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Rusko, Rauno

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Is Coopetitive Decision-making a Black Box? Technology and Digitization as Decision-makers and Drivers of Coopetition

Rauno Rusko

Faculty of social sciences, Management and organizations, University of Lapland, Rovaniemi, Finland

Abstract

Coopetition—simultaneous cooperation—and competition are increasingly becoming popular approaches in business studies. However, coopetition discussions dominate the content of decision-making about coopetition activities. The decision-maker can be a black box, firm, or organization, which optimizes its decisions in the prevailing business environment. The role of technology in decision-making has also passed. Because of developing decision-support systems, it is crucial to understand who makes decisions about coopetition and how, and what is the relationship between human and non-human decision-makers. This study offers a typology, which describes the different degrees of technology in coopetition decisions.

Keywords: Technology, coopetition, decision-making, digitization, platform

Introduction

Coopetition—simultaneous cooperation between competitors—is one of the most popular contemporary topics of marketing management. Typically, coopetition arguments are focused on coopetitive activities, where the role of the human decision-makers and actors features prominently at the outset and during the coopetition relationships (Bengtsson & Kock, 2000). Decision-making is defined as "the passing of judgment on an issue under consideration" or "goal-directed behavior in the presence of options" (Simmons, 2008). Thus, decision-making naturally involves a decision-maker, a decision, "goal-directed behavior," an "issue under consideration," and alternatives or options. These elements are also important in decisions about coopetition: a decision-maker (or a "player") is usually a CEO, an executive, a company, a manager, or a group of managers such as an executive committee, a council, a board, a group manager, a commander, or any stakeholder, including an individual, a group of individuals, a company, or a governmental (or non-governmental) organization (Arantes da Costa et al., 2009). A decision is contingent, in one way or another, on collaboration with competing firms or units. Intentional coopetition has to be based on "goal-directed behavior," with the intention of increasing profitability, for example, in the short or long term using better products, marketing, or other actions of supply chain. Profitability is not the sole aim of coopetition; it might be based on better market share, position, or technological innovations, for instance (Gnyawali & Park, 2008). The "issue under consideration" is linked directly or indirectly with potential collaboration decisions or competition decisions, if the prevailing relationships display a general collaboration tendency (cf. Kylänen & Rusko, 2011). Coopetition decisions contain either decisions to collaborate or decisions to compete, depending on the status of the initial relationship.

Thus, most of the coopetition studies are considered intentional, focused, and coopetitive, where the decisions are made by CEOs, firm managers, or a group of managers, that is a decision-making body with several human actors. In addition, consumers are important stakeholders in the coopetition activities (Salvetat & Géraudel, 2012). However, coopetition arguments include perspectives that emphasize emergent, unintentional, or tacit coopetition (Mariani, 2007; Walley, 2007; Kylänen & Rusko, 2011; Galkina & Lundgren-Henriksson, 2017). In fact, coopetition is often regarded as a by-product of managerial decision-making (Galkina & Lundgren-Henriksson, 2017). Moreover, amid the exceptional perspectives on

coopetition, the role of human beings is crucial. This study focuses on the role of technology or digitization in the birth, continuity, and potential enlargement of coopetitive relations.

The main question guiding this research is as follows: do digitization and technology (e.g., artificial intelligence (AI)) play any role in the birth, continuity, and enlargement of coopetition relationships among organizations and firms? This research also seeks to understand that, assuming that digitization, technology, and AI are the remarkable sources and drivers of coopetition, what forms do they take in these coopetition relationships? Data analysis will be based on the contemporary coopetition discussions, which are mainly focused on coopetition relationships and digitization. The main research question above explores the triangle-shaped relationship between coopetition, technology, and decision-making (Figure 1).

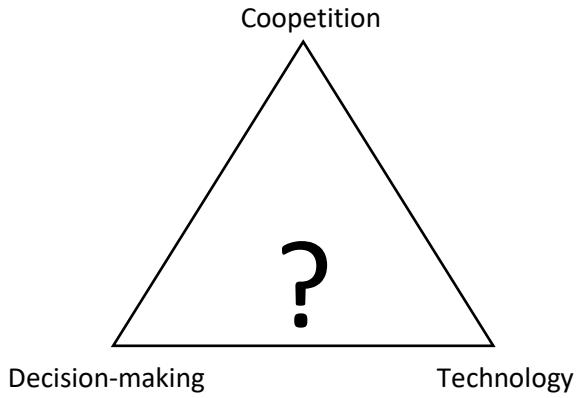

Figure 1. The main research question of the study.

To answer the main research question, this paper is organized into several subthemes. In addition to coopetition, decision-making, and technology, this article also presents a combined form of these three themes: (a) decision-making in coopetition, (b) decision-making technology, (c) technology in coopetition, and (d) decision-making in technology-driven coopetition as the combined form (Figure 2).

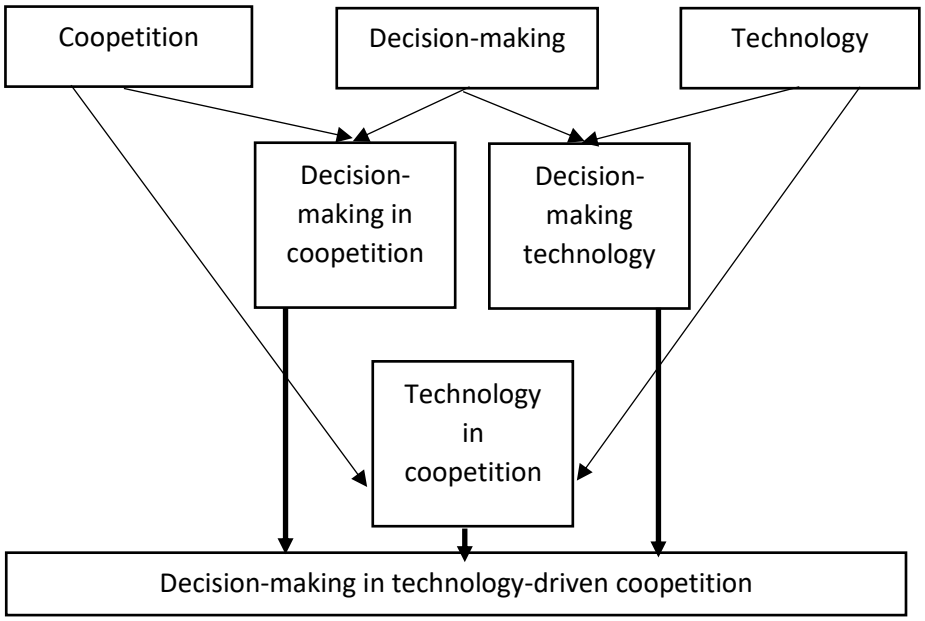

Figure 2. The main structure of the study.

The structure of this study is as follows: the literature review discusses the main themes pertinent to coopetition, decision-making, and technology as well as a combined form of these three elements. This is followed by a short section on this study's research design. Afterward, the outcomes of the literature review in relation to "decision-making in technology-driven coopetition" will be presented, leading to the introduction of a typology, which describes the different degrees of technology in coopetition decisions. Finally, this article offers some recommendations for future research and concludes with several managerial implications.

Literature review

Coopetition

Considering the definition of coopetition—simultaneous cooperation between competing firms (or other entities), several coopetition articles have sought to distinguish between competition- and cooperation-based coopetition. Bengtsson & Kock (2000) have identified three alternative coopetition relationships: (a) cooperation-dominated, (b) equal, and (c) competition-dominated. Several subsequent studies have emphasized similar perspectives, albeit with some variations. In the context of coopetition, Padula & Dagnino (2007), for instance, have considered the dimension between competition and cooperation. They have commented that both competition and cooperation are indicative of strong paradigms of management; however, coopetition—between these two—has not yet achieved the status of a paradigm (cf. Bengtsson et al., 2010).

These perspectives resemble Brandenburger & Nalebuff's (1996) idea of coopetition: "*cooperating to create a bigger business pie, while competing to divide it up*," where both cooperation and competition join in the same context. It is possible to link this idea with incremental and radical innovations (Rusko et al., 2018). Incremental innovations focus on minor improvements to the existing products and services, whereas radical innovations focus on major innovations of new products and new markets. In fact, "cooperating to create a bigger business pie" describes the cooperation-based coopetition, and "while competing to divide it up" suits competition-based coopetition (cf. Ritala & Hurmelinna-Laukkanen, 2009; Bouncken et al., 2017; Rusko et al., 2018).

Ritala & Hurmelinna-Laukkanen (2009) consider radical innovations to be very common outcomes of coopetition in high-tech industries, in which common standards are used to improve the interoperability and compatibility of current products and technologies. Generally, new standards are typical drivers of coopetition (see e.g., Garraffo, 2002; Metaxiotis et al., 2003; Gueguen, 2009). Ritala & Hurmelinna-Laukkanen (2009) have also noticed that radical innovations and coopetition tend to coexist when completely new markets provide a strong motive for competitors in an established business to create a new "business pie"—a new source of revenue. One relevant difference between coopetition in the context of incremental innovation and radical innovation is based on value creation and value appreciation. Coopetition in the form of cooperation-based coopetition is linked with value creation, especially when the main aim of collaboration between competitors is creating new common knowledge to create a new business pie. Competition-based coopetition is linked with value appreciation, competitive advantage aims, and circumstances of competitive pressure (Ritala & Hurmelinna-Laukkanen, 2009; Rusko et al., 2018).

According to Ritala & Sainio (2014), coopetition is negatively related to technological radicalness and positively related to business-model radicalness. Thus, they claim that coopetition benefits incremental technological developments over time and promotes radical business-model innovations, mainly because competitors seek to differentiate their offerings. In other words, Ritala & Sainio (2014) argue that, in coopetition, technological development is linked with incremental innovations, and radical innovations relate to new business models. In addition, Bouncken & Kraus (2013) have identified some problems in coopetition regarding novel revolutionary innovations. They observe that the coopetition of small and medium-sized

enterprises (SMEs) can trigger radical innovations, but at the same time, it can harm extremely novel revolutionary innovations, especially when SMEs share knowledge with their partners. However, Bouncken and Kraus suggest that learning from partners might have a positive effect on coopetition in relation to (radical) revolutionary innovations. They also claim that coopetition is advantageous in conditions of greater technological uncertainty (Rusko et al., 2018). Figure 3 shows the perspectives on coopetition and innovation presented in this subsection.

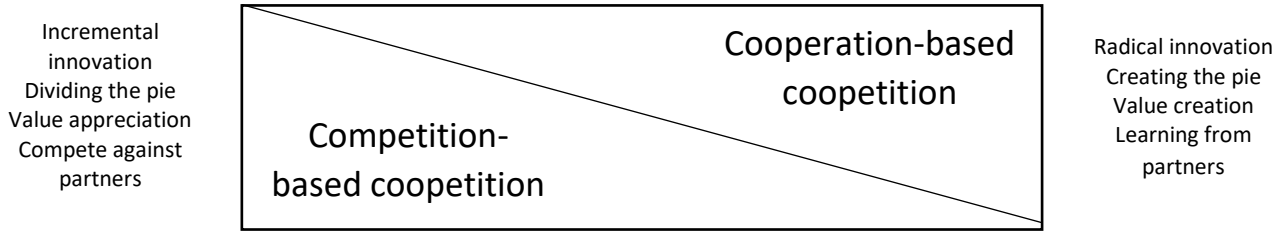

Figure 3. Competition-based and cooperation-based coopetition (modified from Rusko et al., 2018).

Decision-making in strategic management

In strategic management, decision-making often takes place in accordance with the available choices among the alternative strategies (e.g., action courses) (Mintzberg et al., 1998; Melchor & Julián, 2008). According to Simmons (2008), decision-making involves "the passing of judgment on an issue under consideration" or "goal-directed behavior in the presence of options." Decision-making can also be defined as involving any behavior that provokes a reaction to expectations (Nicolai & Seidl, 2010).

In economics, decision-making is often assumed as being a rational process. In strategic management, however, it is emphasized that strategic decision makers are bounded by their rationality (Eisenhardt & Zbaracki, 1992). Furthermore, uncertainty is a relevant element of strategic decision-making. According to Schwenk (1984), strategic decision-making is linked with uncertainty. Such a decision-making process involves goal formulation, problem identification, alternative generation, and evaluation/selection (Schwenk, 1984). Thus, strategic decision-making involves elements such as bounded rationality and uncertainty. This means that individual decision-makers have to discuss and confer with one another about strategic decisions. It is even possible that decisions and strategies may emerge based on the ideas of learning school (Mintzberg et al., 1998).

The role of technology in strategic management

Technology change is a major strategic factor for many organizations (Eschenbach & Geistauts, 1988). There are two main attitudes in organizations toward technology change. According to Eschenbach & Geistauts (1988), for example, some firms respond defensively to technology change, seeing technology as a problem, while others, through strategic use of technology, gain permanent advantage. Furthermore, the business of some firms is contingent on technology (e.g., ICT businesses) (Sakas, Vlachos, & Nasiopoulos, 2014), whereas in some firms, the focus of business is elsewhere, and technology is only an assistive tool, peripheral to their main business activities.

The literature of strategic management, which is dominated by arguments about technology, is strongly focused on competitive advantage (Sakas et al., 2014). According to Sakas and colleagues (2014), there are many ways to analyze the need for increased technological innovation in IT companies and its relation to the competitive advantage. They posit that the development of technology can be considered as either continuous or radical, and technology can be used in either an aggressive or a defensive way (Sakas et al., 2014). In other words, Sakas and colleagues (2014) and Eschenbach & Geistauts (1988) recognize the divide

between the attitudes that regard technology as a problem (defensive) or as a source of competitive advantage (aggressive).

New technology and technology change (innovation) have been divided into two categories: incremental and radical (e.g., Forés & Camisón, 2016). Radical innovations include organizational interactions with the external environment and suppliers, whereas incremental innovations only include modifications and refinements, which are important to ensure competitive advantage (Khan & Naeem, 2018).

Decision-making in coopetition

Coopetition discussions have hitherto been based on the decisions and actions of *human beings*, especially the entrepreneurs and managers of organizations. In discussions on coopetition, the role of human decision-makers and actors is important concerning coopetition relationships (Bengtsson & Kock, 2000). However, coopetition studies often regard these coopetition actions at the meso-level or macro-level (Tidström & Rajala, 2016), but not at the individual or psychological level, assuming that the decision-makers are firms, business units, organizations, or networks.

Brandenburg & Nalebuff's (1996) seminal book on coopetition introduces coopetition as a game of network, value net, which contains firms, substitutes (competitors), consumers, complementors, and suppliers—all of whom are cooperating and are part of the same value net. However, coopetition actions and activities are mostly assumed to be based on intentional, targeted decisions taken by managers, executive committees, or other groups of managers. There is, however, other discussions that emphasize indirect forms of coopetition, such as emergent, unintentional, tacit or by-product decision-making (Mariani, 2007; Walley, 2007; Kylänen & Rusko, 2011; Galkina & Lundgren-Henriksson, 2017). The perspectives above resemble coopetition between consumers, which Walley (2007) considers to encompass the features of tacit coopetition. Consumers act in a collaborative way, although there is concurrent competition among consumers. Thus, contemporary coopetition discussions cover both intentional and unintentional perspectives on coopetition. Coopetition situations, therefore, are mostly products or by-products of decision-making of human beings.

Decision-making in technology

One of the most popular perspectives on the effects of new decision-making technology (techniques) is provided by Simon (1960, preface): "the computer and the new decision-making techniques associated with it are bringing changes in white-collar, executive, and professional work as momentous as those the introduction of machinery has brought to manual jobs." This perspective emphasizes the role of radical change of decision-making technology in work. Remarkable in this perspective is that the effects of technology are not limited to the level of the executive but extend to several levels of the organization. However, critics of the features of strategic decision-making technology are mostly critical of its limited usefulness in the organization. In particular, these tools are claimed to be designed for rational problem-solving by individual decision-makers, although practical strategy work calls for tools that support collective knowledge production, promote dialogue and trust, and function as learning tools (Moisander & Stenfors, 2009). Thus, one dimension of strategic decision-making technology is individual versus team as a user of the decision-making technology. Another dimension is human being vis-à-vis computer as a decision-maker. AI is a specific topical theme in the discussions on strategic decision-making technology. According to Buchanan & O'Connell (2006), in the mid-1950s, scientists were already envisioning how new tools (e.g., computers) might improve human decision-making. They even produced early computer models of human cognition, which could be considered the early versions of AI. This development continued until the emergence of decision support systems, targeting practical needs of managers (Buchanan & O'Connell, 2006).

Finally, AI systems have been developed in such a way as to contain self-decision-making, self-adaption, and self-learning systems. The manufacturing literature, in particular, emphasizes these features of decision-

making technology (e.g., Park & Tran, 2012; Zhou, 2013). However, non-human algorithms are affecting the outcomes, content, and order of issues in the search engines, portals, and social media all over the Web. These algorithms actually "decide" on the webpages and linkages, which come to the surface in different contexts. Part of these outcomes and orders include the issues that are based on commercial advertisements, which firms can steer but are mostly the result of these digital algorithms. In addition, some planned tools of strategic management have features where smart "matchmaking platforms" make decisions or suggestions about cooperation between companies in the form of Complex System Innovation (CSI). Collaboration between companies is based on systematically generated corporate capability profiles of organizations with promising cooperation potential (Venghaus & Stummer, 2015). In this case, the initial coopetition decision is governed by algorithm.

One form of the digital linkages, which is mainly focused on customers' decision-making, is called "moneyball" strategy, which is based on the statistical analyses of customers' earlier choices and scores. The principles of this statistical method were initially used in baseball strategies, but it was later applied to business by Netflix; this approach uses data to make decisions about what movies to recommend to its customers (Morte, Boland, & Rollino, 2007; Rusko, 2015b). Digital linkages on the Internet connect different firms' webpages to the same entity. Thus, customers might experience that these firms are part of the same entity, although the firms do not have any agreed cooperation with one another. In this case, customers are "supply chain managers" of their visit on the Web (Rusko, 2015b). Despite the nearly non-existent role of firms in this "cooperation" and the obviously strong role of technology, the activator in this kind of "cooperation" is a human being—a customer who visits the Web and chooses different combination of portals and webpages in their virtual trip. Algorithms form the underlying linear algebra of search engines, which determine the order of the outcomes for a search. According to some evaluations, algorithms of Google, for instance, contain 200 variables (Mäkinen, 2016). AI leans on algorithms and programming too. According to Doinis & Caraiscos (2009), AI has two dimensions: human centrality and rationality. AI discussions emphasize rationality, where systems are a combination of mathematics and technology.

The role of technology in coopetition research

In several coopetition studies, the researched industry or branch is based on technology or digitization (Garraffo, 2002; Gnyawali & Park, 2009, 2011; Fernandez, Le Roy, & Gnyawali, 2014; Rusko, 2014). However, technology is normally the underlying element of coopetition studies but not necessarily their main focus. This subsection emphasizes following perspectives of technology in the coopetition literature: online coopetition, platforms in coopetition, virtual coopetition, and holonic coopetition. However, the distinction between these perspectives is ambiguous, and mostly these coopetition perspectives strongly overlap.

One form of coopetition, where digitization plays an important role, is *online coopetition*. Guo and colleagues (2014) have identified online coopetition activities in tourism: many hotels are concentrating on increasing their market share by establishing cooperation with online travel agencies. The power of these kinds of online travel agencies depends on the supply (and number) of the hotels on these pages. In other words, the appeal of the online pages is contingent on the intensity of the coopetition among the hotels in the specific online linkage. Online coopetition is often based on information. In tourism, for instance, platforms are the essential part of digitization. In tourism, these platforms are known as eTourism—infomediation of tourism (Belleflamme & Neysen, 2009). According to Belleflamme & Neysen (2009), an infomediary is traditionally defined as a merchant of information. They have identified two roles for infomediary, where they use platforms: collected information and provided information, which concern either the buyer or the supplier of goods and services. Belleflamme & Neysen (2009) consider coopetition perspective relevant to the context

of *platforms*, because the participants on the same electronic platform cooperate to achieve the collective success of the platform, while remaining competitors. Rusko (2014) has parallel findings about coopetition on the smart phone platforms, such as Android. Smart phone market has spheres or collaboration networks; these are based on underlying systems (platforms), which the competitors use in the smart phone industry (Rusko, 2014). From this perspective, technology drives for coopetition, but decision-makers are human beings, that is CEOs and managers of the smart phone companies.

In the branch of transport, the *virtual coopetition* (or co-opetition) has also been introduced. Hajdul (2014) has observed that in the EU, the average percentage share of empty runs as a total number of covered kilometers is 25%. According to Hajdul (2014), coopetitive Web-based platforms in transportation might be the solution to this problem. In this case, platform—not a human being—might be the practical decision-maker, which will organize the forms of everyday cooperation of competing transportation companies. Virtual coopetition has a form that is based on the *virtual teams*. Baruch & Lin (2012) have remarked that coopetition influences the performance of the virtual teams and their knowledge sharing. In addition, according to Lin et al. (2010), in the virtual team, coopetition is linked with performance and knowledge sharing. They have stated that perceived job effectiveness is influenced directly by knowledge sharing, cooperative attitude, and competitive conflict, while knowledge sharing is influenced by cooperative attitude and competitive conflict (Lin et al., 2010). According to Rusko (2015), professional consumers of game industry use common virtual platforms on the Internet, which can be considered consumer coopetition. The digital business models of the companies even recruit paying consumers to produce extra content for the well-organized platforms, while they are “consuming” (crowd sourcing) these virtual products (Rusko, 2015).

Stock investors might also draw on cooperation, which is based on common or joint platforms. The stock discussion boards, which are actually Internet portals, are called virtual investing communities (VICs), where members are able to speculate about a share's future performance in a structured way. According to Gottschlich & Hinz (2014), the members of VICs can make a purchase or offer sale recommendation for any share, along with a target price at a specific future date. This arrangement of VIC is interesting from the perspective of coopetition: individual investors are actually competing in the same stock markets. However, they make joint collaborative recommendations in these arenas. In reality, this is another form of coopetition, which is based on virtual platforms. This perspective has received very limited attention in the contemporary coopetition discussions.

Coopetition is also present in large systems as *holonic coopetition* or collaboration. Holonic collaboration is typical of virtual organizations or companies. According to Ulieru, Brennan, & Walker (2002), the rules for holons in a holonic e-enterprise (HE) are coopetition rules, which are implemented as strategies for negotiation, collaboration, cooperation, and other coordination mechanisms. The holonic collaboration platforms and the Internet are also key coordinators of actions (Uliery et al., 2002). Dagnino (2004) has observed that coopetition strategy may be considered an emerging effective practice within a “System of Business Enterprises” (SBE). By combining in an integrative complex systems framework the two perspectives—strategic resources and strategic networks—Dagnino (2004) defines “the SBE as a complex dynamic network of resources and capabilities.” According to Dagnino (2004), SBE coopetition strategy helps develop new and local solutions to problems, such as new products, processes, or routines. Given the simultaneous closeness and openness of systems, Dagnino (2004) does not nominate any particular platform, such as the Internet, for SBE or SBE coopetition.

Research Design

This study is a theoretical research, which is focused on decision-making in coopetition. The method is qualitative, which poses several challenges in terms of the literature review (c.f. Randolph, 2009). One

challenge is that often a study is not very successful in clearly linking the findings of the literature review to the researcher's own study (Gall, Borg, & Gall, 1996). The literature review is not restricted to any particular journals or publication years or forms, although the theme associated with technology and digitization emphasizes the most recent studies of coopetition. Moreover, coopetition studies are most popular in the literature review compared with other studies. The main source of the literature review has been Google scholar with search terms such as "coopetition" with "technology," "platform," "digitizing," and/or "decision-making." Google scholar returned (February 25, 2018) about 17,500 search results about "coopetition." This study did not investigate the content of all of these coopetition studies. The search returns illustrate a lack of serious discussions about coopetitive decision-making.

This study is based on the finding that coopetitive decision-making has been taken for granted in the coopetition studies. This shortage is increasingly discernable, mainly because of the changing role of technology in decision-making. Therefore, this study focuses specifically on the role of technology and decision-making in the contemporary coopetition studies. Furthermore, this study advances the pertinent discussions by introducing a new typology, which revolves around the role of technology in coopetitive decision-making. It is common to offer different kinds of coopetition typologies. For example, Walley (2007), Rusko (2011), Pellegrin-Boucher, Le Roy & Gurău (2013), and Czakon & Rogalski (2014) have introduced different kinds of typologies of coopetition. These typologies, among others, are contextual and do not focus on decision-making in the context of technology, which is the main focus of this study.

Decision-making in Technology-driven Coopetition

Decision-making in technology-driven coopetition has several stages or alternative forms. These different forms are based on the types of linkage between human being and technology as the decision-maker. The literature introduces several degrees of technology in coopetitive decision-making. Figure 4 outlines these degrees. The literature illustrates the general importance of technology in coopetitive decision-making. The role of platforms is very important too. However, the importance of platforms deviates, in that platforms are likely to be part of the supply chain in business (Belleflamme & Neysen, 2009; Guo et al., 2014; Rusko, 2014). In this case, technical platforms become doubly important for running businesses. Platforms connect competitors to one another; for example, companies have to use, and possibly develop, joint platforms to act in the market. However, the aim of these platforms is not to participate in other decision-making sectors of the companies. The next degree of technological decision-making might also contain platforms, albeit not necessarily. In this category, technology is directly related to practical or strategic decision-making of companies and provides decision-support, content, information, or timetable for coopetition (Morte, Boland, & Rollino, 2007; Gottschlich & Hinz, 2014; Hajdul, 2014; Dagnino, 2004; Venghaus & Stummer, 2015). Figure 4 introduces the fourth type of technology in coopetitive decision-making, where algorithms alone make decisions about coopetition. In the literature, the ideas of Venghaus & Stummer (2015) about matchmaking platform somehow resemble the total role of technology in coopetitive decision-making.

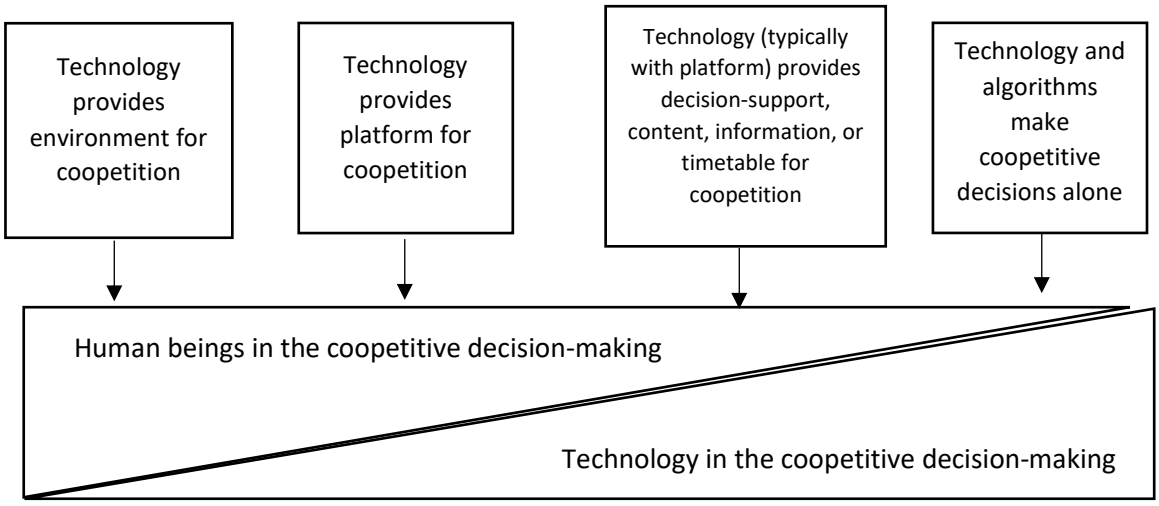

Figure 4. The degree of technology in coopetitive decision-making.

There are some alternatives for decision-making in technology-driven coopetition. For example, technology provides an *environment* or *industry*, where coopetition exists; technology provides *platforms*, where coopetition is focused on; and finally, technology provides *decision-support, content*, *information*, or *timetable*, where each particular coopetitive action follows with or without human beings' decisions, including CEOs, managers, or teams of decision-makers. Table 1 lists the articles relating to each category. Table 2 offers more examples about the content of these categories in the proposed typology.

Table 1. Three types of technology-driven coopetition.

Type of technology-driven coopetition	Article or other sources	Industry, context, or other case description	Decision-maker/ target of decision
Technology provides environment for coopetition	Garraffo (2002)	Mobile phones, computers Coopetition in emerging technologies	Firms; aim to exchange technologies, new markets, standards
	Metaxiotis et al. (2003)	Knowledge management and computer information systems community	Decision support through knowledge management and AI standards
	Gnyawali & Park (2009)	Technological innovations of SMEs	Firms; technological capability, resource complementarity, and resource similarity
	Gueguen (2009)	IT industries; five ecosystems: Palm, Microsoft, Symbian, Research in Motion (RIM), and Linux	Firms; establishing a standard
	Gnyawali & Park (2011)	IT industry; Samsung and Sony; Public policy	Firms and (restrictive) policy makers; advance of technological innovation

	Ritala & Sainio (2014)	Cross-industrial survey in Finnish markets; business-model radicalness	Firms; incremental innovations (no radical innovations)
	Rusko et al. (2018)	Self-driving car industry	Firms; new disruptive technologies to the market
Technology provides platform for coopetition	Belleflamme & Neysen (2009)	eTourism; platforms provide collected and provided information for suppliers or buyers.	Firms in general; platforms provide (potential) coopetitive linkages.
	Guo et al. (2014)	Online coopetition activities in the branch of tourism; hotels and online travel agencies	Firms (and distribution channels/marketing traditions of tourism)
	Rusko (2014)	Smart phones and platforms (e.g., Android) of mobile technology	Firms; to achieve competitive platforms for smart phones
Technology (typically with a platform) provides decision-support, content, information, or timetable for coopetition	Morte, Boland, & Rollino (2007)	Moneyball strategy in Netflix	This approach uses data to make decisions about what movies/products to recommend to customers. Customer/firm, final decision-maker
	Gottschlich & Hinz (2014)	Virtual investing communities	Social network and individual investors
	Hajdul (2014)	The branch of transport has the virtual coopetition via platforms to avoid logistically empty runs.	Web-based platforms in transportation with firms
	Dagnino (2004)	Italian industrial district: Carpi (knitwear and sweaters), Parma (cured ham, Parmesan cheese), Prato (textiles and clothing), and Valenza Po (gold jewelry)	Mainly firms with SBE, which is a complex system and is self-organizing, coevolving, organizationally closed and emergent
	Venghaus & Stummer (2015)	Complex System Innovation (CSI) suggests partnerships	Initially, algorithms of CSI; finally, companies might be able to participate in decision-making.

Several studies have focused on the theme that states that "technology provides an environment for coopetition" (e.g., Garraffo, 2002; Gnyawali & Park, 2009; Gueguen, 2009; Gnyawali & Park, 2011; Ritala & Sainio, 2014; Rusko et al., 2018). These kinds of technology and industry include mobile phones, computers, self-driving cars, and generally, IT-branches and emerging technologies. These studies emphasize the importance of coopetition in radical, emergent, or disruptive innovations and technologies (Garraffo, 2002; Gnyawali & Park, 2009; Gueguen, 2009; Gnyawali & Park, 2011; Rusko et al., 2018), except perhaps for Ritala & Sainio's (2014) study, which emphasizes the usefulness of coopetition, especially in incremental innovations. Many studies of coopetition focus on cases whereby technology provides platforms for coopetitive relationships (i.e., Belleflamme & Neysen, 2009; Guo et al., 2014; Rusko, 2014). In tourism and e-Tourism the role of (self-organizing) sales and marketing platforms is particularly crucial (Belleflamme &

Neysen, 2009; Guo et al., 2014), but the branches of IT or ICT platforms might also be important drivers for coopetition (Rusko, 2014).

In the another segment of Table 1, where technology provides content, information, or timetable to the firms and organizations, the role of platforms is significant. The examples cover several firms and industries, such as moneyball strategy in Netflix (Morte, Boland, & Rollino, 2007), virtual investing communities (Gottschlich & Hinz, 2014), the branch of transport with virtual coopetition to avoid logistically empty runs (Hajdul, 2014), Italian industrial district (Dagnino, 2004), or platforms for matchmaking potential partner companies (Venghaus & Stummer, 2015). Table 2 takes into consideration the type of decision-making and relational share of competition and cooperation in the activity under coopetitive decision. The content of Table 2 draws on one of the most famous definitions of coopetition: "cooperating to create a bigger business pie, while competing to divide it up" (Brandenburger & Nalebuff, 1996; Luo, 2005; Rusko, 2015). Table 2 applies this definition, in the sense that the *creation of bigger business pie* illustrates the joint activities of competitors to develop suitable and effective technologies, platforms, and decision-support systems, while the *dividing pie up* phrase demonstrates the use of ready technologies, platforms, or decision-support systems in competition. This logic rests on the assumption that cooperation is essential for the development of new (radical and disruptive) joint innovations, but when the joint innovations are ready, it is time for competition and only (minor) incremental joint innovation activities. This interpretation appears in the analysis of Table 1 above.

Table 2. The different roles of technology in cooperation- and competition-based coopetition.

	Technology as environment for coopetition	Technology as platform for coopetition	Technology as decision-support, content, information, or timetable for coopetition
Cooperation-based coopetition (growing the pie)	Competing firms together develop the same technology for their business. *The least limited decision-making*	Competing firms together develop the same platform for their business.	Competing firms together develop the joint decision-support systems.
Competition-based coopetition (capturing/ dividing the pie)	Competing firms use the same technology in their competition.	Competing firms use the same platform in their competition.	Competing firms use the same decision-support systems in their competition. *The most limited decision-making*

In Table 2, the freedom of decision-making develops diagonally and is the highest when technology functions as an environment for cooperation-based coopetition and lowest when the competing firms use the same (ready) decision-support systems in their competition.

Surprisingly, few coopetition studies directly address the question of "who will make the strategic decisions in coopetition?" Implicitly, most of the coopetition studies presuppose that firms and organizations are decision-makers, but they refrain from naming the decision-makers directly. Table 1 actually shows the most probable decision-makers of coopetition in each study, based on the context of text, where decisions and decision-makers have been mentioned. It is obvious that the role of technology will feature prominently according to the movement from the type of "technology provides environment for coopetition" to that of "technology provides decision-support, content, information, or timetable for coopetition."

Discussion

Coopetition studies are focused on relationships, where CEOs, senior managers, or teams make decisions about coopetitive activities. Often these studies do not name the coopetition decision-maker, which could be a company, firm, or organization. In fact, this kind of perspective follows the traditions of micro-economics, where firms optimize their production, costs, and profits, hence their "black box" (Sydow, Schreyögg, & Koch, 2009). Optimizing might be challenging for firms. Therefore, emphasis has been put on critical success factors (CSF) to help decision-makers focus their attention on critical processes and to "guide the direction and orientation that the management must follow in order to optimize the decision-making processes" (de Resende et al., 2018). This optimization is possible to be extended to the birth of partnerships, which is related to resources and other features of the potential partner companies in the matchmaking platforms (Venghaus & Stummer, 2015).

However, Bengtsson & Kock (2000) emphasize that collaboration between companies is governed by individuals' relationships across the competing companies and their business units. Moreover, physical closeness affects coopetition. According to Rusko (2015), the possibility of coopetition is increasing because of individuals' daily actions, which take place in the same place or geographical area. Individuals' physical closeness and geographical proximity encourage collaboration between competing firms, such as in tourism destinations, where there are several competing firms in the same area (see e.g., Kylänen & Rusko, 2011).

The role of individual decision-makers will figure prominently in the business and coopetition studies in the future, mainly because of the increasing importance of non-human decision-makers, such as robots and AI. There is a growing need to probe further whether decisions are made by human beings or by robots. In addition, decision-support platforms and networks have increased their role in decision-making. Generally, one of the perspectives that emphasizes the co-existence of individual actors and technology is socio-materiality (La Rocca, Hoholm, & Mørk, 2017). Even contemporary human resource management (HRM) takes into account success in relationships between individual decision-makers and machines.

Conclusions

Although it is difficult to define coopetition as a paradigm, but perhaps less so as a *complementary* paradigm (Bengtsson et al., 2016), the coopetition discussions have shared considerable common grounds with management, marketing, and business. Therefore, the limited number of coopetition studies is surprising, which focus on decision-makers of coopetition strategy and activities. However, this theme is doubly important, mainly because of the increasing technological tools for decision-making. The technological decision-supporting systems, robotics, and AI have rapidly expanded. Most of these systems tend to support decision-making. Thus, because of the changing environment, there is a need to examine the grounds of coopetition decision-making and the contemporary role of technology in decision-making processes.

This study focused on mapping the current situation in coopetition, decision-making, and technology "triangle" (Figure 1). This perspective has been complemented by a combined form of these three themes.

Thus, this theoretical paper offers three dimensions: (a) technology as environment for coopetition, (b) technology as a platform for coopetition, and (c) technology as decision-support, content, information, or timetable for coopetition. These three dimensions have been considered in relation to cooperation-based coopetition and competition-based coopetition. The role of technology depends on the maturity of technology in coopetition: disruptive radical new innovations, such as platforms or standards, encourage the competing companies to cooperate with the aim to "create a bigger pie," whereas ready common platforms and standards allow incremental innovations and time to "divide the business pie" by competition.

This study offers several themes for further research. The claim that coopetitive decision-making is a black-box requires further empirical studies. What specifically demand further examination are these questions: (a) from whom and how do coopetition decisions emerge?, (b) are there any industry-specific differences in these coopetition decisions?, and (c) how will the introduction of robotics and AI change strategic decision-making, such as coopetition and collaboration? Socio-materiality is one alternative approach to probe the relationships between individuals and technology in the context of strategic decision-making, such as decisions about competitive, collaborative, or coopetitive activities.

This study offers the following managerial implications. First, firms and organizations need to consider decision power in decision-making systems and decision-support systems. These systems aim to achieve rational decisions at a strategic level (e.g., coopetition). In the contemporary and future decision-support systems, the functional relationship between rationality and human centrality might be challenging. A few key questions enquire about whether "rational" decisions are always the right decisions, or how rationality has been defined in AI systems, for instance. The managers are advised to consider the increasing automatization of linkages, such as moneyball strategy. Instead of human beings, decisions to cooperate (and to have coopetitive activities) might be determined by the algorithms of machines.

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