Proposing a Framework Towards Product Innovation Success: The Role of External Knowledge Type and Network Setting

James Bloodgood[1*]
[1] College of Business Administration, Kansas State University

* jblood@ksu.edu

Abstract: External knowledge in organizational networks plays a key role in organizational innovation. The explicit and tacit knowledge contained in these networks can influence the ability of an organization to access them. A key characteristic of networks that may influence knowledge sharing and acquisition in their networks is the degree of network density. This paper aims to provide a conceptual framework for understanding how network density and the degree of external knowledge tacitness interact to influence product innovation success. Using network and knowledge theories, propositions argue that explicit knowledge is more successfully accessed in open networks, while tacit knowledge is more successfully accessed in closed networks. Furthermore, external knowledge with a combination of explicit and tacit characteristics is proposed to be most advantageous and successfully accessed in networks with both open and closed characteristics.

Keywords: Knowledge, network, network density, innovation

Type: Conceptual paper

1. Introduction

Building brand equity with consumers is critical for a company's long-term success, but the consumers' path to get there has evolved dramatically in the past three decades (Tasci, 2021). As a result, the procedures for developing a strong relationship between a brand and customers receive increased attention in marketing research and practices (Vukasovi´c, 2016). Brand equity is studied due to its significant impact on financial brand value and strategy based, such as the value of having well or not well-known brand name and efficiency on marketing expenses (Keller, 1993). In addition, brand equity creates value for customers by enhancing information processing and shopping, building confidence in decision-making, reinforcing buying behaviours, and improving self-esteem (Singh and Pattanayak, 2016). Many marketers also value the concept of brand equity for its dynamic approach towards accelerating a company's business plans, generating growth in market share, and building a top-of-mind brand. For example, when a company has strong brand equity, it benefits from minimal vulnerability to competitive marketing actions, higher margins, stronger intermediary cooperation and support, and brand extension possibilities. Therefore, measuring customer-based brand equity (CBBE) is essential to understanding its competitive strength in the marketplace.

Brand equity has emerged as one of the most extensively researched topics in branding and marketing since the 1990s (Tran, May and Taylor, 2021; Motameni and Shahrokhi (1998); Singh and Pattanayak, 2016). It began to be commonly used by advertising practitioners in the 1980s. Throughout the 1990s, significant scholarly contributors included those from Aaker (1991), Kapferer (1992) and Keller (1993). However, there has been no consensus on the content and meaning of brand equity (Vázquez, Del Rio and Iglesias, 2002) and its measurement (Washburn and Plank,

2002). Today, almost all definitions of brand equity agree that the phenomenon entails the value given to a product by customers' connections with and perceptions of a specific brand name and financial (Simon and Sullivan 1990). Numerous empirical research measuring CBBE as a multidimensional construct was devoted to various product categories, such as groceries and specific product classes (Lassar, Mittal and Sharma, 1995; Washburn and Plank, 2002). Scholars asserted that a brand is the most valuable asset of a company (Aaker, 1991, Kapferer, 1992) including multinational brands.

The rise of multinational brands competing in global markets raised the question of how brands should be managed in a global and competitive environment. While management of brand values has been extensively discussed in the literature from a domestic marketing perspective, few studies have done so from an international perspective (Vukasovi´c, 2016). For example, although lubricant companies are making significant strides in establishing brand equity, the assessment of brand equity for the lubricants industry has received less attention. Specifically, understanding interrelationships between dimensions of CBBE requires further investigation (Vukasovi´c, 2016), especially in the context of the Asian emerging economy. Although considerable evidence supports the correlation between the CBBE dimensions, the interrelationship between the brand equity dimensions and its role in building brand equity for the lubricant industry remains unresolved.

The lubricants industry is critical to the global industrial sector due to its role in optimising machinery operations (Hanaysha, 2016). The automobile industry's lubricant demand accounts for more than half of global demand. With increasing global demand for lubricants, the global market value of lubricants is expected to reach USD182.6 billion by 2025 (Sönnichsen, 2021). The forecasted growth is based on increasing demand for high-performance engines and renewable energy. In the lubricant industry, brand performance and trust are the key drivers of consumer purchase intention, as most consumers are less concerned about pricing (GFK, 2012). In the competitive landscape of a marketplace, maximising the uniqueness of a product’s technology, quality, and design is challenging, as competitors can easily duplicate a design or technology and make ambiguous distinctions between the original product and its imitation. Thus, marketers and practitioners must ensure that customers can quickly identify original products by ensuring they are equipped with sufficient information. This study is expected to help marketers strategise brand positioning effectively and remain competitive.

In Malaysia, customer purchase decisions on automobile lubricants rely on mechanics or personnel at automobile workshops recommendations. The report (GFK, 2012) shows that 75% of customers accepted mechanic recommendations at workshops, and only 25% of consumers made their own decisions. The report also forecasted high brand switching if consumers have low brand awareness of a particular engine lubricants brand. Brand switching occurs when a customer is motivated to review available alternatives in the marketplace due to a change in competitive activities and changes of belief towards using a specific brand (Matzler, Strobl, Thurner, and Füller, 2015). On the other hand, low brand switching will result in brand loyalty, described by a deeply held commitment to rebuy or patronise a preferred brand consistently in the future, despite situational influences and marketing efforts having the potential to induce switching behaviour (Oliver, 1999).

As such, understanding CBBE by measuring the effects or impacts of each dimension and how they are related to each other is essential. For example, all dimensions may or may not be applied to other product brands; however, its applicability to lubricant brands remains uncertain. Previous studies argued that brand awareness has a positive and direct impact on purchase intention (Keller, 1993). However, the emergence and growth of new lubricant brands recently show that simply being aware does not indicate a positive or negative perception. Thus, assessing the brand equity dimension is vital for marketing managers from lubricant industries, as they can then use the results further to rationalise the brand expenses and customer-related marketing activities. If marketing/brand managers often have limited resources (e.g. money, time, and workforce) to implement branding strategies, these findings can help them prioritise and allocate resources across the CBBE

dimensions. Therefore, the main objective of this study is to assess the interrelationship among the dimensions of CBBE (Aaker, 1996). The findings from this study are expected to help managers design branding strategies by focusing on the dimensions of the CBBE model. Much of organizational innovation is thought to depend on obtaining new knowledge, but little has been done to connect the source of the new knowledge to the focal organization. Knowledge is not necessarily objectified. It originates from a social environment. Since interorganizational networks are ubiquitous, it makes sense to integrate their presence into the conversation more extensively (Zhang & Chen, 2021). This research examines the role of network density in enabling access of different types of knowledge by organizations in those networks.

The network literature suggests that organizations should attempt to access weak ties or open networks in an effort to acquire new or different information and knowledge they need to effectively deal with environmental changes (Granovetter, 1973). The argument is that closed networks primarily contain redundant information and knowledge which does little to help an organization positively react to a changing environment. Thus, open networks provide more unique knowledge that can benefit the organization as it responds to environmental changes. The ability of organizations to change is diminished, in part, because they often fail to search for new knowledge, and instead rely on their antiquated or obsolete existing knowledge base (Tripsas & Gavetti, 2000). Although coming into the presence of different information and knowledge may be important for organizations, the real goal is for an organization to be able to integrate the new or different knowledge into the organization so that it can act in a beneficial manner. Merely seeking different knowledge is insufficient. Thus, the need to integrate different knowledge into the organization requires additional considerations. I argue that absorptive capacity is key to an organization's ability to integrate new or different knowledge, and that absorptive capacity is more important for organizations accessing open networks than it is for closed networks.

Dense networks are often portrayed as limiting new information and knowledge. What information that is passed around the network is often redundant. But what about new knowledge that is created within the network? This knowledge may be just as valuable (or more so) as knowledge that is external to the network.

Thus, we cannot say with any certainty that knowledge arising from dense networks, on average, is any more or less valuable than knowledge arising from open networks. The following are some of the key factors that come into play in dense networks:

1. More sharing with network members
2. Network created information is more applicable to members
3. More qualitative assessment of the information by members occurs (multiple sources can evaluate it), but this assessment can be more biased/subjective
4. More comprehension of the information occurs because of a common language being used by members (this is most important with tacit knowledge)
    - but new ways of looking at it may be limited/socially bounded

It is easy to say an organization needs information and knowledge from network members as well as those outside the network. But what is the effect of this knowledge on organizational performance measures such as product innovation? Evaluating the knowledge type and the type of network separately provides some simplistic clues as to how they might influence knowledge integration, but the interaction of knowledge type and network type creates some additional complexity.

In the remaining sections the literature on innovation, organizational knowledge, absorptive capacity, knowledge type and networks are reviewed. Then, propositions are developed that focus on the relationship between knowledge type and network setting, and how it influences product innovation. Finally, managerial and research implications of these relationships are discussed.

2. Literature Review

A. Innovation

Innovation is the search for novelty and value (Kaplan & Vakili, 2015). It is considered a key contributor to organizational competitiveness and performance. For example, organizations can gain first-mover advantages through innovation (Moorthy, 1988). Or, in some cases, innovation may be required just to maintain competitiveness (e.g., red queen competition (Barnett & Hansen, 1996)). This is due, in part, to the effect that innovation efforts have on innovation and imitation behaviors of competitors (Oldham, 2018), such as imitative scope and speed (Giachetti, Lampel, & Li Pira, 2017).

There are differences in innovation strategies among organizations. For example, innovation efforts can vary from formal to informal, with more formal approaches resulting in more organized innovation capabilities (Ambos & Tatarinov, 2022). Organizational innovation processes can change over time as an organization grows (El Hanchi & Kerzazi, 2020). Large and small organizations may differ in the degree of innovation and risk that they seek (Marom, Lussier, & Sonfield, 2019). Moreover, in existing organizations, there is a tendency for the prioritization of value of the innovation over its novelty (Ghosh & Wu, Forthcoming). Ultimately, there are a variety of ways to improve organizational innovation, including efforts such as multiple design iterations and multifunctional teams that can hasten knowledge development (Eisenhardt & Tabrizi, 1995).

Organizations do not only innovate within organization boundaries. Open innovation involves accessing knowledge from multiple organizations in order to purposefully enhance innovation opportunities (Santoso, Prijadi, & Balqiah, 2020). Some examples of open innovation include networks of competitors and supply chains. Of course, open innovation can lead to undesirable knowledge leakage that should be minimized if the knowledge is a key part of an organization's competitive advantage (Bloodgood, 2013).

B. Value of Organizational Knowledge

Advancing organizational knowledge is crucial for the development of innovations that spur organizational growth and performance (Zander & Kogut, 1995). For example, knowledge can increase the development of new products and processes as well as improve existing ones. Knowledge can be generated internally through experience and activities such as experimentation and theoretical development. An organization's internal knowledge can be significantly advanced by combining it with externally-derived knowledge, such as that found in other organizations. This advancement can also maintain a distinct character stemming from the unique way in which an organization integrates and subsequently applies its generated and acquired knowledge (Grant, 1996). Thus, it is key for organizations to access external knowledge to complement their internally-derived knowledge.

One of the ways that external knowledge assists organizations is to enable adjustment. Useful existing internal knowledge has a way of integrating into an organization's activities to the point of

routinization and the creation of core rigidities (Leonard-Barton, 1995). Over time, organizations can become misaligned as internal and external forces change, but the organization does not. Thus, maintaining organizational alignment is important but can be challenging (Sabherwal, Hirschheim, & Goles, 2001). Typically, organizations need to find an appropriate balance of imitation, inertia, and rationality (Chen, 2008). New external knowledge can be used to disrupt routines and enable an organization to realign itself in a beneficial manner. Of course, organizations must first acknowledge that they need realigning. Managers need to sense a problem or issue that needs addressing and construct meaning to move forward (Kiesler & Sproull, 1982).

The value of knowledge can vary among organizations, partly because of differences in the potential complementarity of it with their existing resources (Bloodgood, 2019). For example, innovation with broader technologies may benefit from organizations with broader knowledge resources, while innovations with narrow technologies may benefit more from organizations with more specific, deeper knowledge (Vakili & Kaplan, 2021). Moreover, it can be difficult for organizations to know the value other organizations place on a knowledge resource because it is nearly impossible for organizations to see how other organizations evaluate knowledge (Tsai, Su, & Chen, 2011). These types of differences lead to differences in perceptions of the value of knowledge as well as differences in the capability of organizations to use the knowledge. A key component of this may be creative arbitrage, where knowledge is used in a different context than its original use (Fleming, Mingo, & Chen, 2007). Thus, the purpose of knowledge seeking varies by organization, and it influences the innovation resulting from successful search. For example, organizations engage in ongoing knowledge search efforts, with more innovative products occurring when organizations engage in early search and more product introductions when organizations engage in later search (Katila & Chen, 2008).

C. Absorptive Capacity

Absorptive capacity is the ability to acquire, integrate, and apply new knowledge (Cohen & Levinthal (1990). High levels of absorptive capacity enable an organization to benefit from newly acquired knowledge by helping the organization more effectively understand integrate the knowledge into the organization. One important benefit of absorptive capacity is the ability to innovate via new products and processes. Frequently, this innovation occurs through the combination of new and existing organizational knowledge. Absorptive capacity can help integrate external knowledge into existing organizational knowledge, thus enhancing an organization's knowledge resources (Todorova & Durisin, 2007).

Absorptive capacity is influenced by factors such as experience, organizational resources, and organizational processes. For example, an organizational member's prior experience can negatively affect perceived ability to access knowledge, and informal seeking of tacit knowledge can help (Shi & Weber, 2021). Processes involving teams, for example, can be influenced by managerial diversity which can affect motivation and behaviors (Schubert & Tavassoli, 2020). Relatedly, an organization's culture may influence employee innovation effort (Suifan, Alhyari & Qandah, 2021).

Part of absorptive capacity involves identifying external knowledge, but it is more than just scanning for knowledge; it involves proactively listening and identifying deeper meanings behind environmental change (Simsek et al., 2009). Organizations that are able to do this quickly, stand a better chance of grasping opportunities before competitors. Gaining knowledge quickly may also help in other ways, such as hastening decision-making which can promote organizational growth and performance (Baum & Wally, 2003). As such, absorptive capacity can be viewed as a dynamic

capability (Zahra & George, 2002) that can enhance organizational competitiveness, especially in changing environments.

D. Knowledge Type

Enhancing organizational learning can benefit a wide array of organizational efforts (Siren, Kohtamaki, & Kuckertz, 2012). Like many organizational resources, knowledge can enhance an organization's competitiveness when it is valuable, rare, inimitable, and non-substitutable (Barney, 1991). The value of knowledge can be difficult to quantify, and this generates opportunities that varies across organizations (Denrell, Fang, & Winter, 2003) as they seek knowledge. One problem is that the search for knowledge may involve noisy signals that increase ambiguity, which can lead to innovation but also cause inefficient resource usage (Leenders & Voermans, 2007). Thus, knowledge, when organized and applied appropriately (Kaffka et al., 2021), is a tremendous asset for organizations that can bring competitive advantage when it is valuable are distinct from knowledge used by other organizations.

Organizations can maintain a competitive advantage when they use valuable knowledge to innovate, and when that knowledge is unique and tacit (Ghemawat, 1986; Hall, 1992; Spender, 1996). Knowledge can have different characteristics and are both important (e.g., explicit and tacit). Tacit knowledge is difficult or impossible to communicate (Polanyi, 1967). This difficulty is caused by insufficient shared meaning or lack of focal awareness by the knowledge holder (Philipson & Kjellström, 2020). Some of the lack of awareness can stem from the routinization of knowledge within the organization. Knowledge can become embedded over time in routines (Nelson & Winter, 1982), and it can become increasingly complex and tacit as routines become embedded in or interact with other routines (Ketokivi & Schroeder, 2004). The degree of knowledge tacitness influences the ability to share, understand, and use knowledge within and between organizations.

E. Networks

Networks can provide an organization with access to external knowledge that can help it increase its innovation ability. External knowledge is often obtained from other organizations in a network with or without their consent. Although the degree of knowledge sharing can be influenced by the extent of anonymity contained in the sharing method (Al-Mashhadani, Ahmad, Awang, & Hishan, 2021). An organization may work in a cooperative manner with other organizations to advance an innovative technology, for example. In addition, an organization may also attempt to covertly access others' knowledge in an effort to close a competitive gap.

Although networks can be composed of a variety of structures that can influence knowledge transfer and organizational performance (Soh, 2010), one of the most important structural characteristics that influences knowledge access is the degree of network closure. Network closure is the extent of connections among network members (Coleman, 1988). Networks that are considered open contain connections among members that are not duplicative. While, networks that are considered closed contain many connections among network members (Burt, 2005). Lack of access to networks is one of the reasons that newer organizations tend to engage in search behaviors that are narrow in scope and internally-focused (Barwinsky, 2020).

Open networks

Networks can play an important role in influencing innovative behavior (Tong & Han, 2021).
For example, an organization can create a link that connects disparate networks (or parts of networks) to and exploit unique information (McEvily & Zaheer, 1999). More often found in open

networks, chance encounters with other organizations can lead to unforeseen opportunities that may increase innovation (Miner, Bassoff, & Moorman, 2001). These encounters are one reason why open networks can be beneficial. Access to new, unique information is much more likely when a network is open.

Open networks do have an inherent potential for constraining some types of information sharing. The lack of trust and familiarity may inhibit organizations from certain types of interactions and transactions that may expose them to opportunistic efforts by other organizations (Yang, Guo, Wang, & Zhang, 2021). This results in a reduced motivation to share certain type of critical organizational knowledge. Moreover, there is a limited capability to share some types of knowledge, such as that which has a strong tacit character. Organizations that are very different may have significant differences in organizational culture and language that makes some knowledge hard for other organizations to fully comprehend. This difficulty can impede knowledge transfer. Open networks, with their more shallow and varied interactions do little to enhance the deeper understanding of new knowledge.

Closed networks

Closed networks offer some respite from the problems faced by open networks. These networks are made up of dense connections (Bloodgood & Chen, Forthcoming) which provide opportunities for enhanced interactions. These frequent, deeper interactions help form shared context, language, and understandings that can promote the desire and ability to share knowledge (Krackhardt, 1992). As such, network density enhances trust and reciprocity among network members (Kadushin, 2002; Soh, 2010).

Trust in networks can be intentionally developed by the use of collective real options, which involve multiple network members making small investments that lead to relational small wins that end up reducing the uncertainty of working together (McCarter, Mahoney, & Northcraft, 2011). Furthermore, cooperative goals can be developed, thus increasing open discussion among network members as compared to a decrease in discussion found when competing goals exist (Tjosvold and Weicker, 1993).

Closed networks have some drawbacks that can reduce knowledge sharing. The close, numerous connections in these networks foster continued focus on interactions within the network rather than outside of it. This results in less access to new, unique information from organizations outside the network. Instead, knowledge sharing can become repetitive and limiting. Less new knowledge advancement may occur in closed networks, but what knowledge exists may diffuse to a greater extent (Fleming et al., 2007).

3. Propositions

The benefits of networks are complex and are often dependent on factors such as network structure and knowledge type (e.g., market, technological knowledge) (Nikiforou, Lioukas, & Voudouris, 2020). In open networks, relationships between organizations are typically shallow, transactional, and fleeting. This results in organizations having weak, varied connections. Varied, explicit knowledge is more available among weakly connected organizations than is tacit knowledge. Since weaker connections exist, unique explicit knowledge is shared only among a subset of open network members rather than being fully shared among the majority of organizations. Therefore, the knowledge remains more distinctive.

Explicit knowledge is relatively easier to diffuse between organizations than is tacit knowledge. Thus, new explicit knowledge can be relatively easily understood and utilized by the knowledge

receiving organization. On the other hand, tacit knowledge is too difficult to effectively transfer among weakly-connected organizations. The presence of tacit knowledge in other organizations is often inaccessible. There is insufficient shared context and understandings to identify the knowledge if it is present. Even if identified, tacit knowledge is frequently difficult to capture in an open network with weakly connected organizations. These relationships are depicted in Figure 1.

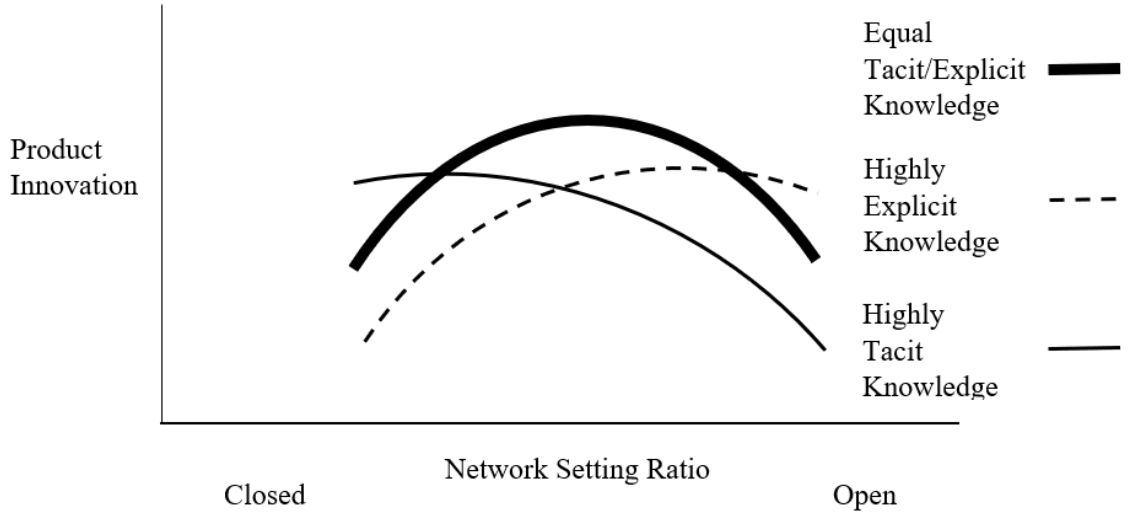

Figure 1: Relationship between Innovation and Network Setting Ratio

With explicit knowledge being easier to access in an open network, and still remaining somewhat unique, it can be used to enhance organizational innovation. Organizations trying to access tacit knowledge from organizations in an open network will likely find the knowledge to be difficult to identify and comprehend. This makes the knowledge difficult to capture and utilize for innovation. Thus, in an open network highly explicit knowledge is more likely to lead to more innovation than is knowledge that has a more significant tacit character. Therefore, the following proposition is offered:

P1: In open networks, new, highly explicit external knowledge leads to greater product innovation than does new, highly tacit external knowledge or new knowledge with an equal explicit and tacit character.

To the extent that some types of innovation may require close working relationships among organizations, a dense closed network can provide the trust among network members (Kadushin, 2002; Soh, 2010) that is needed to make integrative product and process advances. Although diverse knowledge may occur less often in closed networks than it does in open networks, when diverse knowledge is accessed, interactions in dense networks can help integrate the knowledge (Mors, 2010). This is particularly important for knowledge that has a tacit character, which is naturally more difficult to diffuse than explicit knowledge. For example, some customer knowledge management aspects involve closer interaction between organizations and their customers (Muniz, Dandolini, & Biz, 2021), and, thus, likely include knowledge that has a more tacit character.

An additional factor in knowledge diffusion is trust. Trust between organizations acts as a perceived safeguard against opportunism. This facilitates knowledge diffusion by reducing concern that an organization's knowledge it is sharing will come at a significant cost, such as through

reduced competitiveness. Trust is more likely to be built up in closed networks (Burt, 2005), and the temporal nature of network member exchange can positively influence knowledge sharing (Abualqumboz, Chan, Bamford, & Reid, 2021).

In closed networks, tacit knowledge is more likely to be diffused than it is in open networks because the dense connections provide frequent and context-rich settings for knowledge diffusion (Bloodgood, Hornsby, Rutherford, & McFarland, 2017). This provides knowledge for organizations that are part of the closed network to identify and pursue knowledge-based innovations that are inaccessible to other organizations that are not part of the closed network. Thus, closed-network organizations can create innovations that are unique relative to organizations outside the network.

On the other hand, explicit knowledge shared within a closed network provides little opportunity for distinct innovation because it lacks sufficient newness given that there are fewer source-organizations for new, unique knowledge. Therefore, the following proposition is offered:

P2: In closed networks, highly tacit external knowledge leads to greater product innovation than does highly explicit external knowledge or new knowledge with an equal explicit and tacit character.

While open and closed networks each provide distinctive benefits and drawbacks for knowledge sharing and access, moderate amounts of network density have enhanced, beneficial performance impacts (Swaminathan & Moorman, 2009) that can go beyond predominantly open and closed networks. Access to the most useful array of knowledge resources requires connections to both open and closed networks (Baum et al., 2012). This provides an opportunity for organizations to capture both highly tacit and highly explicit knowledge, if available in the network.

Complementary external knowledge that is not too similar to an organization's own knowledge, but not so different so it can be integrated with the organization's internal knowledge is considered most useful (Marra, Carlei, & Baldassari, 2020). Since complementary knowledge can exist in either explicit or tacit form, an organization seeking it has an increased opportunity of capturing it in networks that contain both open and closed segments.

Being able to access the most appropriate knowledge, whether explicit or tacit, provides an organization with the best opportunity to create innovations that lead to competitive advantage. This can most likely occur in networks that contain both open and closed segments. Therefore, the following proposition is offered:

P3: In a network with equal open and closed characteristics, new knowledge with equal explicit and tacit characteristics leads to greater product innovation than knowledge that has a highly explicit or highly tacit characteristic.

4. Discussion

Managers have discretion in resource development (Amit & Schoemaker, 1993) such as knowledge. Therefore, because organizations are in competition, it is important for organizations to be strategic in external knowledge seeking. As part of enhancing knowledge seeking, it is important to have an infrastructure that supports knowledge enhancement efforts (Anand et al.,

2009). An organization's network is a key part of that infrastructure because it provides access to external knowledge. Here, it is proposed that the type of knowledge being sought should guide the network segments being used to access the knowledge. This is particularly important when the knowledge is to be integrated into a knowledge base that provides or maintains a competitive advantage for the organization.

Organizational networks typically involve knowledge sharing in both directions; and more of this is being done online as time goes on. It is also becoming more decentralized. Thus, supporting knowledge diffusion by focusing on online infrastructure that enhances decentralized and self-organized networks is important for organizations to consider (Marques, Yan, & Matthews, 2020). Of course, there is the risk of organizational knowledge leakage that must be managed to prevent a loss of competitiveness (Bloodgood & Chen, Forthcoming).

It is also important to realize that networks change over time (Manjak, Simon, & Szalkai, 2011). For this study, that means that the degree of network density can fluctuate. Organizations should, thus, be cognizant of where and when they attempt to access empirical and tacit knowledge. Tactics for acquiring external knowledge, and limiting knowledge leakage, should be reassessed periodically to make sure effort are undertaken with the appropriate network segments.

In addition, since accessing knowledge is only the beginning of an organization's effort to use the knowledge, several questions should be addressed by organizations. Some important ones are as follows:

> How comprehensive is the knowledge, such that it will enhance the organization's competitive advantage?
>
> How likely is the organization to understand and integrate the knowledge?
>
> How likely are other organizations to obtain and integrate the knowledge?
>
> Will competing organizations have difficulty gaining the knowledge and replicate or improve upon the innovation?

We must consider limitations such as the degree of competition within the network and the geographical dispersion of the network members, since these factors can influence the degree of trust and sharing among organizations (Mena, Humphries, & Choi, 2013). In addition, the network role of the organization is likely to be an important consideration. More dynamic roles in networks are thought to positively influence innovation (Alberti, Belfanti, & Guisti, 2021). Moreover, insufficient success in knowledge acquisition in networks may result in knowledge substitution by the failed acquirer (Yoo & Choi, 2005). If the substitution is beneficial, this can have negative consequences for other organizations' competitiveness (Porter, 1985).

Future research could examine how variations in the degree to which organizations work together on innovation could influence innovation performance and organizational performance (Bremner & Eisenhardt, Forthcoming). It is not clear whether potential gains from community efforts (e.g., crowdsourcing) would outweigh potential losses for particular individual organizations who end up sharing positive outcomes (Bloodgood, 2013). In addition, it is likely that the relationships are more complex than simply focusing on open and closed networks. Other factors including types of opportunities and organizational use of resources and capabilities could play an important factor in the relationship between knowledge and innovation (Eklund & Mannor, 2021).

5. Implications and Future Research Directions

Some of the implications for managers of this analysis include increasing attention towards the characteristics of their external networks, and being aware of the characteristics of the knowledge they are seeking. In particular, the density of their networks should be assessed to determine how easily and effectively external network knowledge can flow and be utilized by their organization. This can be achieved by not just knowing which organizations in a network they are connected to, but also increasing awareness of the totality of connections among network members. This is not always easy, of course, but organizational members, such as sales people and purchasing agents, can glean this type of information from their external contacts while performing their regular duties. They can try to find out who knows whom among network members. Additionally, external knowledge characteristics can be assessed to some degree by clearly identifying their source and form. Knowledge contained in printed form or presented at industry conferences, for example, is more likely to be explicit than is knowledge contained in individuals' actions or in the routines of other organizations (Nelson and Winter, 1982). If managers can identify both the network density and knowledge type, they can try to obtain the appropriate type of knowledge from each type of network. Doing so would provide an increased chance for innovation success.

Both network and knowledge researchers can benefit from understanding how network density and knowledge tacitness interact in influencing innovation success. In regard to future research, network researchers can add this interaction to their models when examining participation and use of networks by organizations. Moreover, these network and knowledge characteristics can be used to predict learning outcomes for organizations. Knowledge researchers can examine the productivity of knowledge search in different types of networks. It would also be interesting for researchers to assess the awareness of organizations as to the density of the networks they are members of, and the tacitness of the knowledge they are seeking. Researchers should avoid making assumptions that managers are fully aware of these characteristics, and instead consider surveying managers about their perceptions of their networks and the knowledge they are seeking. Finally, innovation research can also be extended by looking at the degree to which managers understand the importance of network density and knowledge tacitness. Managers may look to strategic partnerships as a means to gather external knowledge (Swaminathan & Moorman, 2009). These partnerships may vary in their degree of success depending on the type of network the organizations are part of, and the tacitness of the knowledge being sought by members of the partnership.

REFERENCES

Abualqumboz, M., Chan, P. W., Bamford, D., & Reid, I. (2021). Temporal dimensions of knowledge exchanges in horizontal knowledge networks. Journal of Knowledge Management, 25(4), 899-919. doi: 10.1108/JKM-05-2020-0346.

Alberti, F. G., Belfanti, F. & Giusti, J. D. (2021). Knowledge exchange and innovation in clusters: A dynamic social network analysis. Industry and Innovation, 28(7), 880-901. doi: 10.1080/13662716.2021.1904840

Al-Mashhadani, A. F. S., Ahmad, R., Awang, H., & Hishan, S. S. (2021). The moderating effect of anonymity on personal cognitive attributes towards knowledge sharing in online programming communities. International Journal of Innovation and Business Strategy, 15(2), 64-74.

Ambos, T. C., & Tatarinov, K. (2022). Building responsible innovation in international organizations through intrapreneurship. Journal of Management Studies, 59(1), 92-125. doi. 10.1111/joms.12738

Amit, R. & Schoemaker, P. J. H. (1993). Strategic assets and organizational rent. Strategic Management Journal, 14, 33-46.

Anand, G., Ward, P. T., Tatikonda, M. V., & Schilling, D. A. (2009). Dynamic capabilities through continuous improvement infrastructure. Journal of Operations Management, 27, 444-461.

Barnett, W. P., & Hansen, M. T. (1996). The red queen in organizational evolution. Strategic Management Journal, 17(S1), 139-157.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17(1), 99-120.

Barwinski, R. W., Qiu, Y., Aslam, M. M. & Clauss, T. (2020). Changing with the time: New ventures' quest for innovation. Journal of Small Business Strategy, 30(1), 18-30.

Baum, J. A. C., McEvily, B., & Rowley, T. J. (2012). Better with age? Tie longevity and the performance implications of bridging and closure. Organization Science, 23(2), 529-546. http://dx.doi.org/10.1287/orsc.1100.0566.

Bloodgood, J. M. (2013). Crowdsourcing: Useful for problem solving, but what about value capture? Academy of Management Review, 38, 455-457.

Bloodgood, J. M. (2019). Knowledge acquisition and firm competitiveness: The role of complements and knowledge source. Journal of Knowledge Management, 23(1), 46-66. doi:10.1108/JKM-09-2017-0430

Bloodgood, J. M. & Chen, A. (Forthcoming) Preventing organizational knowledge leakage: The influence of knowledge seekers' awareness, motivation, and capability. Journal of Knowledge Management. doi: 10.1108/JKM-12-2020-0894

Bloodgood, J. M., Hornsby, J. S., Rutherford, M., & McFarland, R. G. (2017). The role of network density and betweenness centrality in diffusing new venture legitimacy: An epidemiological approach. International Entrepreneurship and Management Journal, 13(2), 525-552. doi: 10.1007/s11365-016-0412-9.

Bremner, R. P., & Eisenhardt, K. M. (Forthcoming). Organizing form, experimentation, and performance: Innovation in the nascent civilian drone industry. Organization Science. doi: 10.1287/orsc.2021.1505

Burt, R. S. (2005). Brokerage & Closure. Oxford University Press, Oxford.

Chen, C. (2008). Linking the knowledge creation process to organizational theories. Journal of Organizational Change Management, 21(3), 259-279.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. Administrative Science Quarterly, 35(1), 128-152.

Coleman, J. S. (1988). Social capital in the creation of human capital. American Journal of Sociology, 94: S95-S120.

Denrell, J., Fang, C., & Winter, S. (2003). The economics of strategic opportunity. Strategic Management Journal, 24, 977-990.

Eisenhardt, K. M., & Tabrizi, B. N. (1995). Accelerating adaptive processes: Product innovation in the global computer industry. Administrative Science Quarterly, 40, 84-110.

Eklund, J. C., & Mannor, M. J. (2021). Keep your eye on the ball or on the field? Exploring the performance implications of executive strategic attention. Academy of Management Journal, 64(6), 1685-1713. doi. 10.5465/amj.2019.0156.

El Hanchu, S., & Kerzazi, L. (2020). Startup innovation capability from a dynamic capability-based view: A literature review and conceptual framework. Journal of Small Business Strategy, 30(2), 72-92.

Fleming, L., Mingo, S., & Chen, D. (2007). Collaborative brokerage, generative creativity, and creative success. Administrative Science Quarterly, 52, 443-375.

Ghosh, S., & Wu, A. (Forthcoming). Iterative coordination and innovation: Prioritizing value over novelty. Organization Science. doi.org/10.1287/orsc.2021.1499

Ghemawat, P. (1986). Sustainable advantage. Harvard Business Review, September-October, 53-58.

Giachetti, C., Lampel, J., & Li Pira, S. (2017). Red queen competitive imitation in the U.K. mobile phone industry. Academy of Management Journal, 60(5), 1882-1914.

Granovetter, M. S. (1973). The strength of weak ties. American Journal of Sociology, 78, 1360-1380.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. Strategic Management Journal, 17(S2), 109-122.

Hall, R. (1992). The strategic analysis of intangible resources. Strategic Management Journal, 13, 135-144.

Kadushin, C. (2002). The motivational foundation of social networks. Social Networks, 24, 77-91.

Kaffka, G. A., Singaram, R., Groen, A. J., & Kraaijenbrink, J. (2021). Entrepreneurial cognition of the business model construct: A mixed methods study of STEM and non-STEM entrepreneurs. Journal of Small Business Strategy, 31(3), 148-163.

Kaplan S., & Vakili, K. (2015). The double-edged sword of recombination in breakthrough innovation. Strategic Management Journal, 36, 1435-1457. doi: 10.1002/smj.2294

Katila, R. & Chen, E. L. (2008). Effects of search timing on innovation: The value of not being in sync with rivals. Administrative Science Quarterly, 53, 593-625.

Ketokivi, M., & Schroeder, R. (2004). Manufacturing practices, strategic fit, and performance. International Journal of Operations & Production Management, 24(2), 171-191.

Kiesler, S., & Sproull, L. (1982). Managerial response to changing environments: Perspectives on problem sensing from social cognition. Administrative Science Quarterly, 27, 548-570.

Krackhardt, D. (1992). The strength of strong ties: The importance of Philos in organizations. In N. Nohria & R. G. Eccles (Eds.), Networks and Organizations: Structure, Form, and Action, 216-239. Harvard Business School Press, Boston, MA).

Leenders, M. A. A. M., & Voermans, C. A. M. (2007). Beating the odds in the innovation arena: The role of market and technology signals classification and noise. Industrial Marketing Management, 36, 420-429.

Leonard-Barton, D. (1995). Wellsprings of Knowledge. Harvard Business School Press, Boston, MA.

Mandjak, T., Simon, J., & Szalkai, Z. (2011). A framework for the analysis of global, regional and local business networks. Industrial Marketing Management, 40, 822-829.

Marom, S., Lussier, R. N., & Sonfield, M. (2019). Entrepreneurial strategy: The relationship between firm size and levels of innovation and risk in small business. Journal of Small Business Strategy, 29(3), 33-45.

Marques, L., Yan, T., & Matthews, L. (2020). Knowledge diffusion in a global supply network: a network of practice view. Journal of Supply Chain Management, 56(1), 33-53.

Marra, A., Carlei, V., & Baldassari, C. (2020). Exploring networks of proximity for partner selection, firms' collaboration and knowledge exchange: The case of clean-tech industry. Business Strategy and the Environment. 29, 1034-1044. https:/doi.org/10.1002/bse.2415

McCarter, M. W., Mahoney, J. T., & Northcraft, G. B. (2011). Testing the waters: Using collective real options to manage the social dilemma of strategic alliances. Academy of Management Review, 36(4), 621-640.

McEvily, B., & Zaheer, A. (1999). Bridging ties: A source of firm heterogeneity in competitive capabilities. Strategic Management Journal, 20, 1133-1156.

Miner, A. S., Bassoff, P., & Moorman, C. (2001). Organizational improvisation and learning: A field study. Administrative Science Quarterly, 46(2), 304-337.

Moorthy, K. S. (1988). Product and price competition in a duopoly. Marketing Science, 7(2): 141-168.

Mors, M.L. (2010). Innovation in a global consulting firm: When the problem is too much diversity. Strategic Management Journal, 31: 841-872.

Muniz, E. C. L., Dandolini, G. A., & Biz, A. A. (2021). A customer knowledge framework. Journal of Information and Knowledge Management, 20(3), 1-33. doi: 10.1142/S0219649221500283.

Nelson, R. R., & Winter, S. G. (1982). An Evolutionary Theory of Economic Change. The Belknap Press of Harvard University Press, Cambridge, MA.

Nikiforou, A., Lioukas, S., & Voudouris, I. (2020). Network structure and firm-level entrepreneurial behavior: The role of market and technological knowledge networks. Journal of Business Research, 106, 129-138. doi.org/10.1016/j.jbusres.2019.09.008

Oldham, M. (2018). How fast to run in the Red Queen race? International Journal of Intelligent Systems in Accounting, Finance & Management, 25, 28-43.

Philipson, S. & Kjellström, E. (2020). When objects are talking: How tacit knowing becomes explicit knowledge. Journal of Small Business Strategy, 30(1), 68-82.

Porter, M. E. (1985). Competitive Advantage. The Free Press, New York.

Polanyi, M. (1967). The Tacit Dimension. Routledge & Kegan Paul, London.

Sabherwal, R., Hirschheim, R., & Goles, T. (2001). The dynamics of alignment: Insights from a punctuated equilibrium model. Organization Science, 12(2), 179-197.

Santoso, A. S., Prijadi, R., & Balqiah, T. E. (2020). How open innovation strategy and effectuation within platform ecosystem can foster innovation performance: Evidence from digital multi-sided platform startups. Journal of Small Business Strategy, 30(3), 102-126.

Schubert, T., & Tavassoli, S. (2020). Product innovation and educational diversity in top and middle management teams. Academy of Management Journal, 63(1), 272-294. doi. 10.5465/amj.2017.0741.

Shi, W., & Weber, M. (2021). The impact of entrepreneurs' prior experience and communication networks on perceived knowledge access. Journal of Knowledge Management, 25(5), 1406-1426. doi: 10.1108/JKM-05-2020-0365.

Simsek, Z., Lubatkin, M. H., Veiga, J. F., & Dino, R. N. (2009). The role of an entrepreneurially alert information system in promoting corporate entrepreneurship. Journal of Business Research, 62, 810-817.

Siren, C. A., Kohtamaki, M., & Kuckertz, A. (2012). Exploration and exploitation strategies, profit performance, and the mediating role of strategic learning: Escaping the exploitation trap. Strategic Entrepreneurship Journal, 6, 18-41.

Soh, P. (2010). Network patterns and competitive advantage before the emergence of a dominant design. Strategic Management Journal, 31, 438-461.

Spender, J. G. (1996). Making knowledge the basis of a dynamic theory of the firm. Strategic Management Journal, 17(S2), 45-62.

Suifan, T., Alhyari, A., & Qandah, R. (2021). Role of knowledge infrastructure capabilities in product/service innovation. Journal of Information & Knowledge Management, 20(2), 1-24. doi: 10.1142/S0219649224500234.

Swaminathan, V., & Moorman, C. (2009). Marketing alliances, firm networks, and firm value creation. Journal of Marketing, 73, 52-69.

Tjosvold, D., & Weicker, D. (1993). Cooperative and competitive networking by entrepreneurs: A critical incident study. Journal of Small Business Management, 31(1), 11-21.

Todorova, G., & Durisin, B. (2007). Absorptive capacity: Valuing a reconceptualization. Academy of Management Review, 32(3), 774-786.

Tong, X., & Han, X. (2021). Knowledge network capability and organizational innovation: Network position transition and ambidextrous innovative behaviors as mediators. Social Behavior and Personality, 49(9), 1-16. doi: 10.2224/sbp.10246.

Tripsas, M., & Gavetti, G. (2000). Capabilities, cognition, and inertia: Evidence from digital imaging. Strategic Management Journal, 21, 1147-1161.

Tsai, W., Su, K. H., & Chen, M. J. (2011). Seeing through the eyes of a rival: Competitor acumen based on rival-centric perceptions. Academy of Management Journal, 54, 761–778.

Vakili, K., & Kaplan, S. (2021). Organizing for innovation: A contingency view on innovative team configuration. Strategic Management Journal, 42, 1159-1183. doi. 10.1002/smj.3264.

Yang, N., Guo, M., Wang, J., & Zhang, Y. (2021). The moderating effect of network power on relational risks and knowledge flow in R&D network. Management Decision, 59(10), 2421-2441. doi: 10.1108/MD-05-2020-0662.

Yoo, J. W., & Choi, Y. (2005). Resources substitution: Why an effective late-mover strategy? Journal of Management Research, 5(2), 91-100.

Zahra, S. A., & George, G. (2002). Absorptive capacity: A review, reconceptualization, and extension. Academy of Management Review, 27(2), 185-203.

Zander, U., & Kogut, B. (1995). Knowledge and the speed of the transfer and imitation of organizational capabilities: An empirical test. Organization Science, 6(1), 76-92.

Zhang, L. & Chen, W. (2021). How do innovation networks structures affect knowledge sharing? A simulation analysis of complex networks. Complexity, 1-17. doi: 10.1155/2021/5107630.