Investigating the impact of networking capability on firm innovation performance: using the resource-action-performance framework

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Abstract

Purpose. The experience of successful firms has proven that one of the most important ways to promote co-learning and create successful networked innovations is the proper application of inter-organizational knowledge mechanisms. This study aims to use a resource-action-performance framework to open the black box on the relationship between networking capability and innovation performance.

Methodology. The research population embraces companies in the Iranian automotive industry. All data is gathered by the Iranian Vehicle Manufacturers Association (IVMA) and Iranian Auto Parts Manufacturers Association (IAPMA) samples. Due to the latent nature of the variables studied, the required data is collected through a web-based cross-sectional survey. First, the content validity of the measurement tool is evaluated by experts. Then, a pre-test is conducted to assess the reliability of the measurement tool. The power analysis method and G* Power software are used to determine the sample size. Moreover, SmartPLS 3 and IBM SPSS 25 software are used for data analysis of the conceptual model and relating hypotheses.

Findings. The results of this study indicated that the relationships between networking capability, inter-organizational knowledge mechanisms, and inter-organizational learning results in a self-reinforcing loop, with a marked impact on firm innovation performance.

Originality. Since there is little understanding of the interdependencies of networking capability, inter-organizational knowledge mechanisms, co-learning, and their effect on firm innovation performance, most previous researches have focused on only one or two of the above-mentioned variables. Thus, their cumulative effect has not examined yet. Looking at inter-organizational relationships from a network perspective and knowledge-based view (KBV), and to consider the simultaneous effect of knowledge mechanisms and learning as intermediary actions alongside with to consider the performance effect of the capability-building process, are the main advantages of this research.

Keywords. Networking Capability; Inter-Organizational Knowledge Mechanisms; Inter-Organizational Learning; Innovation Performance.

1. Introduction

In recent decades, the intensification of global competition has made firms' sustainable competitive advantage and long-term growth dependent on continuous innovation (Schumpeter, 1939; Griffiths-Hemans & Grover, 2006). However, researches show that the risk of development and failure rate for innovative activities is increasing as technology becomes more sophisticated and specialized (Cooper et al., 2003). The wide range of capabilities required to deliver new products to the market, especially new local markets, has led firms to increasingly engage in co-innovation, seek to share R&D costs and risks, accelerate innovation cycles, and enhance flexibility, quality, and productivity through inter-organizational collaborations (Faems et al., 2005; Walter et al., 2006; Ford et al., 2018). Such trends have led to the emergence of an open innovation paradigm. This theory emphasizes the need for co-innovation in the context of collaborative networks based on processing the inbound and outbound knowledge flows. Co-innovation is complementary to the firms' internal innovation activities (Faems et al., 2005), and it reduces the risk of competency trap because it broadens the range of partner firms' experiences (Knoppen et al., 2011). The literature emphasizes that networked collaborations lead to co-learning and upgrading the firm's capability (Tsai, 2001). Networked innovations are much more likely to succeed because of product complexity (Pittaway et al., 2004) and higher rates of innovation novelty (Nieto and Santamaria, 2007). Co-innovation is the result of an interactive process in which network members exchange, absorb, and combine the knowledge. However, studies show that most networked collaborations fail because of inconsistencies, inflexibilities, and conflicts (Kale et al., 2002; Pittaway et al., 2004; Rampersad et al., 2010) with rates ranging between 60 and 70 percent (Gulati & Kletter, 2005). Increased complexity, lack of independence, information asymmetry, and the imposition of additional time and costs on the firm are some risks of collaboration. On the one hand, this situation has drawn the attention of innovation scholars to inter-organizational networks, and on the other hand, firms have been thinking about how to establish good networked relationships and thereby successfully enhance their innovation performance.

By adopting a knowledge-based view (KBV) approach to the firm, one of the most important ways to promote co-learning and create successful networked innovations is the proper application of inter-organizational knowledge mechanisms (Lavie et al., 2012). The literature addresses a range of inter-organizational knowledge mechanisms, the most important of which are physical relocation, concurrent product definition and design-build teams (Nobeoka & Baba, 2001), supplier associations, voluntary learning, and problem-solving teams, forums, boundary spanners, and manufacturing audits (Chai et al., 2003; Chai & Yap, 2004), supplier's certification (Knoppen et al., 2011), informal meetings, and dynamic virtual processes (Spraggon & Bodolica, 2012), and document transfer (Feller et al., 2009). Since these mechanisms can help both knowledge sharing and knowledge co-creation, they have a significant impact on the firm's co-learning and innovation performance.

This study distinguishes itself from previous researches by solving some of the following theoretical dilemmas. On the one hand, in spite of the various emphases of the inter-organizational relationship literature on the critical role of networking capability in a firm's innovation performance, the manner and causal mechanism of networking capability impact

on the performance has not been thoroughly analyzed (Kauppila, 2013; Jafari Sadeghi & Biancone, 2017). On the other hand, although the previous studies of knowledge management and organizational learning have identified numerous inter-organizational knowledge mechanisms that have a significant impact on inter-organizational relationships and firm innovation performance (Smeds et al., 2001; Edquist et al., 2002), the effect of these mechanisms on enhancing co-learning has not been investigated. Therefore, although previous research has separately explored the role of networking capability and inter-organizational knowledge mechanisms in enhancing firm innovation performance, the gap in the literature is the need to examine these factors simultaneously (Feller et al., 2009). The literature review suggests that there is little empirical work investigating how networked collaborations simultaneously affect the application of inter-organizational knowledge mechanisms and enhance firm innovation performance (Heidenreich et al., 2014; Weber & Heidenreich, 2016). In this regard, Fang and Pigneur (2010) emphasized the necessity of explaining the networking capability impact on the level of knowledge transfer and consequently, innovation outputs. Since most previous researches have focused on only one or two of the above variables, their cumulative effect hasn't been examined yet. Therefore, this study seeks to answer the central question: "How does networking capability enhance firm innovation performance?" The theoretical insights of this study will help scholars gain a better understanding of how resources, actions, and performance are interacting in the field of inter-organizational relationships, and thus, they can expand this research stream through further research.

2. Basics and Literature Review

2.1. Open innovation paradigm

In recent decades, the literature on innovation management has increasingly turned to a network perspective (Santoro et al., 2018), the main reason being the decline in firms' gains from in-house R&D (Laursen & Salter, 2006). The purpose of the emerging open innovation paradigm is to share development costs and accelerate the innovation process (Chesbrough, 2006; Bengtsson et al., 2015; Santoro et al., 2020). According to this theory, firms should not assume that innovation sources are confined to their boundaries, but must actively leverage external sources (Santoro et al., 2020). Open innovation networks comprise a wide range of partners that provide a heterogeneous set of resources. Participation in these networks enables firms to reduce the time to market and predict future technological trends (Chesbrough, 2006; Santoro et al., 2019). Open innovation is defined as “a distributed innovation process based on purposively managed knowledge flows across organizational boundaries. These flows of knowledge may involve knowledge inflows to the focal organization, knowledge outflows from a focal organization or both” (Chesbrough & Bogers, 2014). According to this definition, open innovation has three inbound, outbound and coupled approaches: the flow of knowledge from outside to the firm, the leveraging of own intellectual capital outside the firm boundaries, and the simultaneous use of both (Chesbrough, 2003; Santoro et al., 2019). Studies show that various issues in the open innovation area have been addressed by researchers (Gassmann et al., 2010), among which the relationship between open innovation and innovation performance is one of them (Cheng & Huizingh, 2014; Bengtsson et al., 2015). The purpose of our study is to explore this relationship from the perspective of knowledge mechanisms and learning and to derive some contribution in this field.

2.2. Networking capability

A business network is a set of actors, including large and small firms, organizations, universities, research institutions, individuals, and inter-organizational relationships that seek to accomplish a specific goal by exchanging resources and engaging in collaborative activities. In general, networks can be divided into two categories, centralized networks and decentralized or self-organizing networks (Provan et al., 2007; Jafari-Sadeghi et al, 2017). The former is a network in which one or more firms, as a hub firm or a focal firm, are responsible for the orchestration of the entire network (Dhanaraj & Parkhe, 2006). Networking, as one of the core capabilities of the hub firm, is defined as the ability to develop and deploy a network to accomplish specific goals (Tidd & Bessant, 2013; Mahdiraji et al, 2015) with a focus on the acquisition of complementary external resources. In other words, networking as hybrid governance allows the focal firm and other partners to focus on their core business while leveraging other firms' resources to enhance innovation capability (Parida et al., 2009). Because of its central position in the network, the focal firm has both greater awareness and broader access to relevant knowledge than other network actors (Tsai, 2001). Gulati et al. (2011) emphasized that the focal firm should pay particular attention to various aspects of networking, including partner selection and evaluation, examining their resources, and developing inter-organizational routines to utilize members' resources to improve their capabilities. The literature has provided various definitions and dimensions for the focal firm's networking capability (Walter et al., 2006; Dhanaraj & Parkhe, 2006; Nordin et al., 2018). This study is based on Maitrega et al.'s (2012) definition of networking capability "a set of organizational activities and routines, which are implemented at the organizational level of the focal firm to initiate, develop, and terminate business relationships to gain an advantage by the firm." This construct consists of partner selection, coordination, conflict resolution, and resource sharing (Miterga et al., 2012; Ripollés & Blesa, 2017; Jafari-Sadeghi, 2019).

2.3. Inter-organizational knowledge mechanisms

The knowledge management and organizational learning literature partly focus on introducing inter-organizational knowledge mechanisms and points out various issues in this area (Hansen & Lema, 2019). Physical relocation mechanism means temporary or permanent transmission and rotation of human resources across the network. Besides, Nobeoka and Baba (2001) defined the concurrent product definition mechanism as the interactions between product components, manufacturability, and functionality considered by all project members in the early stages of their development. In the design-build teams' mechanism (Nobeoka & Baba, 2001), a set of teams is also formed to manage the project systematically, and the higher-level teams manage the downstream teams. Three other mechanisms are supplier associations, consulting/problem-solving teams, and voluntary learning teams (Dyer and Nobeoka, 2000). The supplier association mechanism aims to share information between the focal firm and suppliers and to enhance their capability. In a consulting/problem-solving team mechanism, the focal firm sends teams to their plant to assist its suppliers. Voluntary learning teams are mechanisms whose primary purpose is to improve the status of suppliers by connecting them. Within this mechanism, colonies of suppliers are formed, and the colony's members make periodic visits to each other's plants. Chai et al. (2003) and Chai and Yap (2004) introduced

three mechanisms of forums, boundary-spanners, and manufacturing audits. Forums are periodic meetings where engineers and managers discuss their specialties and roles. Boundary-spanners play a facilitating role in know-how sharing and enhance the efficiency of sharing by understanding the context of network members. In the manufacturing audit mechanism, the focal firm of the network evaluates partners' performance, and after doing so, offers suggestions for improving them. Another mechanism used in capability building is supplier certification (Knoppen et al., 2011). In this mechanism, the focal firm evaluates suppliers' processes and measures their commitment to corrective actions. Moreover, informal meetings and dynamic virtual processes are used (Spraggon and Bodolica, 2012). Informal meetings are unstructured and highly dynamic, and they are based on the spontaneous activities of the network partners. Dynamic virtual processes are communications that enable the virtual transfer of data. Finally, Feller et al. (2009) have also referred to document transfer. Documents contain a variety of explicit knowledge that may not have been documented to date. Effective document transfer between network members will enhance knowledge sharing and application.

2.4. Inter-organizational learning

In addition to the three individual, group, and organizational levels, there is a fourth level of learning, which is referred to as supra-firm, in the context of collaborations and networks (Beesley, 2004). Manuj et al. (2014) argued that inter-organizational learning is "a complex social process in which firms learn from each other or learn with one another to co-create new knowledge." The literature emphasizes that inter-organizational learning is one of the most effective ways of external knowledge acquisition. Network members can increase knowledge sharing through the inter-organizational learning process. Inter-organizational learning is achieved through an interactive process and enables the firm to develop innovation capability (Huang, 2010). Knowledge creation in inter-organizational learning requires aggregating the knowledge bases of different sources and integrating it with the existing knowledge base of the organization (Tsai, 2001; Jafari-Sadeghi et al, 2019), and it manifests itself in the performance of both parties (Inkpen & Tsang, 2005). By summarizing the existing learning processes in the literature, Huang (2010) has concluded that co-learning consists of two general inter-organizational and intra-organizational learning processes. Inter-organizational learning refers to the co-development of a new knowledge base, and intra-organizational learning refers to internalize the knowledge created and its synthesis with the existing knowledge base. Hence, inter-organizational learning can be defined as the co-creation and individual absorption of knowledge by two or more partners. Accordingly, it can be concluded that inter-organizational learning is related to both knowledge sharing and knowledge creation (Peronard & Brix, 2019).

3. Theoretical Framework and Hypothesis Development

Although the role of resources in gaining firms' competitive advantage has been strongly emphasized in various researches, the literature has not paid much attention to the actions needed to leverage these resources (Sirmon et al., 2007). In this regard, only a part of the strategic management literature deals with the role of strategic actions in achieving competitive advantage and enhancing firm performance (Grimm et al., 2006; Miller et al., 2008). Consistent with the theoretical foundations of this stream, some studies have attempted to explain the

causal mechanism between resources and performance (Ketchen et al., 2007; Newbert, 2007; Kraaijenbrink et al., 2010). This literature stream emphasizes the need for pragmatism and the design and implementation of a set of actions for implementing strategies and utilizing resources and capabilities. This approach scrutinizes the path between firm resources and performance and provides a better explanation of the relationship by introducing intermediary actions. Such a perspective argues that resources are the facilitators and enablers of actions (Ndofor et al., 2011). In turn, actions are the conservators and transformers (Zhou et al., 2008) of resources. Resources per se do not affect performance, and in return, actions make resources effect actually (Sirmon et al., 2007; Ndofor et al., 2011). Firms that do not have the necessary resources are likely to see a limited range of actions (Ndofor et al., 2011). Actions subject resources and may take place in different areas (Newbert, 2007). Kauppila (2013) argues that although "possessing strategic resources is necessary, it is not sufficient, because firms must also take appropriate actions to utilize these resources. Whereas capabilities are resources possessed by the firm, strategic actions are different and must be taken to leverage capabilities". In other words, the actions describe what a firm does, and the capability determines how well the firm can perform this action. The potential value of resources is realized by capitalizing actions on them (Ketchen et al., 2007; Sirmon et al., 2007). Therefore, this approach differentiates between resource ownership and exploitation (Newbert, 2007; Jafari-Sadegh et al, 2019) and explains why some firms have performance differences despite possessing similar resources and context (Zott, 2003). The resource-based view (RBV) also somehow endorses this approach. According to the VRIO framework, a firm achieves sustainable competitive advantage if it can acquire valuable, scarce, and costly resources to compete, and to organize itself to take full advantage of these resources. Therefore, organizing management systems as well as designing relevant strategic actions leads to maximum utilization of resources and implementation of organizational strategies (Miller et al., 2008). Based on these theoretical foundations, this study seeks to identify the set of strategic actions needed to complete the causal chain between networking capability and innovation performance. Therefore, with an emphasis on KBV's approach to the firm, we will examine the mediating role of strategic actions of inter-organizational knowledge mechanisms and inter-organizational learning in the relationship between networking capability as a strategic resource and firm performance. Figure 1 illustrates the conceptual model of this study that demonstrates how networking capability plays a role in firm innovation performance.

Please insert Figure 1 here

The differences between our proposed model and other similar studies will provide some contributions. As a case in point, the distinction of our framework with Kauppila (2013) is looking at inter-organizational relationships from a network perspective and knowledge-based view (KBV), and with Tarek and Adel (2019) is to consider the simultaneous effect of knowledge mechanisms and learning as intermediary actions on the one hand and to consider the performance effect of capability-building process on the other.

3.1. Networking capability with inter-organizational knowledge mechanisms and inter-organizational learning

Since inter-organizational networks provide an excellent platform for co-learning and inter-organizational knowledge sharing (Simonin, 2004), they are a useful form of organizational learning (Inkpen & Tsang, 2005). Furthermore, they can play a useful role in the effective and efficient application of inter-organizational knowledge mechanisms to enhance innovation (Weber & Heidenreich, 2016). Previous studies argued that networking capability facilitates inter-organizational knowledge sharing (Capaldo, 2007), through which the focal firm can control information flows and knowledge transfer across the network. The literature emphasizes that participating in networks is itself a mechanism for knowledge sharing (Singh et al., 2016); thus, can lead to a firm's competitive advantage.

The research argues that the synthesis of internal and external knowledge leads to the effective development of the new product, process, technology, and market. Networking reduces the time and volume of investment needed to acquire knowledge by creating communication channels and facilitating access to information (Hildreth & Kimble, 2004; Scuotto et al, 2017). There is little empirical evidence on how networking capability affects inter-organizational knowledge mechanisms. Although few studies have examined the relationship between them (Heidenreich et al., 2014; Weber & Heidenreich, 2016; Ferraris et al, 2017), based on existing literature, we will attempt to explain how knowledge mechanisms are reinforced by networking capability.

Partner selection is an essential aspect of networking capability that involves importing and exporting partners into the network. Miterga et al. (2012) believed that the focal firm focuses on a wide range of characteristics for partner selection, including reputation, prestige, innovativeness, relative bargaining power, financial potential, and openness. Partner selection plays a vital role in applying knowledge mechanisms (Heidenreich et al., 2014) so that it can further assist in finding and identifying the knowledge needed by the focal firm (Grant & Baden-Fuller, 2004). Moreover, by utilizing coordination, the focal firm enables the resources and capabilities of the network members to be appropriately allocated to specified activities.

Coordination also enhances knowledge sharing and aligns the learning activities of network partners (Kandemir et al., 2006). Coordination is a key factor in enhancing the effectiveness of concurrent engineering and design-build teams knowledge mechanisms in inter-organizational projects because the success of implementing concurrent engineering depends on the creation of a common language and the sharing of similar knowledge by different functional teams involved in the project (Nobeoka & Baba, 2001). In other words, the effectiveness of knowledge transfer and management requires the adoption of coordination principles. In addition, conflict resolution can facilitate the implementation of inter-organizational knowledge mechanisms. Adler and Kwon (2002) emphasized that social relationships between network actors reinforce resource exchange and knowledge transfer between them. Many collaborations lead to conflict between partners due to miscommunication and misunderstanding (Cao & Zheng, 2011; Jia et al, 2013; Ferraris et al, 2017). However, it should be emphasized that mutual trust can reduce opportunistic behaviors and conflict and facilitate inter-organizational knowledge sharing.

Therefore, the successful implementation of knowledge mechanisms depends on resolving potential conflicts between partners. Resource sharing is another aspect of networking capability that has a significant impact on inter-organizational knowledge mechanisms. Providing technical equipment and financial resources to network members can make the inter-organizational knowledge mechanisms more effective. For instance, the focal firm can invest in a software platform to provide real-time and secure communication between network members, thereby enhancing the virtual process mechanism. In another case, the focal firm can provide network partners with collaborative workplaces, thereby improving team-building mechanisms. Based on the above discussions, this study concludes that networking capability will facilitate the implementation of inter-organizational knowledge mechanisms. Thus, the first hypothesis is designed as follows.

Hypothesis 1. There is a significant and positive relationship between networking capability and the application of inter-organizational knowledge mechanisms.

Networking has tangible effects such as cost savings, in addition to the intangible impacts, such as learning, which is mentioned in the literature. Besides few studies that have directly addressed co-learning (e.g., Kale & Singh, 2007; Santoro et al, 2018), some other studies have also emphasized the role of inter-organizational collaborations in enhancing co-learning (Kale et al., 2002; Huang, 2010). Learning perspective to collaborations views knowledge acquisition and assimilation as the main goal of inter-organizational relationships (Peronard & Brix, 2019). Therefore, the main motivation for participating in inter-organizational networks is learning how to share knowledge and positioning in a way that guarantees access to the maximum knowledge available in the network.

Firms usually collaborate on networks to improve organizational learning to build collaborative know-how. Meanwhile, networking capability plays an important role in enhancing inter-organizational learning. By selecting the right partners and building long-term relationships with them, the focal firm can solve its problems jointly with its partners' help (Claycomb & Frankwick, 2010; Beheshti et al, 2016). Network learning not only requires establishing information sharing practices between partners but also requires converting information into knowledge and applying it (Prashantham & Young, 2011; Mahdiraji et al, 2012). Since each one of the network partners brings their unique knowledge and capabilities to the network, coordinating them by the focal firm leads to the creation of new knowledge (Parida et al., 2009). Communication available in the network enhances behavioral transparency and reduces information asymmetry (Paulraj et al., 2008; Ferraris et al, 2018), resolves conflicts and thereby facilitates co-learning. Organizational learning research suggests that firms can learn better from each other when they have similar capabilities and that collaborations lead to better learning outcomes and better financial performance when partners have complementary resources and capabilities. Sharing these resources and capabilities can significantly affect network learning. Based on the above discussions, we conclude the second hypothesis as follows.

Hypothesis 2. There is a significant and positive relationship between networking capability and inter-organizational learning.

3.2. Inter-organizational knowledge mechanisms and inter-organizational learning

Knowledge sharing through inter-organizational collaborations is challenging, costly, and time-consuming because of the need for collaborative systems between partners and the high dependence of knowledge on members. These organic systems facilitate knowledge integration in the network, increase the frequency and breadth of information exchange, facilitate knowledge creation and problem-solving (Nileson, 2005), enhance learning, and have a great impact on collaboration output (Feller et al., 2009).

The literature on knowledge management confirms how inter-organizational knowledge mechanisms are applied in effective inter-organizational learning and considers their role in creating collaborative knowledge-sharing systems. For instance, the selection of mechanism depends on the type of knowledge required. Although some sharing mechanisms, such as physical relocation, learning teams, and problem-solving teams are more appropriate for implicit knowledge sharing, some other mechanisms, such as the supplier association, are more appropriate to explicit knowledge transfer. Besides, these mechanisms must also be proportioned to the technological or managerial nature of knowledge, learning phases (Chai et al., 2003), and product development phases (Distanont et al., 2012; Amoozad Mahdiraji et al, 2018). Proportionality means identifying and monitoring the content and use of these mechanisms in practice (Feller et al., 2009).

These cases demonstrate that the realization of inter-organizational learning is largely dependent on the selection and application of the mechanisms used in knowledge sharing (Easterby-Smith et al., 2008; Spraggon & Bodolica, 2012; Mahdiraji et al, 2014). If the type of mechanism used does not fit the time and context of the collaboration, one cannot expect a good output in inter-organizational learning. Therefore, this study argues that successful inter-organizational learning is strongly influenced by the application of inter-organizational knowledge mechanisms. The smarter these mechanisms are used, the more inter-organizational learning will increase. Accordingly, the third hypothesis is scheduled as follows.

Hypothesis 3. There is a significant and positive relationship between the application of inter-organizational knowledge mechanisms and the level of inter-organizational learning.

3.3. Performance implications of networking capability, inter-organizational knowledge mechanisms, and inter-organizational learning

Various studies emphasized the role of networked collaborations in enhancing innovation performance (Faems et al., 2005; Gulati et al., 2011; Singh et al., 2016). Networked relationships provide the knowledge, skills, capital, talent, and equipment required for innovation. Collaborative networks lead to both the improvement of existing products and processes (exploitation) and the development of new products and processes (exploration) (Rothaermel, 2001; Rothaermel & Deeds, 2004). Network collaborations eventuate a broader knowledge base of the firm resulting in better performance.

By building a common understanding of the benefits among network members, networking reduces the risk of intra-network competition, provides a specific system for protecting intellectual property, and avoids opportunistic behaviors (Pittaway et al., 2004; Mokhtarzadeh

et al, 2018). Networking leads to solving network problems collaboratively to speed up their exposure. Experimental evidence suggests that more networking experiences will lead to higher levels of performance in future collaborations. Multilateral interactions between network members discover new opportunities, create new ideas, and increase novelty. However, it should be noted that the more relationships a firm grow and the more networked it becomes, the more difficult it is to manage (Parida et al., 2009; Ferraris et al, 2019).

Gulati et al. (2011) argued that the impact of networks on organizational performance requires the simultaneous functioning of three mechanisms. If the firm has the potential to access and select remote organizations with different characteristics and resources (reach), to identify what combination of intra-organizational resources with network resources leads to synergy and value creation (richness), and to implement coordination processes to objectively achieve and enhance the effectiveness of inter-organizational flows and channels (receptivity), it can enhance its performance through networks. Therefore, it can be said that networking affects the acquisition of new capabilities and the improvement of existing capabilities. Partner selection and coordination capabilities will lead to compatibility and complementarity between the different network partners' resources, which will have a significant impact on enhancing the performance of the focal firm.

Besides, the conflict resolution capability results in better and more understanding of network partners and increased network cooperativeness. Although, there is typically some level of positive conflict in the network, managing negative conflicts in the network is always important (Mele, 2011). Conflict management can be done through destructive methods, including domination, confrontation, and/or through constructive methods, including smoothing over or ignoring/avoiding the issue. The more use of constructive methods and the less use of destructive methods can have a significant impact on the success of network relationships. Moreover, one of the reasons for the effect of networking on innovation is the capability of network partners to share complementary resources (Park et al., 2004; Faems et al., 2005).

Rothaermel's (2001) study showed that established pharmaceutical companies that have the resources needed to commercialize new technology are better able to adapt to new technological changes through an alliance with newcomers. Taylor and Helfat (2009) also reported that established companies transitioning to new technology need to be in touch with both technology developer firms and those that have the resources required for commercializing innovation. Therefore, networking can lead to resource synergy and thereby promote innovation by enhancing complimentary resource sharing. Based on the above, this study argues that a firm, which brings together a variety of partners through networking, can better meet the innovation challenges and has a better performance. Thus, the fourth hypothesis results as follows.

Hypothesis 4. There is a positive and significant relationship between networking capability and firm innovation performance.

The importance of access to external knowledge is increasing (Chesbrough, 2006) and the impact of knowledge sharing on collaboration performance (Nielsen, 2005) and firm performance (Kotabe et al., 2003) is confirmed by the literature. The knowledge sharing related to the market trends and future product roadmap of the focal firm with network partners results

in aligning firm orientations with their priorities and requirements (Oshri & Newell, 2005), which enhances the focal firm's innovation performance. Knowledge sharing reduces market entry time and costs and increases the firm's willingness to develop new products and deliver them to new markets (Yli-Renko et al., 2001). However, the implicit nature of the knowledge transferred and the need to control for other factors affecting firm performance make it difficult to trace the performance outcomes of knowledge sharing (Easterby-Smith et al., 2008).

Since the innovation performance of the focal firm is mainly dependent on the performance of network members around it, the network member capability is of strategic importance. Applying a wide range of inter-organizational knowledge mechanisms helps the focal firm to empower network members and leads to multiplexity in focal firm relationships. Multiplexity, which means the necessity of extensive interpersonal and inter-department communications between partners, reduces search, coordination and monitoring costs and facilitates knowledge flows on the network (Gulati et al., 2011), thereby enhances the focal firm's innovation performance. The more strategic the focal firm's innovation goals are, the more interoperability mechanisms should be used (Prevot, 2005).

Applying mechanisms that are rich and iterative in knowledge sharing will also help integrate knowledge (Marshall & Brady, 2001) and thereby increases inter-organizational learning and innovation. Therefore, how to apply inter-organizational knowledge mechanisms strongly influences firm innovation performance, and firms adopting appropriate mechanisms have better innovation performance (Feller et al., 2009; Weber and Heidenreich, 2016). Correspondingly, the fifth hypothesis is organized as follows.

Hypothesis 5. There is a positive and significant relationship between the application of inter-organizational knowledge mechanisms and firm innovation performance.

Investigating the performance impact of inter-organizational collaborations requires the simultaneous analysis of the collaborative performance and effect of collaboration on the firm's performance (Cao & Zheng, 2011). Investing network partners in shared and complementary resources creates interdependence between them, which reinforces the synthesis of both parties' knowledge and the creation of new knowledge (Cai et al., 2009; Razavi Hajiagha et al, 2015). Since innovation requires access to new knowledge and combinatory knowledge, and collaborative learning results in the efficient incorporation of internal and external knowledge bases by the focal firm, it can be concluded that increased innovative outputs require co-learning (Faems et al., 2005; Easterby-Smith et al., 2008; Hajiagha et al, 2015a,b; Zhou et al., 2018; Linder & Sperber, 2019). Co-learning helps a firm gain both unfamiliar knowledge and learn how to combine new knowledge with their previous knowledge. This study argues that collaborative performance demonstrates itself in the level of co-learning that is a driver for improving firm innovation performance. Therefore, the sixth hypothesis engenders as follows.

Hypothesis 6. There is a positive and significant relationship between inter-organizational learning and firm innovation performance.

4. Research Method

The study population consists of companies working in the Iranian automotive industry. The participants of our research are firms' experts, employees, and managers working in this industry. Because of their organizational role, our respondents are better able to comment on the research core concepts and can be considered as a key informant. Project, product and R&D managers, production process managers, cooperation managers, and strategic planning experts have a good understanding of project technological learning, product and process innovations, and project innovation network.

Several factors make the research environment relevant to the core issues of this study. First, the innovation performance of the automotive industry is influenced by both product innovations and process innovations (Utterback and Abernathy, 1978; Voss, 1994). This makes the automotive industry better suited for a comprehensive review of innovation performance, compared to industries that are purely product-centric or process-centric. Second, the automotive industry, due to the systemic and modular nature of the product has long been comprised of vertical / supply networks, and recent technological changes in the industry have created many horizontal collaborative networks (Batchelor, 2006; Sturgeon et al., 2008). Therefore, it can be said that there is a networking phenomenon. Due to the increasing complexity, expansion, and diffusion of the automotive industry's knowledge base, the locus of innovation lies in firms' network domain rather than focusing on an individual firm. Third, since the cost and quality of an automaker's product are largely dependent on its network productivity, in this industry, the inter-organizational knowledge sharing, and learning is crucial and relevant to empower partners and automakers (Dyer and Nobeoka, 2000).

4.1. Data collection and sampling

In this study, due to the latent nature of the variables studied, the required data was collected through a web-based cross-sectional survey. First, the content validity of the measurement tool was evaluated by experts, and some modifications such as re-wording, deleting, and re-sequencing was performed. Then, a pre-test was conducted to assess the reliability of the measurement tool, and a limited number of questionnaires were sent to the experts. The overall Cronbach's alpha was 0.912. According to statistics provided by the Iranian Vehicle Manufacturers Association (IVMA) and Iranian Auto Parts Manufacturers Association (IAPMA), Iran has 28 active automakers and 1,200 active auto part-manufacturing units. Therefore, the study population size was 1,228. The power analysis method and G* Power software were used to determine the sample size. Accordingly, the sample must be at least ten times the number of paths in the structural model (Hair et al., 2017). The minimum sample size needed to achieve the 75% coefficient of determination at a 95% confidence level is n=187. In this study, for more reliability, the sampling process continued until more than 200 valid questionnaires were obtained. Companies were first contacted by phone, and explaining the purpose of the research, and we seek to gain satisfaction with the survey and identify key informants. The questionnaires were then sent via email to all of these firms. A week after the initial email, a reminder email was sent, and two weeks after the initial email, a follow-up phone call was made for some firms. As a result, a total of 213 questionnaires were returned. Thirteen questionnaires were excluded from the analysis due to miss data as well as the lack of respondent's qualifications. Afterward, the sample size and effective response rate were 200

and 16%, respectively. The response rate obtained in this survey is roughly within the range of similar investigations (e.g., Feller et al., 2009; Heidenreich et al., 2014; Weber & Heidenreich, 2016). The sample profiles are shown in Table 1.

Please insert Table 1 here

4.2. Measures

Appendix A shows the research variables, 31 items, and test results associated with the quality of the measurement tool. The survey questionnaire was developed based on the available measures in the literature. A five-point Likert scale with options ranging from 1 ("strongly disagree") to 5 ("strongly agree") was adopted. Since this study was conducted in Iran, the items were translated into Persian by a professional translator.

The networking capability items were designed based on partner selection, coordination, conflict resolution, and resource sharing (Miterga et al., 2012; Ripollés & Blesa, 2017). The items of inter-organizational knowledge mechanisms were designed based on the measures identified in the literature. For each of the mechanisms, a brief description and corresponding item were considered in the questionnaire. Inter-organizational learning was adopted according to Janowicz-Panjaitan and Noorderhaven (2008) and Schilke (2014). Since it was challenging to collect objective data on the firm's innovation performance, its subjective data was collected from the firm's key informant. According to Frishammar and Horte (2005) and Chen et al. (2009), measures related to this variable were designed based on the accepted category of product innovation and process innovation.

4.3. Key informant, non-response, and common method biases

Surveys are typically influenced by some biases that the researcher needs to avoid by taking schemes. First, even though the unit of analysis in this study was the companies working in the automotive industry, the required data were collected from the key informant of each company. This may lead to key informant bias. However, while this approach may not be ideal in firm-level studies, its application is common in empirical research (Liu et al., 2016). In this study, in order to reduce the key informant bias, a set of criteria for respondent's qualification was considered, including job position, job title, job experience, duration of cooperation with the company, level of education, and familiarity with the core research issues (Kortmann et al., 2014).

Respondents who did not meet the above criteria were excluded. Second, non-response bias means that there is a significant difference between respondents and non-respondents. The literature introduces two methods for estimating non-response bias, examining the difference between early and late respondents as well as the difference between respondents and non-respondents. According to the first method and based on the t-test results, there was no significant difference between those who completed the questionnaire after the first email and those who completed the questionnaire after the reminder email and follow-up phone call. Based on the second method, some follow-up phone calls were made to non-cooperating firms, and they were asked to complete the questionnaire. Based on the t-test results, there was no

significant difference between the mean scores of the variables and the items of this group with earlier participants. Therefore, it can be said that the results of this study are not affected by the non-response bias.
The follow-up phone calls showed that the main reason for non-response was daily occupations and lack of time as well as the fear of disclosing the firm's confidential information. Third, common method bias occurs when the difference in responses is more affected by the common method of scaling metrics extracted from a single data source rather than by the respondents. In the SEM-PLS approach, if the VIF is less than 3.3, there is no multicollinearity between the items; therefore, the measurement model is not affected by the common method bias (Kock, 2015). The analysis of the measurement model shows that this study is not concerned with this biased perspective.

5. Analysis and Results

PLS-SEM is a well-known multivariate statistical approach that explores causal relationships among a set of latent constructs (Hair et al., 2011). This approach is a variable-based method that examines changes in the dependent variable (s) through the manipulation of the independent variable (s). As the literature emphasizes, if the sample size is small and the distribution is abnormal, this approach is superior to other techniques (e.g., LISREL and AMOS covariance-based approaches) (Goodhue et al., 2012). In this study, SmartPLS 3 and IBM SPSS 25 software were used for data analysis. The PLS-SEM analyses are generally divided into two categories (Chin, 2010). The first category examines the measurement model. When sufficient evidence indicating the validity and reliability of the measurement model is obtained, the structural model can be evaluated. Here, first, the results of the measurement model analysis and then the results of the structural model analysis are provided.

5.1. Measurement model analysis

The measurement model examines the relationship between items (manifest variables) and constructs (latent variables). In the PLS-SEM approach, the quality of the measurement model is evaluated based on (convergent and discriminant) validity and reliability. The model convergent validity is confirmed if the items factor loadings are above 0.7, AVE is above 0.5, and composite reliability (CR) is above 0.8 for all variables (Hair et al., 2010; Kock, 2012). The reliability of the measurement model is also assessed by Cronbach's alpha coefficients and composite reliability (CR), which confirms compliance with benchmarks. Appendix A shows the results of the model validity and reliability assessment. The Heterotrait-Monotrait (HTMT) ratio was also used to evaluate discriminant validity. If the values of this criterion are less than 0.9, discriminant validity is acceptable (Henseler et al., 2015), which is consistent with the results as in Table 2, indicating the discriminant validity of the measurement model.

Please insert Table 2 here

5.2. Structural model analysis

The structural model explores the causal relationships between constructs by extracting data patterns and examines the consistency of the theoretical model through experimental data. In this study, the results of the structural model quality assessment indicate the model's goodness of fit with data as in Table 3. The PLS-SEM provides some indicators for evaluating the structural model, including R^2, Q^2, and GOF. These indicators measure the consistency, predictive power, and explanatory power of the theoretical model. For R^2, 0.19, 0.33, and 0.67 are presented as low, medium, and high values, and for Q^2, 0.15, 0.2, and 0.35 are presented as low, medium and high values (Henseler et al., 2013). Moreover, for GOF, 0.1, 0.25, and 0.36 are presented as low, medium, and high values (Wetzels et al., 2009). The blindfolding technique was used to calculate in SmartPLS software. In this study, the blindfolding values were obtained based on the two cross-validated communality and cross-validated redundancy indices for all positive constructs greater than 0.35. Since the indices have a good fit; therefore, the model's predictors well explain the variance of the dependent variable; thus, the quality of the structural model is confirmed.

Please insert Table 3 here

The model implementation specifies the path coefficients and t-values of the six research hypotheses shown in Figure 2 and Table 4. At the 95% confidence level, t-values above 1.96 indicate that the study hypotheses are supported. As can be observed, all the research hypotheses are supported.

Please insert Figure 2 here

According to the results, the networking capability with 0.810 and 0.269, respectively, has a positive impact on inter-organizational knowledge mechanisms and inter-organizational learning. Inter-organizational learning with 0.663 is also affected by inter-organizational knowledge mechanisms. Besides, the coefficients of the performance effect of networking capability, inter-organizational knowledge mechanisms, and inter-organizational learning are 0.345, 0.520, and 0.375, respectively. All coefficients are significant at the 95% level.

Please insert Table 4 here

Since the inter-organizational knowledge mechanisms and inter-organizational learning play a mediating role, this role needs to be explored as well. Sobel statistic is used to test the significance of indirect effects caused by a mediator variable. This statistic is determined by the following equation.

$$Z = \frac{a \times b}{\sqrt{b^2 s_a^2 + a^2 s_b^2}} \quad (1)$$

Where (a) is the path coefficient between independent and mediator variables, (b) is the path coefficient between the mediator and dependent variables, (S_a) is the standard error of independent and mediator variables' path, and (S_b) is the standard error of mediator and dependent variables' path. The Sobel values of knowledge mechanisms and inter-organizational learning are 5.644 and 2.605, respectively, in which their mediation effect is confirmed (>1.96). The variance accounted for (VAF) statistics must be calculated to determine the mediation strength. VAF is determined by the mediation (indirect) effect on the total effect ratio (Zhao et al., 2010). According to Hair et al. (2017), if the VAF is greater than 80%, the mediation is complete, if it is between 20% and 80%, the mediation is moderate, and if it is less than 20%, the mediation is very slight. The results of the mediation test are presented in Table 5. The results indicate that despite the mediation, its strength is low.

Please insert Table 5 here

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6. Discussion and Implication

The main purpose of establishing inter-organizational networks is to access, integrate, and leverage partner resources (Gulati et al., 2011). Network resources may include intellectual property rights, marketing channels, production facilities, and partner staff. Understanding the relationships between resources and actions will increase our understanding of why there are performance differences between firms because the firm's resource portfolio affects not only its actions but also the sequence of those actions (Ndofor et al., 2011). Recently, a stream of literature has emerged that explores the relationship between resources and firm performance. A resource-action-performance theoretical framework (Ketchen et al., 2007) opens a window for scholars to conduct empirical research (e.g., Wei & Wang, 2011; Kauppila, 2013). According to the contribution of this stream for RBV, what justifies the difference between firms' performance is their strategy of how to utilize and leverage resources. Therefore, although it is necessary to know the performance implications of inter-organizational relationships, it is more important to determine the firms' practical strategies to take intermediary actions.

Although previous research has emphasized the role of resources in enhancing firm performance, the strategic actions facilitating this impact are still unknown. According to Wei and Wang (2011), firms need to understand that a firm's resource base development and implementation of strategic actions are correlated, so that the implementation of actions requires the acquisition of the resources needed and the exploitation of resources requires appropriate actions. Furthermore, the co-evolutionary understanding of resources and strategic actions leads to this lesson that there is a direct relationship between capability-building and capability-exploiting. The more the firm can take effective actions to exploit its capabilities, the more it will help build and develop those capabilities. Leveraging the capability deepens its routines and enhances its level. However, limited studies are examining the capability-building mechanisms (e.g., Helfat & Peteraf, 2003; Lavie, 2006; Sirmon et al., 2007; Daneels, 2011). It seems that the resource-action-performance framework can also be used to derive capability-building mechanisms. This framework can provide some insights into clarifying

how to take capability-building actions on asset utilization, capability formation, and its influence on the firm's performance.

Networking capability is one of the main strategic resources of the firm. This study argues that firms need to put two key actions to exploit networking capability, including the application of inter-organizational knowledge mechanisms and inter-organizational learning activities. These two key actions facilitate the impact of networking capability on firm innovation performance indirectly. This study also helps identify some of the antecedents and consequences of inter-organizational knowledge mechanisms and inter-organizational learning. The results of this study show that on the one hand, in the current situation, the realization of innovation performance largely depends on the knowledge actions of firms, and on the other hand, these knowledge actions need to be done collaboratively because of the increasing environmental complexity. In line with this, companies networking managers should not just rely on collaborative activities but should consider utilizing networking for inter-organizational knowledge sharing and inter-organizational learning.

The theoretical contributions of this study could be examined from several viewpoints. First, this research, consistent with previous studies, sought to broaden the theoretical scope of RBV and provide a better understanding of the causes of performance differences among firms with similar resources. Focusing on intermediary actions between resources and performance would partially alleviate the RBV gap in explaining how resources affect the firm's competitive advantage (Priem & Butler, 2001).

Second, the focus of this study was to develop a more theoretical resource-action-performance framework. Considering the gap in explaining how networking capability could affect firm innovation performance, this study provided some theoretical lessons and extended the body of existing knowledge by introducing two essential actions to leverage networking capability. The interactions of networking capability, inter-organizational knowledge mechanisms, and inter-organizational learning lead to a self-reinforcing loop and affect the firm's innovation performance.

Third, another achievement of this study was explaining the role of inter-organizational knowledge mechanisms in inter-organizational learning and enhancing firm innovation performance. Previous literature overlooked the role of these mechanisms and their effects on learning, and little research was performed on why, how, and when these mechanisms are applied (Chai et al., 2003; Scholten et al., 2019).

Fourth, Ndofor et al. (2011) correctly divided a firm's strategic actions into two categories of inbound and outbound actions and emphasized the need to examine both categories. In this study, a combination of both actions was examined. Both inter-organizational knowledge mechanisms and inter-organizational learning involve intra- and inter-organizational activities. Therefore, it could be said that this study also contributed to the current body of knowledge in terms of the simultaneous investigation of intra- and inter-organizational actions.

Fifth, the contribution of this study to open innovation literature addresses the role of inter-organizational knowledge mechanisms in this field. According to the findings of this study, it is very important to use mechanisms in line with the adopted approach in open innovation. Firms that opt for an inbound approach should utilize mechanisms such as boundary-spanners, forums, virtual dynamic processes, and informal meetings, while others with an outbound approach should make use of mechanisms that transfer their knowledge to their partners (Such as the supplier association and

problem-solving teams). It seems that open innovation researchers should further investigate the role of knowledge mechanisms in terms of three open innovation approaches.

This research has also brought managerial implications to its practitioners' audience. The core practical lessons for project, product and R&D managers is the need to select and implement product-centric knowledge mechanisms within the project network to enhance inter-organizational learning and enhance product innovation. These managers should employ product-centric knowledge mechanisms such as concurrent product definition, design-build teams and boundary spanners to foster inter-organizational technological learning, which is useful to combine, integrate and apply knowledge from external counterparts. Production process managers should also concentrate on process-centric knowledge mechanisms such as supplier association, problem-solving and learning teams, audits and certifications to foster inter-organizational technological learning, which are useful to transfer and share knowledge among suppliers. Network managers need to understand how the focal firm's networking capability can affect knowledge mechanisms and inter-organizational learning. They need to understand which dimensions of networking capability have the most impact on which knowledge mechanisms. Thus, network managers must make a proper assessment of the status of the networking capability and form the portfolio of mechanisms based on it. Choosing inappropriate mechanisms will not promote the inter-organizational learning and innovation performance of the focal firm. Strategic planning experts should look at inter-organizational relationships from the perspective of the resource-action-performance framework. The firm's relational resources haven't value-adding impact if they are not exploited. One of the most important tasks of strategic planning experts is to design the strategic actions needed to utilize each of the relational resources. Matching resources and strategic actions will enhance innovation performance.

This study, like any other quantitative research, suffers from methodological limitations. Non-probability sampling and low sample size are likely to compromise the conclusions of the study. Besides, the context of the study may also influence findings and conclusions and challenge their generalizability. Future studies can focus on specific other industries such as pharmaceutical, software, and travel that have dissimilar innovation patterns and provide better conditions by changing the population and sampling procedures. Although this study contributes to clarifying the relationship between networking capability and firm innovation performance, it should be noted that the black box of this process requires further reopening. Therefore, it is recommended researchers to apply more qualitative approaches such as in-depth case studies to more accurately explain the causal mechanism between these two constructs.

In addressing this issue, this study was minimalist and merely focused on introducing intermediary actions, rather than being holistic and able to uncover all unknown aspects of the process (Beach & Pedersen, 2019). However, it is recommended to do research similar to this study and introduce resources, including financial, human, market, etc., and intermediary actions, including co-opetition mechanisms, ecosystem mechanisms, termination mechanisms, etc. in different contexts (country, Industry, etc.) within longitudinal designs. The relevant literature emphasizes that knowledge synthesis requires personal experiences, learning through complex social interactions and socialization processes.

Future studies can consider knowledge synthesis mechanisms as strategic actions and examine their intermediary role in the relationship between networking capability and performance. Feller et al. (2009) also believe that the more contractual protections in collaborations, the less the effectiveness of inter-organizational knowledge mechanisms. Moreover, future research is suggested to examine the moderating effect of this factor on the relationship between strategic actions and performance. Harryson (2008) also indicates that innovations are more likely to emerge from networks with poor communications and that such communications are more suitable for exploratory and creative activities. Furthermore, it is proposed to examine the moderating effect of the tie strength between networking capability and appropriate strategic actions. It is hoped that this study will be able to take a small step towards the theoretical development of the literature.

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