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A novel view on knowledge sharing in the agri-food sector

Monica Fait, Paola Scorrano, Giovanni Mastroleo, Valentina Cillo and Veronica Scuotto

Abstract

Purpose – Nowadays, the agri-food sector is facing several challenges due to a rapid technological change which calls for knowledge sharing (KS) practices to enhance businesses' performance. This has spurred a collaborative approach and the creation of networks. Since there still is a paucity of research on the quality degree of KS, the purpose of this study is to offer an empirical research on the quality degree of KS by exploring outcome expectations and social exchange dimensions. Theoretically, it is examined by a double lens of social capital and social cognitive theory.

Design/methodology/approach – This study offers an empirical analysis of 313 directors of 11 "consortia" in the agri-food sector in Italy by using the fuzzy expert system. The model allows to aggregate multi criteria dimensions of KS and rates its quality.

Findings – As resulted, the quality degree of KS is influenced by outcome expectations – personal and community expectations – and three forms of dimensions of social exchange: structural, relational and cognitive. The paper ends with a discussion of research findings, its limitations and implications.

Originality/value – As there is still a paucity of research on the determinants of quality degree of KS, the research adopts a double lens of social capital and social cognitive theories to explore what are these determinants.

Keywords Knowledge sharing, Social cognitive theory, Social capital theory, Fuzzy expert system

Paper type Research paper

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1. Introduction

The agri-food sector today is facing challenges driven by climate change, rapid technological innovation and new demands for sustainability, transparency and traceability (Hockmann and Pieniadz, 2007; Tripoli and Schmidhuber, 2018). These forces manifest themselves through greater volatility, complexity and control throughout the value chain.

To face up these challenges, a greater collaboration and cooperation between the various actors in the value chain is needed. The scope and structure of this collaboration is a very important strategic decision based on the fact that the value chain in the agri-food sector is characterized by a flow of information exchanged within the company along with suppliers and customers (Christopher, 1998). Moreover, due to the lower innovation-absorption capabilities and to the limited resources for in-house RandD, companies need to develop a broad network of partners which can give them scientific and technological inputs (Knudsen, 2007; Dezi *et al.*, 2018). This is the reason why nowadays information and communication technologies allow a fast and worldwide data and information, and associate a pivotal role to knowledge sharing (KS) practices within a company (Lin, 2007; Sáenz *et al.*, 2009; Pee, 2018). As Wehn and Montalvo (2018, p. 1) stated KS "is based on personal interactions and common actions to achieve specific goals and results. These interactions present potential bottlenecks in the knowledge transfer process due to different behavioral (and possibly conflicting) goals and expected outcomes, (dis) incentives and skills that have not been sufficiently explored".

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KS thus is considered a process of social interactions that involves individuals' knowledge, experiences and skills. It implies the creation of new knowledge (van den Hooff and de Ridder, 2004) which helps organizations to identify best practices, promotes new ideas and organizational learning (Pulakos *et al.*, 2003; Cummings, 2004) and shares companies' achievements (Dyer and Nobeoka, 2000). This has developed a great research interest, stimulating studies on the concept of knowledge-sharing (Bock and Kim, 2001; Gagné, 2009; Zhang and Jiang, 2015; Holdt Christensen, 2007), KS behaviour (Bock *et al.*, 2005; Hsu *et al.*, 2007; Lin, 2007), media and means for KS (Hendriks, 1999; Chow and Chan, 2008; Van den Hooff and Huysman, 2009; Paroutis and Al Saleh, 2009), barriers to KS (Ardichvili *et al.*, 2003; McDermott and O'Dell, 2001) and KS and transferring within organizational units and/or between interorganizational networks by the use of new technologies (Argote, 1999; Alavi and Leidner, 2001; Argote *et al.*, 2003).

Lee and Al-Hawamdeh (2002) and Chiu *et al.* (2006) studied the relationship between the individual factors and KS emphasizing the importance of the quality of KS. In fact, the high quality of knowledge shared improves individual performance and, consequently, enhances business performance (Van den Brink, 2003).

According to Chiu *et al.* (2006), McKinney *et al.* (2002) and DeLone and McLean (2003), KS quality is closely related to relevancy, easy to understand, accuracy, completeness, reliability and timeliness of shared information which are connected with individual factors such as personality, trust and awareness.

Notwithstanding such contributions, there is still a need to explore the determinants of social exchange and their effect on the degree of quality of KS.

On the lens of social capital theory (Nahapiet and Ghoshal, 1998) and social cognitive theory (Chiu *et al.*, 2006; Quigley *et al.*, 2007), we thus examine if the quality degree of KS is influenced by outcome expectations – personal and community expectations (CE) – and three forms of dimensions of social exchange: structural, relational and cognitive.

The aggregation of these multi-criteria dimensions is made via the fuzzy expert system (FES) approach. The FES approach is an expert system (ES) that aggregates information using a fuzzy logic to obtain a conceptual model of a multi-attribute decision support system. It provides an aggregated view of conditions and problems examined in a study. Furthermore, the architecture of the model allows to observe input variables as a flow of data that provides additional information on intermediate variables up to the final variable. In this vein, the use of this model has resulted appropriate for our research scope. In fact, it allows generating a rating for the evaluation of the degree of the quality of knowledge shared on a sample of 313 directors of companies belonging to 11 selected consortia identified in the Italian agro-food sector.

Starting from this scenario, the conceptual and empirical development of this study provides a systemic view of the pre-conditions necessary for the development of a KS strategy. This has evoked the relevance of social capital, as the ability of the individuals to understand the relevance of advantages deriving from to social interaction mechanisms and expectations emerged from KS. Such interactions among different people spur also innovations (Levinthal and March, 1993; Castaldo and Verona, 1998; Golinelli and Gatti, 2001; Di Stefano *et al.*, 2012; Del Giudice and Maggioni, 2014). In fact, the existence of a network of relationships that combines companies' cognitive assets influences the creation of a new value (Brown and Duguid, 2000; Rullani, 2010).

Hence, leveraging on social capital and social cognitive theories, the present article offers the following structure: a theoretical background on KS within a company and interorganizational networks is argued in the Section 2. Then, hypotheses are developed and examined on a sample of 11 "consortia" in the agri-food sector via the FES approach in the Section 3.

Followed by results of the empirical analysis in the section 4, which are argued in the Section 5. The paper suggests new, interesting studies in the section 5.1 and it ends with a debate on research limitations in Section 5.2.

2. Theoretical framework and hypotheses

With the advancement of knowledge economy, knowledge is identified the most crucial asset of companies (Baum *et al.*, 2000; Dyer and Nobeoka, 2000; Gupta and Govindarajan, 2000). It is a driver of a competitive advantage. This has induced the introduction of KS practices in a company's decision-making process (DMP) (Bolloju *et al.*, 2002; Litvaj and Stancekova, 2015; Abubakar *et al.*, 2017), allowing fast knowledge processing and analysis (Eisenhardt and Santos, 2002).

In this context, several authors highlight the importance of social and cognitive factors (Ibragimova *et al.*, 2012), identifying the motivations of the KS behaviour.

As the social cognitive theory suggests, human behaviour based on triadic, dynamic, and reciprocal interaction of personal factors, behaviour and the social network system. The theory is based on the assumption that individuals' learning also depends on observations of the behaviour of others. The reproduction of an observed behaviour thus influences the quality degree of the decisions made (Sherer *et al.*, 1982; Maddux, 1995; Bandura, 1977, 1986; 1989, 2001; 2002).

Such behaviour is controlled either by socio-structural factors or by personal characteristics. The socio-structural factors represent aspects of the surrounding environment that can support individuals' action (Fernández-Ballesteros *et al.*, 2002). These factors can be categorized in outcome, personal and CEs (Bandura, 1977). Especially, the outcome expectancies concern the behaviour assumed by a person who is affected by non – verbal communication and/or feelings of others. It is the result of the combination of personal expectations (PE) and CE (Bandura, 1977; Compeau and Higgins, 1995). PE and CE are characterised by variables that are potentially able to push an individual (agent) to hold and/or avoid a certain behaviour. By assuming that the agent belongs to a network of companies, the outcome expectations (personal and community) can be linked to the objectives of facilitating the competitive ability of his business (FCA), of improving the level of expertise within his company (ILE) or increasing the value of his product (IVP). As stated by Argote and Ingram (2000) and Bender and Fish (2000) to survive in a high competitive market, companies need to enhance their technical expertise and offer new products.

In a nutshell, the outcome expectations are composed of three main types of effects: physical effects (e.g. pleasure, pain, and discomfort), social effects (e.g. social recognition, monetary rewards, power, and applause) and self-evaluation effects (e.g. self-satisfaction, self-devaluation).

Besides when the OE is linked to CE, the agent exchanges knowledge with his/her network to increase and stabilize relationships among members (ISR), to facilitate the survival and strategic growth of the network of firms (FSSG) and to enhance the network's knowledge base (ECK). This has induced a long and complex interactive learning process that involves a continue interaction with multidisciplinary skilled workers and companies that produce complementary products (Du Plessis, 2007).

Therefore, these three forms of expectations (OE, PE and CE) influence the DMP of KS (Bartol and Srivastava, 2002). According to the theory of economic exchange, individuals will behave for rational personal interest; therefore, the decision to share knowledge will occur when its results outweigh the costs as expected (Constant *et al.*, 1994). This means that KS is greater when rewards are higher than costs (Constant *et al.*, 1994; Bock and Kim, 2001).

Naturally, the individual's willing is required to direct his/her actions towards certain activities such as the ability to take appropriate behaviours – known as self-regulation – and the self-evaluation of the robustness of own knowledge. These activities become more

useful if the individual is part of a group of people acting individually or jointly to pursue a common goal.

In this circumstance, it is believed that individuals can benefit from the knowledge and skills of others to fill up their specific gaps, sharing their information and to make new knowledge (Sherer *et al.*, 1982; Maddux, 1995; Bandura, 2001). In fact, KS activities are facilitated by a network with which knowledge becomes structured and codified (for example, the use of a common language).

In light of this scenario, we assume that:

- H1.* The quality degree of KS is influenced by a combination of personal and CEs – known as outcome expectations – in a DMP.

As highlighted by the social cognitive theory, a human behaviour can be analyzed by a dynamic, reciprocal model in which personal factors, environmental influences, and individuals' behaviour continually interact (Bandura, 1986). Whereas, the social capital theory analyses the network of relationships of an individual and a set of resources belonged to a network. Along with how these factors influence interpersonal KS (Meyer and Allen, 1991; Nahapiet and Ghoshal, 1998).

Indeed, the social capital theory gives a particular focus on the ability to generate resources through social relationships (Coleman, 1988). Social capital does not reside either in individuals or in physical elements of production, but it is an entity in itself that springs from a network of relationships (Coleman, 1988). In other words, social capital represents a determinant of interactions that an organization makes available to its stakeholders (Bagnasco, 2002).

Consistent with Bandura (1989), people's behaviour is a product of their social network. In particular, social interactions allow individuals to increase the depth, breadth and efficiency of the mutual exchange of knowledge (Lane and Lubatkin, 1998).

The intertwining of social capital and KS is better described in Nahapiet and Ghoshal's model (1998) where the social capital is considered an aggregate of resources embedded in organization and/or individuals' relationships. This aggregation combines three dimensions: structural dimension (SD), that is represented by those interpersonal relationships based on social bonds, their structure, and adaptation of a specific context; cognitive dimension (CD), which includes, for example, a common language and methods shared between people belonging the same network that generate a matching opinion of their community; relational dimension (RD), that concerns the relationships that are created through a continuous system of interactions and generate a type of social norms such as trust, reciprocity and solidarity.

According to Nahapiet and Ghoshal (1998), SD supports the analysis of the general structure of individuals' connections, whereas a RD allows the explanation of the types of personal relationships developed; and a CD refers to the intangible resources that people should develop a congruent representation and systems of meaning. Hence, structural, relational and cognitive nature placed in the networks of individuals, groups, organizations and communities can facilitate the achievement of common objectives (Nahapiet and Ghoshal, 1998; Burt, 2000; Inkpen and Tsang, 2005). These three dimensions are interrelated because the intensity and frequency of relationships allows the actors involved to know each other, share information and generate a common sense (Tsai and Ghoshal, 1998). There is, thus, a kind of causal sequence between the three dimensions because of a social interaction reduces opportunistic behaviours and generates trust and identity that are the basis of cooperative behaviour. This generates mutual benefits within a community (Uphoff, 2000).

Especially, the SD focuses on the characteristics of interactions within a network in terms of their intensity and bond strength (Seibert *et al.*, 2001; Inkpen and Tsang, 2005). Alongside, the personal nature of the relationships among individuals with same goals (Yli-Renko *et al.*, 2001; Requena, 2003; Wasko and Faraj, 2005). In this perspective, two inputs are identified: the first is the internal cohesion which is an expression of the propensity to maintain

exclusive relationships within the consortium (MER); the second concerns the creation of personal relationships with members with same goals (CRMSG).

On this basis, we declare that:

- H2.* The two types of the SD (MER and CRMSG) are predictors of the quality degree of KS within a network.

While, the RD refers to the quality of connections, in terms of trust, identification, and cooperation between two or more actors (Bolino *et al.*, 2002) to satisfy a need for sociability, respect and prestige (Granovetter, 1973). Trust is considered one of the most important factors (Fukuyama, 1995; Prusak and Cohen, 2001; Chowdhury, 2005; Holste and Fields, 2005; Abrams *et al.*, 2003) because of it is based on reciprocity which is an antecedent of the degree of cohesion (Ridings *et al.*, 2002). This also induces an explicitly (Krackhardt, 1999; Schippers *et al.*, 2007) and tacitely KS (Stenmark, 2001; Janowicz-Panjaitan and Noorderhaven, 2009). Trust, thus, is characterized by two variables: assuming a consistent behaviour with the network's goals (ACB) where people tend to act in line with network's objectives, which develops CEs through the setup of norms, values and principles, and avoiding internal conflicts (AIC), which regard the ability to create a comfortable environment to share a specific field of knowledge.

Whereas, identification is considered the process by which an individual recognises himself with another person or group of people (Nahapiet and Ghoshal, 1998). Some studies have shown a positive relationship between identification with a group, expectations and motivations to knowledge exchange (Lewicki and Bunker, 1996; Nahapiet and Ghoshal, 1998). This relationship is also identified within territorially distributed contexts (Davenport and Daellenbach, 2006) where people interact each other to solve problems and exchange knowledge (Ardichvili *et al.*, 2003). Additionally, the identification is linked to emotions which enforce loyalty and generate depth knowledge (Ellemers *et al.*, 1999). This has resulted in strengthen your sense of belonging to a community (SBC). Along with addressing and solving common problems (ASP) which are in line with community's expectation.

Therefore, we consider that:

- H3.* The four relationship dimensions (RDs) (ACB, AIC, SBC and ASP) are motivators of the quality degree of KS within a network.

Finally, the CD of social capital identifies the resources that generate a common perspective within a network. In this way, people build their comfort-zone with those associate the same interpretations and meanings of a situation (Chow and Chan, 2008; Wasko and Faraj, 2005). This also creates a common language to avoid misunderstanding (Leana and Van Buren, 1999) and formulate a mutual communication (Brown and Duguid, 2000). The CD is composed of easy access to information (EAI), presence of physical working groups (PWG), and creation of virtual working groups (VWG) which are expressed in internal chat, and online community, among others.

Hence, we retain that:

- H4.* The three types of CDs (EAI, VWG and PWG) leverage the quality degree of KS within a network.

3. Methodology

3.1 Fuzzy expert system

To evaluate the aforementioned hypotheses, the FES is employed to analyze the determinants of social exchange which affects the quality degree of KS in a DMP. According to Von Altrock (1997), was chosen to replicate a DMP by introducing the approximation typical of human reasoning, with the use of an inferential engine in fuzzy logic.

The model relies on ES, a software that provides multi-attribute decision support systems and behaviour simulation in certain situations. ES allows to obtain the same evaluations and indications that would give an expert of the observed problem, providing an aggregated view of the conditions and problems examined, also through decision-making schemes suggested by the experts.

The ES uses a knowledge based in tabular form in which the information and DMPs indicated by the experts are inserted. The knowledge base consists of situations and rules encoded in blocks of type IF (condition) → THEN (action).

The blocks describe the universe of possible actions that must be performed when certain situations occur, as far as possible.

The inferential engine processes the information contained in the blocks of rules, using the knowledge base to infer new situations and generate solutions (Facchinetti *et al.*, 2000; Marchi *et al.*, 2014; Veltri *et al.*, 2015). This widely used technique allows to concentrate the analysis on the determination and aggregation of the already known concepts and evaluation schemes, and has the advantage of being independent of the data. This allows to free the schematization of the evaluation model from the validity of the available data set and to obtain additional information given by the intermediate variables. Besides, another positive aspect of the FES approach is the presence of intermediate variables which help to understand from where the final score derives. This is represented in a tree shape model which shows inputs and outputs and their intertwining. In the paper, the FES is based on the formalized tree structure that allows creating a rating for the quality evaluation of shared knowledge (Figure 1). The system obtained is technically described in the Table I.

The tree graphically represents the logical path that an expert runs through in the quality evaluation of shared knowledge and can be decomposed by aggregation levels starting from the final evaluation. According to the theoretical framework proposed, the aggregations of the first level are the intermediate variables – outcome expectations (OE)

Figure 1 The evaluation model of quality degree of KS

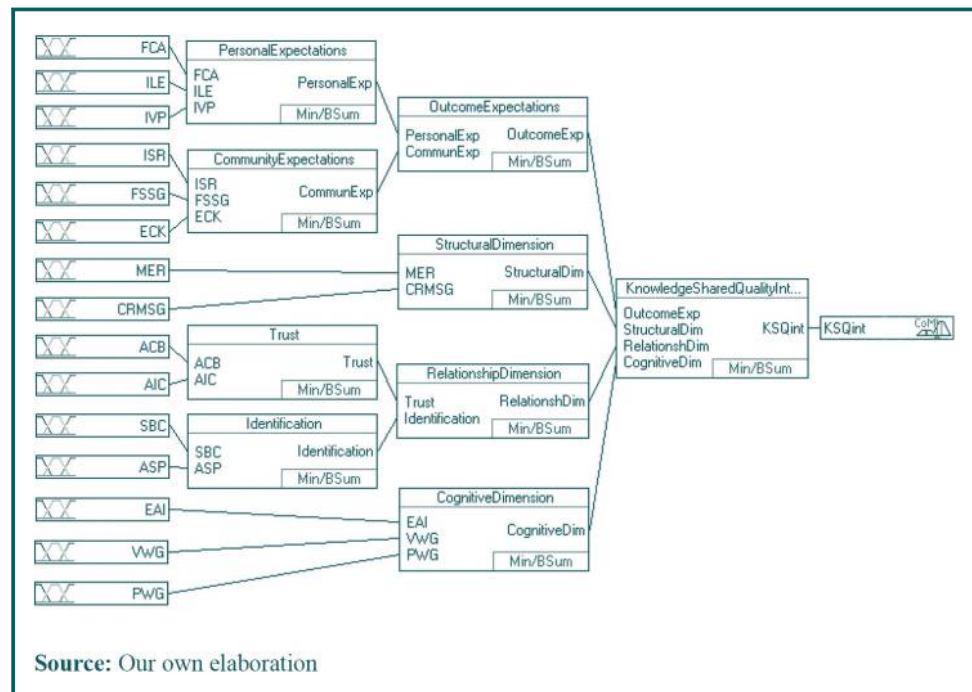


Table I The characteristics of the tree shape model

Input variables	15
Output variables	1
Intermediate variables	8
Rule blocks	9
Rules	895
Membership functions	119
Source: Our own elaboration	

divided into PEs and CEs, SD; CD; RD (distinguished in trust and identification) representative of the macro-themes explaining the phenomenon under examination; these are disaggregated into a subsequent group of variables representative of the initial inputs and identified in:

- facilitating the competitive ability of his business;
- improving the level of expertise within his company;
- increasing the value of his product;
- increasing and stabilising relationships among members;
- facilitating the survival and strategic growth of the network of firms;
- enhancing the network's knowledge base;
- maintaining exclusive relationships within the network;
- creating personal relationships with members who share the same goals;
- assuming a consistent behaviour with the consortium's goals;
- AICs;
- strengthening a sense of belonging to a community;
- addressing and solving common problems;
- EAI; and
- creation of VWGs.

By reading the tree shape model from the right side, you can see the analysis work done by the experts in representing their DMP. Additionally, this facilitates the identification of the characteristics and weaknesses of the assessed company within the network. The final goal of the model is to obtain an evaluation close to that given by an expert for every possible combination of the level of the inputs.

The multi-criteria perspective that characterizes it makes it appropriate to the objective of observing the facilitating elements of the sharing of knowledge and, consequently, of understanding the preconditions necessary for the development of a KS strategy.

3.2 Sample

The model was tested on a sample of companies belonging to 11 Italian agri-food protection consortia. The research consortia have been identified in the most relevant agro-food areas in the Italian economic context – wine production, ham production sector, dairy, olive oil and fruit farming. To select the consortia we have considered two data: the year of foundation, to consider those that over time have more consolidated relationships and the number of companies belonging to the network. Especially, for each “consortia”, there are in the average of 150 companies for a total number of 1646. Additionally, the oldest companies were founded in 1924 and the newest one in 1990.

In Italia ci sono numerosi consorzi agroalimentari, noi abbiamo selezionato questi 11 perché sono i più longevi e quelli con un maggior numero di consorziati.

The choice to use the phenomenon of business networks as a research context derives from two considerations drawn from managerial literature. The first is that the studies have already observed that the competitive success of the companies belonging to the network is linked to the dissemination of knowledge (Nishiguchi, 1994; Baum *et al.*, 2000; Dyer and Nobeoka, 2000; Gupta and Govindarajan, 2000).

The second reason is that the network is in itself synonymous of social capital as it represents the set of social relations at a given moment. The strategic networks are composed of inter-organizational ties that are enduring and of strategic significance for the firms entering them (Gulati *et al.*, 2000). Therefore they are a place in which the social capital, as “aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition” (Bourdieu, 1986, p. 248), exists and grows for effect of relationships (Inkpen and Tsang, 2005).

The relational capital makes cognitive resources available (information) or regulations (trust) which allows individuals to achieve objectives that would not obtain alone. In this perspective the social capital has been identified as a possible facilitator of knowledge transfer (Lane and Lubatkin, 1998; Yli-Renko *et al.*, 2001; Zahra *et al.*, 2000; Inkpen and Tsang, 2005). These considerations allow us to observe that the “consortia” represents a clear example of the creation, maintenance and management of long-term organizational networks which are able to pursue the goal of growth and survival through knowledge dissemination and sharing (Maizza, 2010; Maizza *et al.*, 2015). Not considering the legal motivations that have produced these forms of association, the Agri-food protection consortia have been formed and consolidated over time through a process of sharing vision, mission and values among entrepreneurs who feel ambitious and desire to get to know a territory, its products and its values (Maizza, 2010; Maizza and Iazzi, 2010). Each consortium was created, in fact, for the protection of a specific agricultural food and production. The communication activities they perform are increasingly important tools for promoting the quality and culture contained in a geographical area. They are, therefore, a natural meeting place for knowledge, experiences and skills from which exchange can bring a competitive advantage. These associations are located in some specific Italian regions such as Emilia Romagna, Piemonte, Toscana, Veneto and Trentino Alto Adige. They are virtuous examples of creation and dissemination of value within and outside of a network in the international scene (Fait, 2012).

The network of formal and informal social relationships, personal and sharing of values that characterizes them so fully responds to the perspective of organizational social capital.

3.3 Survey

Before proceeding with the employment of the FES approach, data were collected by a questionnaire. The questionnaire was divided in four macro variables: outcome expectations (OE), SD, RD and CD. The questionnaire was composed of close-ended questions based on a 10 evaluation scale: 0 (not important) to 10 (very important) (Likert, 1932). Along with the value of “unimportant”, “sufficiently important” and “quite important”, to be able to weigh the participants’ answer of each item.

Preliminarily we test the questionnaire through a pilot survey on 20 companies belonging to the “consortia”. Subsequently, from September to November 2017, 1,676 questionnaires were distributed by e-mail to the directors of companies belonging to 11 agri-food consortia in the most relevant areas of the Italian economy. Being an exploratory research, conducted on a selected sample, the technique of convenience sampling was applied and a total number of 313 properly completed, and so valid questionnaires were collected, considered and analyzed. Table II shows the information of the respondents.

3.4 The sensitivity analysis of the model

The model is calibrated by verifying the correspondence with a certain number of typical cases (cases where estimation is already known) and it is optimized through sensitivity analysis. The sensitivity analysis, a process through which the variation of the output obtained is studied when one or more inputs change (initial variables or factors). The robustness of the evaluation indicates the ability of this to remain valid to the changes in the data on the basis of which it was assumed.

To verify the validity of the choices made in the model, the sensitivity analysis was carried out using an one-at-a-time approach: the final score was then evaluated with reference to the single variation of each model variable (Borgonovo *et al.*, 2003). Because of the intrinsic non-linearity of the model, the entire variation interval was considered for each input (Saltelli *et al.*, 2008).

The variation was studied both to verify the correct performance of the output (verify the expected monotony) and to test the correctness of the level variation (check the influence of the input), information necessary for the calibration of the model. To test the validity of the model, but also to test its ability to work on scenarios, simulations were initially started with equal values on three levels: low = 2, medium = 5 and high = 8. In this way, in addition to evaluating the consistency of the monotony and the correct amplitude of the levels, we tried to obtain operational information, through the analysis of the sequence of activated intermediate variables of the input. Subsequently, using real cases (analysis by scenarios) various simulations were made to control the possibility of variation of the single inputs.

As an example some scenarios are illustrated graphically (Figures 2-7) for the variables MER (maintain exclusive relationships within the consortium) and PWG (presence of PWGs). For both variables, the trend of the curves shows that, when their level changes, the final level and the monotony do not undergo anomalous variations, and this is indicative of a correct calibration of the model.

4. Findings

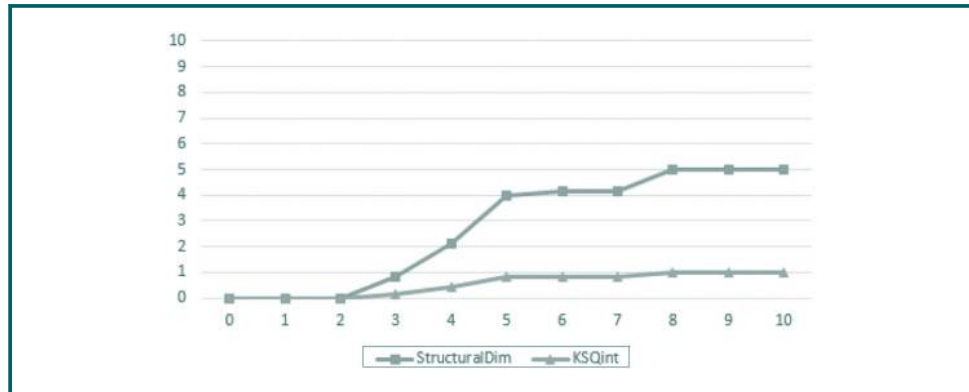
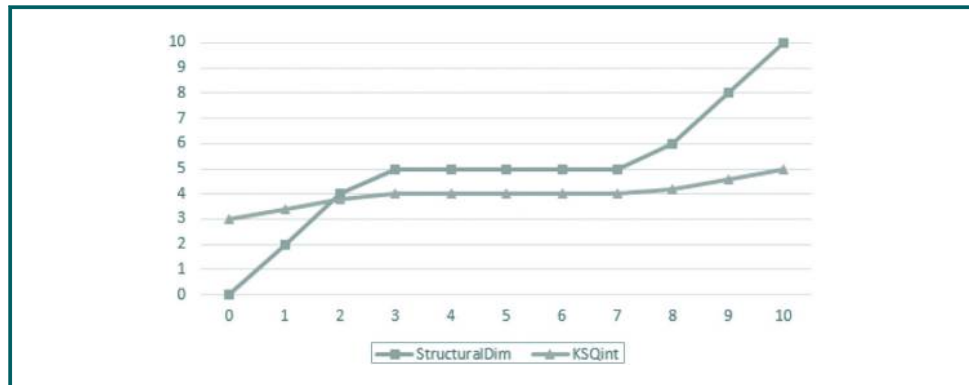
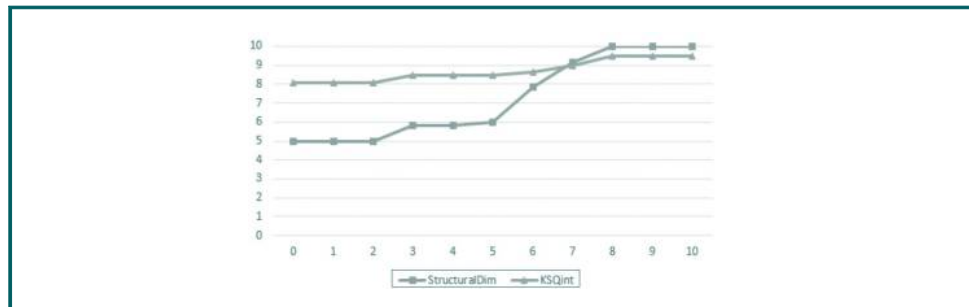
By considering the fact that a company acts in a network when it shares values, objectives and strategies with other equivalent partners with the same goals, we observe whether the quality degree of KS can be a key factor of an aggregative strategy and which are the variables that can influence (reinforcing or inhibiting) KS practices.

The proposed model allows to conduct the analysis along two different perspectives.

In the first perspective, the reworking took into account all the questionnaires from the survey independently of the respondents' consortium. In this way, it was possible to know the average value assigned to the quality of the knowledge exchanged within the network of

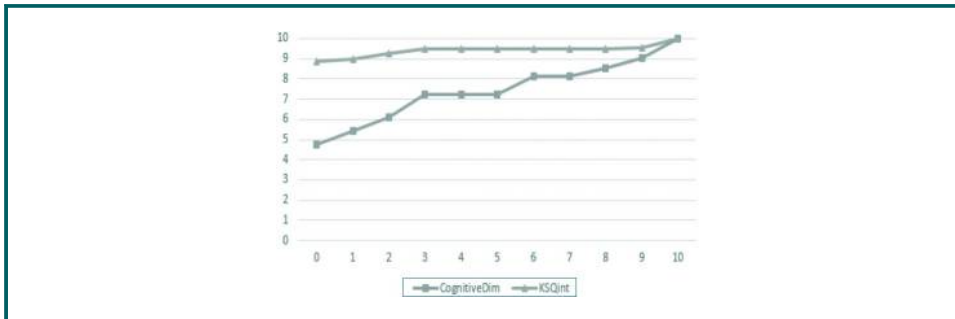
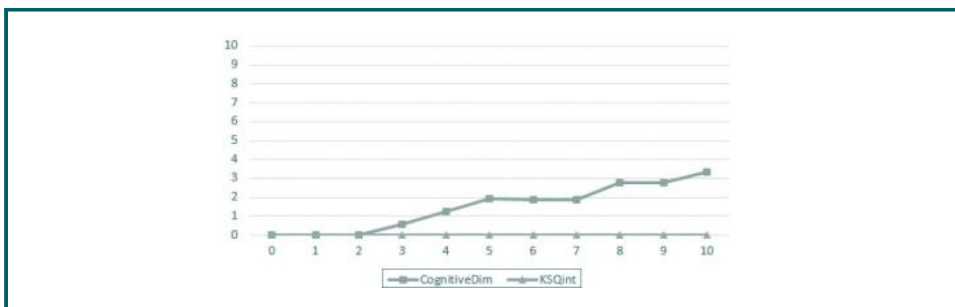
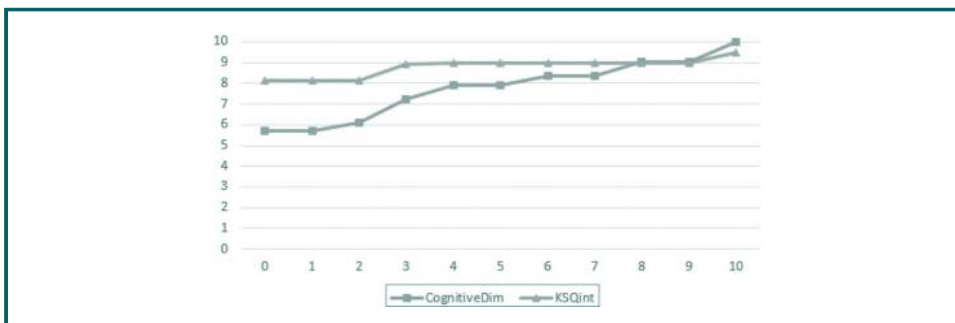
Table II Demographic information

		(%)
Years of membership in the consortium	For less than 10 years	17
	From 10 to 20 anni	35
	From 21 to 30 anni	21
	Over 30 anni	27
Employees	From 10 to 49 dipendenti	85
	From 50 to 250 dipendenti	13
	Over 250 dipendenti	2
Revenue	Up to 2 ml €	83
	From 2 to 10 ml di €	15
	Over 10 ml di €	2

Figure 2 MER's influence: all input at level 2**Figure 3** MER's influence: all input at level 5**Figure 4** MER's influence: all input at level 8

respondents companies (KSQ) and the variables that affect this value (Figure 8). The reading of table must be started from right to left, to understand as the intermediate variables participates to model the average value assigned to the quality of the knowledge exchanged. The members of the consortium have assigned a highly positive judgment of the quality of the exchanged knowledge (KSQ = 8.523).

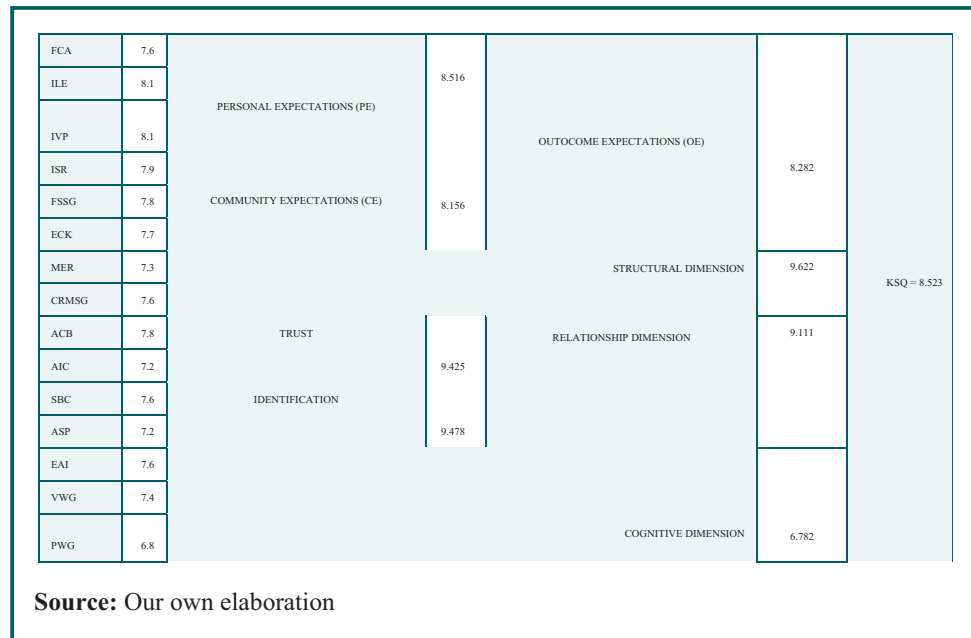
The analysis of the four macro-variables identified has, then, highlighted that only three of them are actually recognized as significant facilitators of the propensity to KS: the Outcome

Figure 5 PWG's influence: all input at level 8**Figure 6** PWG's influence: all input at level 2**Figure 7** PWG's influence: input:ID_001-consortium_08

expectations (OE = 8.282), the SD (SD = 9.622) and the RD (RD = 9.111). CD (CD = 6.782) is, in fact, less relevant.

H1 is therefore confirmed. What is interesting to note, and which the model succeeds in highlighting, is the incidence that the intermediate variables have on the previous statement. PEs (PE = 8.516) have a slightly higher relevance than CEs (CE = 8.156).

The model also allows as to observe that, within the PEs, the variables that most affect the evaluation are: Improving the level of expertise within the company (ILE = 8.1) and Increasing the value of its product (IVP = 8.1). A slightly lower value but, however, important is assigned to the variable: Facilitating the competitive ability of the business (FCA = 7.6). It

Figure 8 “Block” analysis to judgment assigned by Consortium 1 and Consortium 8

is evident, therefore, that in a logic network of KS is recognized as a driver to generate a benefit in terms of improving the company's internal skills, increasing the value of its product and, therefore, of its competitive capacity.

However, the data relating to CE should not be neglected; in relational logic it is representative of the evaluation of the effects that the behaviour of the individual can generate on the other individuals with whom he establishes a relationship. All three variables identified in the model have average values – increasing and stability of relationships among members (ISR = 7.9), facilitating the survival and strategic growth of the network of firms (FSSG = 7.8) and enhancing the network's knowledge base (ECK = 7.7).

In this perspective, therefore, the single individuals evaluate the KS as a tool that can facilitate the strategic growth of the network in terms of both increasing and stabilizing relationships between the players and improving the knowledge base useful for creating value over time.

The greatest relevance for the achievement of the KSQ is assigned by the respondents to the SD which, in fact, presents an average value equal to 9.622. This stems from an analogous importance assigned to the two variables that characterize it – maintaining exclusive relationships within the consortium (MER = 7.3) and creating personal relationships with members who share the same goals (CRMSG = 7.6). This would mean that the intensity and strength of the link within the network and the personal nature of the relationship between actors sharing the same objectives really represent the channels not only to transmit but also to access knowledge. Therefore, the *H2* is confirmed.

Equally important in a process of KS is recognized by the network actors in the RD which refers to the quality of connections, in terms of satisfaction, trust and cooperation between actors. For this reason, the third hypothesis (*H3*) is confirmed.

In fact, both the intermediate variables that compose it – Trust (T = 9.425) and Identification (T = 9.478) – present high average values. This means, first of all, that the rules of reciprocity – Assuming a consistent behaviour with the network's goals (ACB = 7.8); AICs (AIC = 7.2) – on which trust is based, in general, facilitators of the exchange process.

Of these, however, the one that assumes greater importance is the variable representative of the propensity to adopt behaviours consistent with the objectives shared by a network (ACB), evidently considered the privileged driver to generate an epistemic community that shares specific fields of knowledge.

The model also allows us to observe that in the process of identification the sense of belonging to a community (SBC = 7.6) is the strongest motivation for an individual to share knowledge. However, neglected the perception of variable Identification as a tool to face and solve common problems (ASP = 7.2).

H4 is, however, only partially demonstrated. The model, in fact, shows a relatively modest importance assigned to the resources that allow the formation of a common perspective within a network that facilitates interpretations and meanings (CD = 6.782). This is probably due to the absence or non-use, in CD, of operational tools that can generate a sharing of language and, therefore, communication between the individuals. Nevertheless, it is interesting to observe the results of two of the three input variables – EAI (EAI = 7.6) and creation of VWGs (VWG = 7.4). These values suggest, therefore, that the companies are aware of the importance of those communication formulas.

In the second perspective, the empirical results were then re-analyzed by a benchmark point of view (Figure 9), comparing so the main value (Cm) of the KS (KSQm) with the values of the consortium 1 and of the consortium 8 that respectively have the lowest (C1) and the highest (C8) KS value.

The comparison between the average value (KSQ-Cm = 8.523) and that of the Consortium 8 (KSQ-C8 = 9.000) shows that the latter is the best value and depends mainly on the RD (RD = 10). In fact, it is observed that both the intermediate variables (trust and identification) are assigned the maximum value (T = 10 and I = 10). It is also useful to note that the CD also has a higher value (CD = 7.407) than the general data average value (equal to Cm = 6.782). These results can support that fact that the “consortia” has characterized by companies well connected each other. Besides, the management board of each consortium creates opportunities to enhance the involvement of companies both in the production marketing phases, implementing long-shared strategies.

The comparison between the average value (KSQ-Cm = 8.523) and that of the Consortium 1 (KSQ-C1 = 7.520) shows that the SD s (SD = 6.795) and the relational (RD = 6.489) of the social capital have a negative effect. The average sufficient value of the SD shows how the internal link is not very intense and how the common values are not yet such as to justify a sharing of knowledge. A consideration that is strengthened if we observe the intermediate variables of the RD; both the values of trust (T = 5.968) and identification (I = 6.428) are in fact relatively low when compared with the average value (Tcm = 9,425; lcm = 9,478).

The reciprocity norms, that characterize trust, are perceived but not adequately considered as drivers of sharing, such as the sense of belonging to a community seems latent. Similar considerations can be made regarding the expectations that both from an individual perspective (PE = 7.126) and community (CE = 6.795) do not represent strong motivations for sharing knowledge. In fact they are relatively low when compared with the average value (PECm = 8,516; CECm = 8,156). Probably, in Consortium 1 the integration regards the compliance of the production regulations and the defence of the common brand and the KS is not yet perceived as a tool that can improve the level of expertise and the competitive ability of the business and that can facilitate the strategic growth of the network and the stability of relationships.

5. Discussions and implications

Managerial studies have long recognized the link between KS and competitive success (Baum *et al.*, 2000; Dyer and Nobeoka, 2000; Gupta and Govindarajan, 2000; Nishiguchi, 1994) facing the analysis, more often than not, on the technological aspects of sharing and

Figure 9 "Block" analysis to judgment assigned by Consortium 1 and Consortium 8

INPUT	Cm	C1	C8		Cm	C1	C8		Cm	C1	C8		Cm	C1	C8			
FCA	7,6	7,2	7,6	PERSONAL EXPECTATIONS (PE)	8,516	7,126	7,436	OUTCOME EXPECTATIONS (OE)	8,282	7,043	7,667	KSQ	9,622	6,795	9,103	7,520	9,000	
ILE	8,1	7,6	8,1															
IVP	8,1	7,6	8,1															
ISR	7,9	7,0	7,9	COMMUNITY EXPECTATIONS (CE)	8,156	6,795	7,287	STRUCTURAL DIMENSION (SD)	9,622	6,795	9,103	RELATIONSHIP DIMENSION (RD)	9,111	6,489	10	6,782	6,795	7,407
FSSG	7,8	7,4	7,8															
ECK	7,7	7,6	7,7															
MER	7,3	6,8	7,3	TRUST	9,425	5,968	10	COGNITIVE DIMENSION (CD)	6,782	6,795	7,407	TRUST	9,478	6,428	10	6,782	6,795	7,407
CRMSG	7,6	6,4	7,6															
ACB	7,8	6,0	7,8															
A/C	7,2	5,6	7,2	IDENTIFICATION	9,478	6,428	10	COGNITIVE DIMENSION (CD)	6,782	6,795	7,407	IDENTIFICATION	9,478	6,428	10	6,782	6,795	7,407
SBC	7,6	6,0	7,6															
ASP	7,2	6,2	7,2															
EAI	7,6	7,6	7,6	PNVG	6,8	5,8	6,8	COGNITIVE DIMENSION (CD)	6,782	6,795	7,407	COGNITIVE DIMENSION (CD)	9,478	6,428	10	6,782	6,795	7,407
VWVG	7,4	6,8	7,4															
PNVG	6,8	5,8	6,8															

Source: Our own elaboration

transferring knowledge within individual organizational units or between inter-organizational networks (Argote, 1999; Alavi and Leidner, 2001; Argote *et al.*, 2003).

The present work intends to understand what are the pre-conditions necessary to create a suitable relational environment to ensure that KS strategies can be effective for creating value for the network in the agri-food sector. The peculiarity of the work lies in the proposed multi-perspective theoretical approach, since it integrates the dimensions of social capital (Nahapiet and Ghoshal, 1998) – structural, relational and cognitive – with the outcome expectations of the organization observed both in the individual perspective – PEs – and in the network – CEs (Chiu *et al.*, 2006; Quigley *et al.*, 2007).

In this work, the value assigned to outcome expectations supports that *H1*. Which states the quality degree of KS is influenced by a combination of personal and CEs –known as outcome expectations – in a DMP. Then, empirical evidences recognizes motivational factors – PE and CE – as useful drivers for understanding the dynamics of sharing (Chiu *et al.*, 2006; Quigley *et al.*, 2007) but, at the same time, suggests which are the variables that represent facilitators or inhibitors of KS. In fact, the process that leads to the strengthening of the quality of knowledge passes through the recognition of the benefit that can be drawn in terms of improving the company's internal skills, enhancing the value of its product and, therefore, of strategic growth of the network made possible by the increase and stabilization of the relationships between the individuals and the improvement of basic knowledge.

On the lens of the theoretical perspective of social capital (Chua, 2002; Inkpen and Tsang, 2005; Wasko and Faraj, 2005; McElroy *et al.*, 2006; Chow and Chan, 2008), the empirical results show that there is a positive relationship between the quality of exchanged knowledge and the dimensions of social capital. The value assigned to the quality of the exchanged knowledge (KSQ) is relatively high in the context of the social phenomenon of the consortia and derives mainly from the macro-variables of SD, relationship dimension and CD.

The value of the SD supports that the two types of the variables (MER and CRMSG) are predictors of the quality degree of KS within a network (*H2*). In fact, the level of intensity and bond strength within a network along with the personal nature of the relationship between actors with the same goals represent the channels not only to transmit but also to access to knowledge.

Furthermore, the value of the intermediate variables of relationship dimension – trust and identification – underpins that knowledge exchange process is closely related to these variables. The four dimensions considered in the model (ACB, AIC, SBC and ASP) are motivators of the quality degree of KS within a network (*H3*). In fact, the propensity to adopt behaviours consistent with the objectives shared by the network is considered the privileged driver to generate an epistemic community that shares specific fields of knowledge, just as the strengthening of the sense of belonging to a community becomes fundamental.

As far as the three types of CDs are concerned, their role of factors that leverage the quality degree of KS within a network is partially supported (*H4*), because the values indicate that the link with KS is still latent. In fact, the value assigned by the consortium members interviewed is relatively lower than that of the other dimensions; this is a symptom of the fact that there is an awareness of the importance of activating communication models that facilitate the dissemination of information, but the probable absence or non-use of some operational instruments represent an element that negatively affect the quality of the knowledge exchanged. The empirical verification has allowed to demonstrate the importance to adopt a social-cognitive perspective for the activation of a qualitatively high level of KS within a network, because an adequate integration of social capital dimensions and cognitive variables can generate their contextual enhancement. The multi-criteria approach adopted to build the model, designed for this purpose and based on a FES, proved adequate for the evaluation of input variables as facilitator or inhibitor of KS, also in the benchmark perspective. As an example, the consortium 8 has a high value of the quality of knowledge exchanged because it has succeeded in achieving a good integration of the socio-cognitive dimensions assumed on the basis of the theoretical

model. This is probably due to the nature of the integration that embraces the entire supply chain and, therefore, inevitably generates a greater sense of belonging and trust in all the members of the network who have, over time, been able to perceive in a similar way the advantage not only personal but also for the community. In consortium 1, on the contrary, the presence of the network is motivated by compliance with the specification to benefit from the designation of origin as a common brand; as the values of the dimensions of social capital demonstrate, the integration between social phenomenon and cognitive phenomenon is not complete but only latent so that even the value of exchanged knowledge is not adequately perceived as a driver of competitive advantage.

Therefore, these reflections allow us to overcome the only technological vision (Hendriks, 1999; Chow and Chan, 2008; Van den Hooff and Huysman, 2009; Paroutis and Al Saleh, 2009) and monothematic of many approaches to KS (Bock and Kim, 2001; McDermott and O'Dell, 2001; Ardichvili *et al.*, 2003; Gagné, 2009; Lin, 2007) suggesting that the study of KS and its potential as a driver of the competitive advantage of a company operating within a network cannot disregard the analysis of the nature and the importance assigned to the socio-cognitive variables highlighted in the theoretical model since they constitute the substratum on which the KS strategies are based.

5.1 Implications for research and practice

The paper aims to observe the facilitating elements of KS and, consequently, to understand the preconditions necessary for the development of a KS strategy. To this end, it proposes a model, based on a FES approach, which serves to provide a vision of the DMP similar to that which would be followed by an expert of the observed problem. The main results have both theoretical and empirical implications. From a theoretical point of view, they contribute to expanding KS studies by focusing on the relationship between these strategies and the structural-relational-cognitive structure of a network of companies. In particular, it fills the gap linked to the absence of operational tools that are adequate to understand the existence of environmental conditions appropriate to the implementation of these strategies. The social-cognitive perspective adopted and the resulting model have, in fact, made it possible to understand that a qualitatively high quality KS process within a network requires the integration between social capital dimensions and cognitive variables and a contextual exploitation. From the management point of view, the model allows us to identify the intermediate variables of this integration as well as the input variables that characterize each of the four dimensions. The usefulness of this information is twofold: on the one hand, it provides an overall view within a general phenomenon, which is that of the network of companies, and this regardless of the specific sector to which it belongs. In this perspective, in fact, the average value represents a threshold value that allows the individual organization to know its position. On another hand, the model provides useful insights for the agri-food sector. According to research results, the integration of social capital dimensions and cognitive variables and their contextual enhancement improve the sense of belonging and trust in all the members of the network allowing to perceive in a similar way the advantage not only personal but also of the community. This could specifically affect the integration of the entire supply chain and, in turn, the activation of a qualitatively high level of KS within a network. According to Webber and Labaste (2010), in agri-food sector the coordination failures are typically the result of a trust deficit or asymmetric relationships. Because of poor past performance, many value chains do not engender trusting relationships. This can lead to excessive risk mitigation, causing inefficiencies and reduced value addition.

As in agri-food sector advances in communication technologies and declining transportation costs could facilitate coordination between chain actors (Gibbon *et al.*, 2008), not only by vertical integration but by standardization of processes but also through sophisticated information and communication technology (Gereffi *et al.*, 2005, p. 80), qualitatively high level of KS is closely related on the integration of social capital dimensions and cognitive variables and their contextual enhancement.

The analysis of the variables and the comparison allows to understand at what stage of the process of generation of an epistemic community is placed and to evaluate what strategic corrections to make so that the production and the exchange of knowledge can actually be useful for generating value for the network and in the network.

Moreover, the benchmark with similar organizations allows managers to assess their own structure and to identify which are the individual variables that are facilitators and which must be strengthened and those which act as inhibitors because they are still poorly developed. Finally, from a long-term viewpoint, the model can become a tool to understand the effects that a specific KS strategy has generated on the initial set-up.

These factors positively affect the quality of KS and, in turn, the DMP as well as the organizational behaviour.

5.2 Limitations

Although the resulting reflections are, on the whole, interesting and useful, the study has some limitations. Without doubt, the informative value of the model is attested by the empirical results obtained. At the same time the observations, in terms of managerial implications, cannot be generalized since, changing the nature of the analyzed network, the combination of the variables could take a different valence and the observations could be heterogeneous. A future research, on other types of network, is necessary to verify the reflections related to the socio-cognitive structure as a sub-layer for an efficient KS strategy.

Secondly, the work analyzes the relevance assigned to certain socio-cognitive variables that are interpreted as facilitators or inhibitors of the KS strategy. In this way, it limits the vision to the existence of an environment with initial minimum conditions within which a sharing strategy can be activated. Therefore, a possible area of future research is to use the model to verify the effects produced on this initial structure by the implementation of a specific KS strategy (creation of a virtual community, the adoption of *ad hoc* technologies) to evaluate the efficiency of the same both at the level of individual company and network. This would allow us to overcome the further limit of the work represented by the cross-sectional nature of the data. The identified socio-cognitive variables are a phenomenon that evolves due to the sharing of knowledge, therefore a longitudinal analysis between initial and final values would allow to overcome the limits of a static measurement and to capture the complexity and dynamism that exists in the relationship between KS strategy and structural-relational-cognitive structure of the network.

Corrigendum

It has come to the attention of the publisher that the article Monica Fait, Paola Scorrano, Giovanni Mastroleo, Valentina Cillo, Veronica Scuotto, (2019) "A novel view on knowledge sharing in the agri-food sector" published in *Journal of Knowledge Management*, currently at Earlycite, did not reference three sources drawn upon. These sources were: FACCHINETTI G., MASTROLEO G., PABA S., (2000). "A fuzzy approach to the geography of industrial districts". Proceedings of "SAC 2000 - ACM Symposium on Applied Computing", 514 – 518; MARCHI G., VIGNOLA M., FACCHINETTI G., MASTROLEO G., (2014). "International market selection for small firms: a fuzzy-based decision process", *European Journal of Marketing*, Vol. 48, Issue 11/12, 2198-2212, and VELTRI S., VENTURELLI A., MASTROLEO G., (2015). "Measuring Intellectual Capital in a firm belonging to a strategic alliance", *Journal of Intellectual Capital*, Vol. 16, 174-198. These references should now be added in paragraph 3.1 Fuzzy Expert System, at the end of the following sentence: 'The inferential engine processes the information contained in the blocks of rules, using the knowledge base to infer new situations and generate solutions'. The author guidelines for *Journal of Knowledge Management* state that articles must be fully referenced. The authors sincerely apologise for this.

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