given outcome to occur. For example, $X_1 * \sim X_2 * X_3$ may be sufficient to produce the outcome Y. Adopting the standard notation for this technique, this result would be expressed as $(X_1 * \sim X_2 * X_3 \rightarrow Y)$, where X_1 , X_2 , and X_3 are antecedents; Y is the outcome of interest; * denotes the union of two or more conditions; and \sim denotes the absence or negation of a condition, in this case equal to the opposite value of X_2 (i.e., $1 - X_2$).

The fsQCA technique was originally developed for small samples or populations (Ragin, 1987). Therefore, the fact that the sample universe for this study was small was not a drawback. To correctly apply this technique, the stages recommended in the literature should be followed. The first is the calibration of variables. The second is the analysis of necessity. The third is the analysis of sufficiency.

We first calibrated the variables. Next, we performed analysis of necessary conditions based on the consistency values for each condition. The aim was to verify that none of these values exceeded the recommended threshold of 0.9, established by Ragin (2006). This situation was corroborated by the results.

The outcome (analogous to the dependent variable in regression analysis) in this study was the percentage of online sales. The conditions (analogous to independent variables) were age of the firm, the management's ICT training, organizational size (measured as the number of members of the organization), the presence and use of online social networks, and the need for outsourced professional ICT management or support. Table 2 displays this information. Table 2 also shows the type of variable (continuous, categorical, or dichotomous) and the way in which each categorical variable was calibrated.

Table 2 - Variables used in the fsQCA.

<i>Outcome</i>	<i>Description</i>	
Percentage of online sales	Online sales as a percentage of total sales	Continuous variable*
<i>Condition</i>	<i>Description</i>	
osn	Use of online social networks	Dichotomous variable ¹
age	Age of organization	Continuous variable*
size	Number of members of the organization	Continuous variable*
ict.training	Top manager's ICT training	Categorical variable ²
ict.outsourcing	Outsourcing of ICT management	Dichotomous variable ³

Source: Compiled by the authors.

*Continuous variables were calibrated using fsQCA 2.0 software.

¹ Dichotomous variable (1: use of online social networks; 0: no use of online social networks).

² Categorical variable with four levels (0.01: no knowledge; 0.33: user level; 0.67: intermediate level; 0.99: advanced level). Calibrated as per Rihoux and Ragin (2009).

³ Dichotomous variable (1: outsourced ICT management; 0: no outsourced ICT management).

4. Results and discussion

By way of preliminary analysis in this study, Table 3 presents the descriptive statistics (means) for the variables considered in the analysis.

Table 3 - Descriptive statistics for the variables used in this study.

<i>Variable</i>	<i>Mean</i>
Online sales as a percentage of total sales	1.30%
Percentage of organizations that use social networks	62.96%
Age of the organization	27 years
Number of individual members of the organization	6,135 members
Top manager’s ICT training	18.51% high 74.07% moderate 7.40% low
Percentage of organizations with outsourced ICT management	33.33% internal management 48.15% internal management with outsourced support 18.52% outsourced management

Source: Compiled by the authors.

The population comprises firms with a low percentage of online sales, despite their extensive presence on online social networks. E-commerce opens the door to a huge market, which organizations should consider in their commitment to competitiveness, especially cooperative

societies (Jorge-Vázquez *et al.*, 2019). For their online business activities, these organizations primarily rely on internal management with support from external specialists. The top managers have ICT training that they themselves class as moderate. These firms have considerable experience and, on average, have more than 6,000 members. The integration and size of cooperatives have been considered clear development factors in the literature (Gorgues *et al.*, 2019).

The analysis presented below aims at identifying which of the previously discussed factors are positively related to the percentage of online sales of these companies. The results of the fsQCA appear in Table 4, which presents the intermediate solution, showing the causal configurations ordered by their raw coverage.

The results indicate that the first configuration has a raw coverage of 37%. The results also indicate that the age of the organization, the top management’s ICT training, the use of online social networks, and external ICT management or support are conditions that, when combined, explain a high percentage of online sales. The top organizational manager is a key figure in the commitment to innovation (Mozas *et al.*, 2016). The outsourcing of ICT to professionals and the use of virtual social networks, as a means of loyalty, explain higher online sales (Bernal *et al.*, 2019). Similarly, the second causal configuration consists of the use of online social networks, the top management’s ICT training, the external management of ICT tools, and organizational size. Literature shows that there are positive relationships between innovation and

Table 4 - Results of the fsQCA.

<i>Causal configuration</i>	<i>Raw coverage</i>	<i>Unique coverage</i>	<i>Consistency</i>
age* ict.training*osn*ict.outsourcing	0.375967	0.062463	1.000000
size* ict.training*osn*ict.outsourcing	0.359310	0.045806	0.964856
~age*~ ict.training*~osn*~ict.outsourcing	0.198691	0.198691	0.869792
~size*~age*ict.training*~osn*ict.outsourcing	0.032124	0.032124	0.900000
Model coverage	0.652588		
Model consistency	0.933617		

Source: Compiled by the authors.

company size (Voulgaris and Lemonakis, 2013). This combination of conditions explains a high percentage of online sales, with a raw coverage of 35.9%. This model has a total coverage of 65.26%, which denotes the percentage of organizations explained by the conditions used in the analysis. The total consistency is 93.36% of the cases. This value comfortably exceeds the minimum recommended consistency of 0.74, which supports the validity of the model (Ragin, 2008; Woodside, 2013).

These results provide empirical evidence that enables acceptance of the five propositions formulated earlier. Thus, the conditions of age, size, the management's ICT training, participation in online social networks, and outsourced ICT management positively influence firms' tendency to participate actively in e-commerce through online sales. In view of the results obtained, this study should serve as encouragement to olive oil agri-food cooperatives, and the olive oil agri-food industry in general. It has become increasingly clear that the incorporation of these technologies into the olive oil sector is a decisive competitive factor in ensuring the survival and profitability of companies and in tackling the challenges posed by this new digital era (Bernal *et al.*, 2019). In short, agri-food companies have an obligation to adapt to the technological revolution in order to compete successfully in the market (Gaiani, 2008).

5. Conclusions

The greater competitiveness generated by the increase in olive oil production at world level and the structural deficiencies of the Spanish olive sector (lack of integration in the olive grove, small organizational structures, lack of professionalization, low profitability and low bargaining power vis-à-vis distribution) have led a large group of cooperative societies to create second-degree cooperative societies from which carry out, jointly, the marketing of their products in order to achieve greater profitability.

Based on the proposed objective, consisting of analysing Spanish second-degree olive-growing entities in terms of their participation in e-commerce, the results obtained through the fsQCA

analysis have made possible to identify a series of structural and organizational variables that explain a greater participation in e-commerce through online sales. In this way, the hypotheses put forward in the theoretical framework are accepted, which indicates that the ICT training of management, the age of the company, the presence and use of virtual social networks and the size of the organisation (measured by the number of members of the organisation and external ICT management) are factors which together have a relevant explanatory capacity for the level of online sales in organisations.

The results have been obtained from the total population of second degree olive cooperatives, and not from a sample, so they are representative of the reality under study. According to the literature analysed, integration favours the professionalisation of companies. On the other hand, in the study carried out it has been shown that the training in ICT of the company head favours the online sales of the organization. All this suggests the need to achieve greater integration in the sector that favours investment in ICT training, both for their managers and for the rest of their employees. The increase in e-commerce is a reality in all countries and companies need to have human capital capable of using ICTs, especially in the commercial field. However, this study shows that the external management of ICTs increases the percentage of online sales. This can be explained by the shortage of ICT professionals in the commercial field specialising in specific sectors, such as the olive grove, and the lack of this type of professional in the small organisational structures, which leads them inexorably to outsourcing. However, we believe that in the future the internal management of ICTs should be adopted as a priority and even more so if the increase in business size allows greater investment in specialised human capital. This investment in ICT training will be essential in an increasingly digitalised future.

Achieving greater integration must also be a future business strategy. It has been shown that the size of the organisation affects the percentage of its sales that are made online. Creating synergies between second grade cooperatives, either by creating third grade structures or by

generating agreements with other companies, cooperatives or non-cooperatives in the olive sector, would improve marketing and further level out the negotiating power in the sector now in the hands of distribution.

The capacity of ICTs to reduce transaction costs and improve efficiency in companies along the value chain is a reality. If we refer to the commercial area, it is known that the use of virtual social networks as a communication channel and a relationship marketing strategy improve competitiveness. This study shows that its use improves online sales, so the achievement of greater popularity and presence in the networks should be established as goals to be achieved.

This research opens up a huge field of work for future research. Within it we can highlight the following: to deepen the study of which structural and organizational variables favor market orientation through virtual social networks or other ICT applications and to determine whether this explanatory model coincides with other agri-food subsectors.

The objective of this research was to analyze Spanish second-tier olive oil producers in terms of their participation in e-commerce. The results of the study, which were obtained using fsQCA, enables identification of a series of structural and organizational conditions that explain a higher level of participation in e-commerce through online sales. Accordingly, the propositions formulated in the theoretical framework are accepted. These propositions posit that the management's ICT training, the age of the firm, the presence and use of online social networks, the size of the organization (in terms of number of members), and external ICT management are factors that, when combined, have considerable explanatory capacity for organizations with a higher percentage of online sales.

The results of this study were obtained by analyzing data on the total population of second-tier olive oil cooperatives. They therefore offer meaningful insight. Accordingly, these results should encourage these firms to invest in ICT training for both managers and other employees and in establishing a stronger social network presence. These are key factors in the design and implementation of expansion or diversification strategies with regard to online business. At the same time, the positive relationship between size and the percentage

of online sales provides another argument to support greater integration of the olive oil sector in an attempt to tackle the commercial problems that have plagued this sector for decades.

This study opens a vast field of research that may be exploited by future studies. Potential opportunities include furthering the study of the structural and organizational variables that encourage a market orientation through online social networks and other ICT applications and studying whether this explanatory model might be applicable in other agri-food sectors.

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