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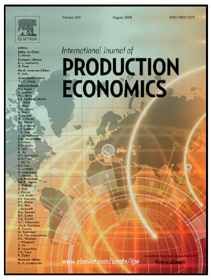

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Supply Chain Organizational Learning, Exploration, Exploitation, and Firm Performance: A Creation-Dispersion Perspective

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ABSTRACT

We introduce and empirically test the creation-dispersion model of supply chain organizational learning to align learning orientations in a supply chain context. Our paper seeks to advance the knowledge on supply chain organizational learning by showing that four distinct supply chain learning orientations (team, learning, memory, and systems), previously studied only as a collective, can be parsed strategically. We parse these four learning orientations into creation capacity (team and learning orientations) and dispersion capacity (memory and system orientations). The creation and dispersion capacity can enhance exploration (long-term) and exploitation (short-term) practices respectively in supply chain organizations. We used a survey questionnaire to collect data from 128 respondents belonging to firms of various sizes and different industries. We find that creation capacity is positively associated with exploration and indirectly associated with exploitation through exploration. Dispersion capacity is associated with exploitation and indirectly influences market share and profitability through exploitation. The findings demonstrate that creation and dispersion-based combinations of supply chain learning orientations coalesce to influence exploration and exploitation practices. We discuss the implications for supply chain organizational learning literature.

Key words: Supply chain organizational learning, Exploration, Exploitation, Creation capacity, Dispersion capacity

INTRODUCTION

As a vital operating system, the supply chain of an organization is responsible for up to 90 percent of an organization's cost base (O'Byrne, 2016). Supply chain function is undergirded in nearly every aspect of an organization's operations and requires coordination and cooperation within the organization and with entities external to the organization, including the critical connection to the customer (Marchese and Lam, 2015). Jim Owens, a former Caterpillar CEO, feels that "the competitor that's best at managing the supply chain is probably going to be the most successful competitor over time" (Malik et al., 2011, p. 2). The challenge of simultaneous management of exploration and exploitation practices is pronounced in the supply chains (Lauer, 2014; Gualandris et al., 2018; Turner et al., 2018). Supply chain functions have the unique challenge to minimize inventory levels, drive down costs, and deliver flawless customer service (exploitative practices), while looking towards new technologies and practices that will allow operational innovation and flexibility (explorative practices) (Marchese and Dollar, 2015; PwC, 2015). Cultivation of skills important for supply chain efficiency and effectiveness, such as, agility, complex problem-solving, and adoption of new technology and business models, require supply chain organizations to become focused on organizational learning that fosters both exploration and exploitation practices (Malik et al., 2011; Marchese and Dollar, 2015; PwC, 2015).

The need to simultaneously manage exploration and exploitation efforts is rooted in March (1991), who was the first to characterize the need to explore and exploit in the context of a learning organization. Though there is a general consensus that firms are required to simultaneously explore and exploit for short-term performance and long-term survival (Birkinshaw and Gupta, 2013; Long, 2016; O'Rielly and Tushman, 2013), there is little consensus on the nature of orientations and how they drive exploration and exploitation. Since March's seminal article, there has been only limited advancement in the knowledge and understanding of how firms manage exploration and exploitation (Birkinshaw and Gupta, 2013; Levinthal and March, 1993; O'Reilly and Tushman, 2013). There is also a limited understanding of how organizations manage trade-offs to create different structures that offset organizational routines necessary for exploration and exploitation, to allocate variegated resources and attention necessary for exploration and exploitation pursuits in a supply chain, and to develop processes, capabilities, skills, and cultures to enable each dimension (Birkinshaw and Gupta, 2013; Jensen and Clausen, 2017; Lavie and Rosenkopf, 2006).

It is not clear how firms organize learning orientations to pursue exploration and exploitation in supply chains. We propose that pursuing exploitation may require a firm to disperse existing knowledge to incrementally exploit existing resources and capabilities. We propose that dispersion capacity (memory and system orientations) would be directly associated with exploitation in supply chains and creation capacity (team and learning orientations). The dual combination of creation and dispersion capacity could be central to managing innovation challenges in a supply chain. The proposed creation-dispersion capacity as the mode for managing exploration and exploitation is motivated by a recent call for research on "*the four dimensions of organizational learning [to] open the black box of how individual learning dimensions have varying impact on exploration versus exploitation*" (Ojha et al., 2018, p. 228). Creation-dispersion capacity helps identify, classify, allocate, and leverage human capital, devote learning efforts, allocate incentives and budgets, and develop routines and management systems required for exploration and exploitation (Amabile, 1996; Gupta et al., 2006; Nagji and Tuff, 2012).

This paper explores the answers to two research questions related to the academic gaps mentioned above. First, we ask whether distinct supply chain learning orientations, previously viewed only as a collective capability, can be parsed and synergistically employed to enhance supply chain related exploration and exploitation outcomes? Second, what is the indirect relationship between creation-dispersion capacity and firm performance through exploration and exploitation? By proposing creation-dispersion capacity, we extend the prior literature on supply chain organizational learning dimensions – team orientation, memory orientation, system orientation, and learning orientation – studied as a collective (Hult and Ferrell, 1997). Hult and Ferrell (1997) created a parsimonious, four-dimensional conceptualization of supply chain organizational learning that includes *team orientation, system orientation, learning orientation, and memory orientation*. Team orientation is characteristic of an organizational environment supporting team collaboration and cooperation. System orientation provides for an understanding of the big picture versus individual tasks or parts. An organization that encourages continuous learning for the benefit of the company has a learning orientation. Memory orientation is found in an organizational culture that encourages communication and sharing of embedded knowledge, routines, and past experiences (Hult and Ferrell, 1997, Hult, 1998). To the best of our knowledge, these supply chain learning orientations have not been parsed and studied for their synergistic enhancement to either exploration (long-term) or exploitation (short-term) practices. Also absent is the examination of the creation-dispersion capacity on organizational performance through exploration and exploitation.

We make the following contributions. First, we draw on the resource-based view and supply chain organizational learning theory to bring new insights into the challenge of managing the trade-off between exploration and exploitation in the context of supply chains. Extending

Hult and Ferrell's (1997) conceptualization of supply chain organizational learning, we explore the differences in supply chain organizational learning required to ignite exploration and exploitation practices. We propose a *creation-dispersion view of supply chain organizational learning* to argue that team and learning orientations together form the creation capacity – the capacity to facilitate new learning for exploration. On the other hand, memory and system orientations together form dispersion capacity – the ability to spread learning throughout an organization to facilitate exploitation of existing resources and capabilities. Creation capacity can be employed to enhance exploration practices and dispersion capacity can be employed to enhance exploitation practices. By aligning specific learning capacities with exploration and exploitation practices, we provide managers with a new approach to effectively use scarce resources for achieving organizational performance.

LITERATURE REVIEW

Supply chain organizational learning

Organizational learning helps in acquiring newer capabilities that could sustain the competitive advantage of a firm (Miner et al., 1996). Organizational learning is defined as "the process of improving actions through better knowledge and understanding" (Fiol and Lyles, 1985; p. 803) and is one of the most vital competencies of an organization and a primary responsibility of its leaders (Dixon, 1992; Vera and Crossan, 2004). The body of work on organizational learning has rapidly expanded and a number of organizational learning conceptualizations have been proposed (Huber, 1991; Senge, 1990; Fortis et al., 2018). We have chosen to adopt the Hult and Ferrell (1997) conceptualization of supply chain organizational learning (OL) that includes four dimensions of OL, which are *team orientation, system* *orientation, learning orientation, and memory orientation*. We have chosen the Hult and Ferrell (1997) conceptualization for five reasons.

First, the unit of analysis in the Hult and Ferrell framework is the supply chain organization, which is also the context of our study. Second, the four-dimensional OL conceptualization is both concise and inclusive of previous conceptualizations of OL. Third, OL incorporates Huber's (1991) learning sub-processes (knowledge acquisition, information distribution, information interpretation, and organizational memory) central to supply chain organizational learning. Fourth, the Hult and Ferrell conceptualization stresses the importance of proactive management of the supply chain learning orientations and the opportunity for intervention; both aspects are necessary to drive exploration and exploitation. Finally, for OL to become a resource it must convert to behavior or action: "true learning organizations learn and then behave accordingly, by that realizing the potential of their learning capacity by applying the knowledge gained in their learning endeavors to new purchasing situations" (Hult and Ferrell, 1997; p. 98). Based on the OL framework we explore how supply chain learning orientations (resources) influence exploration and exploitation practices (actions).

Supply Chain Organizational Learning and Supply Chain Ambidexterity

March (1991) introduced the theory of the learning organization and presented the challenges of managing the trade-off between two different types of learning-elated capabilities – exploration and exploitation – both important to firm survival, but in competition for the same pool of scarce resources. March (1991; p. 71) defined exploitation as "refinement, choice, production, efficiency, selection, implementation and execution," contrasting it with exploration, which involves "search, variation, risk-taking, experimentation, play, flexibility, discovery, and innovation."

Scholars have continued to study and build on the relationship between organizational learning and exploration and exploitation (Birkinshaw and Gupta, 2013; Lavie et al., 2010; Ojha et al., 2018). Researchers have examined exploration and exploitation in different industries such as pharmaceuticals (Bierly and Chakrabarti, 1996) and biotechnology (Rothaermel and Deeds, 2004), and in a variety of contexts such as strategic learning (Boal and Shultz, 2007; Sirén et al., 2012), strategic renewal (Crossan and Berdrow, 2003), innovation (Lin et al., 2013), international business (Chang, 1995), alliances (Grant and Baden-Fuller, 2004), and new product development (Danneels, 2002). Moreover, researchers have explored how to achieve the optimal mix between exploration and exploitation (Lin et al., 2013; McGrath, 2001; Turner et al., 2013).

Literature suggests that learning capabilities required for successful exploration are different from those needed for exploitation (Birkinshaw and Gupta, 2013; Lavie et al., 2010). Certain aspects of supply chain organizational learning might uniquely enhance either exploration or exploitation and they must be separated and flexed to support an organization's need to shift attention and resources between exploration and exploitation. Classifying learning orientation based on creation-dispersion capacity helps identify ways to allocate appropriate learning resource to enhance exploration and exploitation practices and ultimately firm performance (Kane and Alavi, 2007; Sirén et al. 2012). To explore these issues, we propose a creation-dispersion view of supply chain organizational learning, grounded in the resource-based view and Hult and Ferrell's (1997) conceptualization of supply chain organizational learning, to explain how supply chain learning orientations affect supply chain and performance. A glossary of key terms is listed in Table 1.

Insert Table 1 about here

HYPOTHESES DEVELOPMENT

The Creation-Dispersion Model of Supply Chain Organizational Learning

We introduce the *creation-dispersion model of supply chain organizational learning* (Figure 1). Extending Hult and Ferrell (1997), we define creation capacity as a combination of team orientation and learning orientation that represents the inquiry and production of new knowledge to be utilized for new products or processes, using individuals and teams and their knowledge as the tools of production (Easterby-Smith et al., 2000; March, 1991). Dispersion capacity, a combination of system orientation and memory orientation, represents the organization's ability to distribute knowledge and skills learned throughout the organization and to store knowledge for future access, extension, and refinement (Easterby-Smith et al., 2000; March, 1991).

Insert Figure 1 about here

Creation Capacity – Team and Learning Orientation. Creation capacity represents the search and production of new knowledge to be utilized for new products or processes, using individuals and teams and their knowledge as the tools of production. Creation capacity encompasses people (team orientation) and provides infrastructure support for learning (learning orientation) to improve tools, people, and processes necessary for exploration.

Team orientation provides a learning environment supportive of team collaboration and cooperation and promotes elements such as team spirit, commonality of purpose, agreement, and commitment to organizational vision, enabling employees to work together to achieve supply chain goals (Hult, 1998). Team orientation allows members to not only share and access information with one another across a supply chain, but also encourages members to ask questions, seek feedback, and rectify errors, which enhances their creativity (Gong et al., 2013). Such collaborative effort results in better communication (Gardner et al., 2012) and enables the generation of fresh ideas (Liao and Welsch, 2003), critical sources of knowledge creation. In addition, collaboration enhances the absorptive capacity of a team as team members gain the ability to tap into the shared knowledge repository developed through teamwork (Malhotra et al., 2005). Ultimately, such interactions among team members at different facets of supply chain provide a platform to share and access their knowledge resources with one another, resulting in creativity and the creation of new knowledge (Liao et al., 2007; Nahapiet and Ghoshal, 2000).

Learning orientation emphasizes a learning culture within a supply chain and acknowledges learning as an investment in improving supply chain outcomes (Hult and Ferrell, 1997). Rewards from the refinement of individual knowledge and activities encourage the pursuit of learning necessary for supply chain enhancement. Learning orientation improves supply chain learning at individual, team and organizational levels (Khedhaouria et al., 2017). Organizational commitment to learning also enhances its ability to introduce newer thinking, services, products and processes in the supply chain. Employees working in such organizations are committed to learn and accept the use of new ideas and may better interface with supply chain partners. Learning orientation enhances the capability to address market and operational needs by generating newer knowledge (Calantone et al., 2002; Sinkula et al., 1997).

Dispersion Capacity – Systems and Memory Orientations. Dispersion capacity represents the organization's ability to distribute knowledge and skills that are learned throughout the organization, thereby improving future access, extension, and refinement (Easterby-Smith et al., 2000; March, 1991). Dispersion capacity consists of system orientation and memory orientation.

System orientation enables workers to understand where their work fits into the overall system – understanding the interconnectedness of operational and supply chain activities (Hult and Ferrell, 1997; Hult, 1998). Understanding the system – the integration of the individual elements and activities that make up the whole – enhances the social networking among members, vital for operational and supply chain related information sharing across the system to improve internal and external goal alignment (Argote and Ophir, 2002). When employees have a better understanding of where their knowledge fits in the overall system (Hult and Ferrell, 1997; Hult, 1998), they are likely to interact and communicate more frequently with one another facilitating knowledge transfer among workers (Reagans and McEvily, 2003). System orientation also emphasizes the need for clarity with which the goals are defined. When goals and objectives are clearly established and communicated, it helps develop a shared understanding among workers (Inkpen and Tsang, 2005) and the subsequent knowledge transfer between them by reducing barriers to knowledge reception (Dong-Gil et al., 2005).

While system orientation represents a network for the delivery of learning (Hult, 1998), *memory orientation* represents the capacity to store learning (Hult, 1998). Memory orientation is demonstrated by a culture that encourages communication and sharing of embedded knowledge, routines, and past experiences. The underlying concept of memory orientation is the storage of learned knowledge manifested through routines and repeated activities (Hult and Ferrell, 1997; Hult, 1998). Organizations not only create knowledge, but they also have a tendency to forget the newly created knowledge if not used repeatedly (Argote and Epple, 1990; Benkard, 2000). Knowledge can be codified, and stored as a template, routine or database (Alavi and Leidner, 2016) eases the transfer of knowledge in an inter-organizational setting (Hoetker and Agarwal, 2007). One of the ways through which knowledge could be dispersed throughout the organization is through social settings that encourage both formal and informal conversations. Informal conversation such as coffee break conversation and informal seminars provides a platform for socialization of employees, facilitating knowledge transfer (Agrawal, 2001). In fact, companies such as Facebook, Yahoo, Samsung, and LinkedIn that were rewarded for providing employees the opportunity to work from home are finding that valuable informal exchanges of ideas and knowledge are being lost (Waber et al., 2014). On the other hand, more formal channels such as training and development activities and formal meetings are more apt for disseminating codified knowledge (Alavi and Leidner, 2001). Memory orientation emphasizes the use of both formal channels such as formal routines and mechanisms for sharing information, and informal channels such as conversation of learned lesson from the past. Memory orientation provides ready access to information and knowledge through a repository of experiences that can be drawn upon to solve basic problems (Sinkula, 1994).

Supply Chain Organizational Learning Capacities, Exploration, and Exploitation

Creation Capacity and Supply Chain Exploration Practices. Creation capacity aligns with exploration practices search, explore, experiment, and discover (Baum et al., 2000; Levinthal and March, 1993; March, 1991), enhanced by the proper development and active management of learning resources that emphasize *team orientation* and *learning orientation*. These two learning orientations work together to develop creation capacity and to enhance exploration practices.

Team Orientation. Team orientation ensures that there is a high level of alignment of organizational vision among supply chain team members, resulting in a tightly coupled team structure – an integral element of creation capacity. Team orientation supports team collaboration and cooperation to develop creation capacity. For a team to excel, “a dialogue must exist among members focused on sharing assumptions, thinking together to solve problems, and charting the future operations of the organization" (Hult and Ferrell, 1997, p. 380). When individuals interact with each other in a team, new knowledge is created through the process of socialization, combination, externalization, and internalization (Folkestad and Gonzalez, 2010; Nonaka, 1994; Smith et al., 2013). Tom Kelley, co-founder of IDEO, suggests, "team combustion is why we've been able to find so many unusual solutions to seemingly intractable problems" (Kelley, 2007; p. 125). Team orientation has been linked to creativity (Amabile, 1996; Folkestad and Gonzalez, 2010;), experimentation (Folkestad and Gonzalez, 2010) and risk-taking (Edmondson and Nembhard, 2009), each of which is associated with exploration practice.

Related to benefits for exploration, collaboration is characterized by creating new competencies and developing problem-solving abilities (Faems et al., 2005). The greater frequency of collaboration impels increased search activity, which also increases the likelihood of exploration (Katila and Ahuja, 2002). An atmosphere of cooperation and general openness of team member exchange has been shown to increase the rate of new product and service innovation (Smith et al., 2005; Nonaka and Takeuchi, 1995). Cooperation emphasizes the need for a certain degree of task interdependence so that a team can pursue common innovation goals. Collaboration and cooperation with partners (i.e., suppliers, customers, industry competitors, universities and research organizations) is common in supply chain organizations to advance exploration and innovation progress (Faems et al., 2005).

Learning Orientation. Learning orientation describes an organizational climate with a high commitment to learning, shared vision and open-mindedness, leading to active inquiry, experimentation, and the search for new ideas, knowledge, and opportunities (Huber, 1991; Hult, 1998; Hurley and Hult, 1998). These behaviors are consistent with dispersion capacity and exploration practices. A learning culture is one that strategically values and manages its learning activities, removing barriers, expanding learning capacity and enabling the assimilation of new ideas and technologies from both internal and external sources (Rhee et al., 2010; Jimenez-Jimenez et al., 2014; Teo et al., 2006). A learning culture requires leadership to create and support the open environment, shared vision, and commitment to learning (Slater and Narver, 1994). Perhaps the most widely studied example of a dedicated learning culture is Toyota and the Toyota Production System (TPS) – a creative and problem-solving learning culture that leverages teams and relentlessly searches for new ways of doing things (Folkestad and Gonzalez, 2010; Knott, 2002; Osono et al., 2008).

Considering the above arguments on creation capacity, the presence of a team orientation encourages open communication, cooperation, and collaboration enabling higher levels of risk-taking, creativity, and experimentation. Learning orientation creates an environment encouraging the search for new ideas. Team orientation and learning orientations synergistically expand an organization's creation capacity, a necessity for successful exploration practice (Gilson and Shalley, 2004; Lin et al., 2013; Tushman and O'Reilly, 1996).

Hypothesis 1: Creation capacity is positively related to exploration.

Dispersion Capacity and Supply Chain Exploitation Practices. We argue that memory orientation and system orientation work synergistically to develop an organization's dispersion capacity which is essential to exploitation practices. Learning behaviors that develop an organization's dispersion capacity make the organization more reliable and efficient (exploitation) through refinement of knowledge, knowledge sharing (*memory orientation*), and understanding the multiple inputs of an environment (*system orientation*). Dispersion capacity encourages and reinforces the recycling, sharing, application, replication and refinement of existing knowledge necessary for exploitation practice (Gupta et al., 2006; Kane and Alavi, 2007; Kristal et al., 2010).

Memory Orientation. Organizational memory refers to the stock of knowledge possessed by an organization that enables dispersion capacity for pursuing exploitation (Levitt and March, 1988). Hult and Ferrell (1997) describe an organization with a strong memory orientation as one that "incorporates the idea that by repeatedly performing a set of activities, organizational members develop a knowledge base of those activities and a means for performing better the next time" (Hult and Ferrell, 1997; p. 101). Dispersion capacity represents the entire stock of knowledge that a firm has distributed as well as its proper storage, access, and retrieval (Santos-Vijande et al., 2012). The organization memory orientation, crucial to dispersion capacity, enables organization efficiency (exploitation) by relying on well-honed routines, experiences, and memorized successes and failures (Alavi and Leidner, 2001; Argote and Miron-Spektor, 2011; Bingham et al., 2007). Memory orientation promotes dispersion by the repeated use of knowledge across various projects and enables users to uncover faulty assumptions and reconcile contradictions of their knowledge domain (Padmanabhan and Tuzhilin, 2002). In fact, the utilization of existing knowledge, routines, and experience is what provides an organization with the capability to clinch incremental solutions (exploitation) quickly and at low costs (Fang et al., 2010). The memory orientation dimension of dispersion capacity not only ensures that the lessons learned from the past are kept alive through socialization, but also safeguards its communication across an organization. Indeed, social interactions are essential for knowledge distribution and facilitate exploitation practices (Yli-Renko et al., 2001)

System Orientation. System orientation was first identified by Senge (1990) as the most important element of learning capability because it is about seeing the whole system versus the individual parts. System orientation, one of two orientations that enhance an organization's dispersion capacity, helps employees become aware of how their clearly defined personal tasks and the tasks of their immediate work group are integrated into a complex value chain (Hult, 1998). It transforms individuals into system thinkers, increasing their efficiency in identifying and solving problems (Farjoun, 2010; Idowu, 2013; Senge, 1990).

Based on this discussion, we propose that dispersion capacity through system orientation strengthens understanding of interconnectedness among tasks, tools, and processes in the supply chain to facilitate exploitation. Based on Levinthal and March (1993) if, "exploration – the pursuit of new knowledge, of things that might come to be known" then system orientation can improve exploitation by helping enhance "the use and development of things already know" (Levinthal and March, 1993; p. 105). The memory orientation enhances the temporal depth necessary for exploitation pursuits (cf. Nerkar, 2003) and strengthens refinement of existing resources and capabilities in the supply chain. System orientation and memory orientation synergistically expand an organization's dispersion capacity to improve exploitation practices.

Hypothesis 2: Dispersion capacity is positively related to exploitation.

The Relationship Between Supply Chain Exploration and Exploitation Practices

Rothaermel and Deeds (2004) proposed that the quest for discovery (exploration) as the predecessor of exploitation practices – "the precursor to exploitation, however, is the existence of an exploitable set of resources, assets or capabilities under the control of the firm. Viewed in this light, exploitation depends upon prior exploration" (Rothaermel and Deeds, 2004; p. 203). Simsek et al. (2009) found sequential exploration and exploitation to be a common occurrence in strong, technology-oriented firms since "exploration (discovering, acquiring, and developing new technologies) necessarily precedes exploitation (commercializing, applying, and leveraging new technologies) (Simsek et al., 2009; p. 883). Lavie et al. (2010) found that in some contexts (e.g. new product development) exploration and exploitation are successive – exploitation follows exploration. Based on these definitions, and supported by prior literature, exploration (search, variation, risk taking, experimentation, play, and discovery) is the pursuit for the more significant, transformational ideas, and an antecedent practice to exploitation (the choice, selection, refinement, execution, and implementation or production) of the idea (Govindarajan and Trimble, 2010; Kanter, 2006; Rothaermel and Deeds, 2004).

In the supply chain context, exploration practices (search) and exploitation practices (implementation, refinement, etc.) could be sequentially underway (O'Reilly and Tushman, 2013; Venkatraman et al., 2007). Members of the supply chain team may be actively searching for new technology and processes for future consideration – exploration. These gains in supply chain innovation can be later leveraged and refined by supply chain members for improving ordering and managing raw materials, producing goods and services, and delivering orders to customers – exploitation. When a new technology that is discovered in the exploration process may then be explored and tested before approved for implementation (Rothaermel and Deeds, 2004; Raisch and Tushman, 2016), similarly, the members of the supply chain team implement explorative process or product related gains over time as they would seek to and refine these gains at different facets of tasks, tools, and processes involved in the supply chain processes. As such, successful exploration activity yields from a wide net of explored initiatives a few new concepts (processes, knowledge, products, services, or technologies) that move to development, testing, refinement and implementation. Therefore, exploitation activity includes both the everyday routines and refinement of the core business as well as the implementation of initiatives that were once discovered during the exploration phases. Supply chain organizations transform their operations (exploration) and over time use such explorative transformations to strengthen supply chain metrics – quality, reliability and costs through exploitation (Lauer, 2014).

Hypothesis 3: Exploration is positively related to exploitation.

Supply Chain Exploitation Practices and Organizational Performance

According to March (1991), exploration has a longer-term impact on performance and exploitation has a shorter-term impact on performance. Performance gains from exploitation are more certain and proximate, while those from exploration are more uncertain and distal (Nielsen and Gudergan, 2012). In fact, the time horizon on the process from idea generation to first use can be as long as 30 years (pharmaceuticals) and as short as a year (consumer product line extension, women's apparel – Hardle et al., 1994). The clarification of the sequential relationship between exploration and exploitation as discussed in the prior section of this paper has a subsequent implication on performance. If exploration is the idea generating front end, representing the search but not the selection or implementation of new ideas, processes, or knowledge, then exploration practices can only indirectly influence performance and competitive advantage. Lavie et al. (2010) show that exploration practices indirectly deliver returns for the company.

Exploitation tasks require managers to learn to reduce redundancies in the operational processes. They also require managers to improve and develop their dispersion competencies to lower costs and improve operational reliability (Kristal et al., 2010). Once costs are reduced, the higher proportion of sales revenue contributes toward the profitability of a firm, increasing profit margins. Improving technology is one aspect of exploitation now demanding attention from supply chain managers. Improvement of existing technology more or less resonates with incremental innovation, focusing on catering products and services for the existing market. Such improvement in existing technology has a direct bearing on both the costs effectiveness and sustaining of market share. It has been argued that exploitation leads to higher profitability, that the continuous improvement in the technology will incessantly enhance the value and rarity of existing competencies (Barney, 1991). Moreover, the improvement in technologies is not limited to the confines of the specific department of a firm, rather the improvements are "mobilized, integrated, and applied" across the organization, resulting in a continuous feedback loop and allowing all the units to learn from one another (Siren et al., 2012; p.24). The mobilization of new knowledge generated by a unit's interaction with the localized requirement and the ability of rest of the units to learn and apply one another's localized technological/knowledge improvement strengthens organizational divergent competencies in total (Jensen et al., 2009). Thus, continuously allowing the firm to offer products and services which could address the changing customers' tastes and preferences (Siren et al., 2012).

Continuous improvement of technology through the implementation of exploitation practice also has a positive impact on market performance (Hua and Wemmerlöv, 2006; Luger et al., 2018). As stated, the continuous improvement facilitated by the constant refinement of competencies allows organizations to continuously cater to customers' changing demands. As customers' emergent demands are constantly addressed, businesses are able to maintain sales revenue. For example, Sony operated in a technologically intensive environment, which required ongoing and frequent product improvements. During the 1990s, Sony launched Walkman (portable music playing device), which allowed Sony to sustain 50 percent of the total market share. By continuously improving on the device features, Sony was able to maintain its market leadership (Sanderson and Uzumeri, 1995). Delivering efficiencies has become more challenging even for the leading supply chain organizations as customer demands expand and CEOs continue to press for day-to-day responsiveness and margin improvement (Lauer, 2014). As discussed, through Sony's ability to continuously improve its competencies, the company was able to maintain its market share position, which also resulted in its ability to maintain profitability.

Based on the above discussion, we propose that:

Hypothesis 4: Exploitation is positively related to profitability

Hypothesis 5: Exploitation is positively related to market share

Hypothesis 6: Market share is positively related to profitability

The mediating role of exploitation

In the long-term, exploitation enables the organization to accrue benefits from its exploration activities. Exploitation activities encompass organizational resources such as non-redundant processes, supply chain technologies, and internal and supply partners' competencies. These resources are extremely important for improved market performance (Adner and Kapoor, 2010; McEvily and Chakravarthy, 2002; Quinn, 2000).

Exploitation practices represent the ability of a firm to adapt its operations to meet the processing needs of innovative products and service generated through the exploration processes (Adner and Kapoor, 2010). While exploration presents the opportunity, exploitation reflects the firm's ability to learn to seize that opportunity. Consequently, exploitation practices are instrumental in achieving first mover advantage in the market and increasing market share and profits (Adner and Kapoor, 2010). This argument is clearly reflected in McEvily and Chakravarthy's (2002; p. 286) statement that, "a technological or scientific breakthrough, such as the transistor or Shannon's information theory, is generally followed by a period of highly uncertain R&D in which firms experiment with the best way to exploit the technological and market opportunities it creates."

Exploitation also encompasses firm-specific technical knowledge that has been generated through years of experience in producing their products. This knowledge is idiosyncratic in nature and not very accessible to its competitors. Idiosyncratic exploitation related knowledge acts as a barrier to imitation and leads to persistence of a firm's advantages over its competitors in terms of higher market share and profits (McEvily and Chakraarthy, 2002).

Another aspect of a firm's exploitation practices is the use of existing technologies and competencies in its supply chain. Assigning production processes to the most competent supplier is one such practice and has been shown to have a direct impact on the successful implementation of innovation in multiple firms leading to improved firm performance. For example, Quinn (2008) reports that Intel focuses on its internal competencies while the end product is manufactured by the suppliers who own the necessary production technology. This has allowed Intel to "offer advanced microprocessors and complex integrated circuits to computer and systems customers with a timing quality, reliability and cost that has given Intel a preeminent position in microprocessors" (Quinn, 2000; p.16).

The above discussion clearly demonstrates that a firm's exploitation practices are necessary to realize the opportunity of higher performance presented by its exploration practices. Consequently, we hypothesize that,

Hypothesis 7: Exploitation mediates the relationship between exploration and profitability

Hypothesis 8: Exploitation mediates the relationship between exploration and market share.

METHODS

Sampling context

To test the proposed hypotheses, we draw on survey data. Survey methodology allows for the collection of primary self-reported data based on the perception of the respondents. The emphasis is placed on the generalizability of results as long as the sample represents the characteristics of a population. Related to the supply chain learning orientation studies, surveys have been used in several key studies, Hult (1998) and Kristal et al. (2010). Our initial sampling frame was the alumni database of a large public university in the southwest United States. To ensure that the respondents are key informants (Kumar et al., 1993), a screening question was used. The question asked respondents whether or not they are involved in the strategic decision-making process of their extended supply chain organizations. Only those who met the key informant criterion were involved in the final survey sample. In formulating our survey questionnaire, we used validated scales from previous research.

Qualtrics software, an online survey tool, was used to collect data. Initially, 300 respondents were provided the link to the survey questionnaire. A total of 150 respondents provided a response. Out of 150 responses, 22 responses were dropped because they contained missing data on one or more survey items. The final sample size was 128, a response rate of 42.6%. We further confirmed that the respondent was indeed a key informant on the constructs of interest; we checked the job title. The title of the respondents included supply chain manager, supply chain analyst, materials manager, operation manager, production manager, VP operation, etc.

The sample represented a broad range of industries, including software/hardware, aviation, healthcare, food and beverage, automotive, electrical, transportation, metal fabrication and plastic/rubber. The majority of companies in the sample generate more than 50% of their sales revenue from the sales of services. Organizations in the sample included a variety of sizes based on the number of employees and sales revenue. Categories include companies employing less than 100 employees (n = 49), between 100 and 999 employees (n = 36), and more than 1,000 employees (n = 43). The sample represented companies that were generating less than 5 million U.S. dollars (n = 51), between 5 and 50 million U.S. dollars (n = 27), between 50 and 100 million U.S. dollars (n = 5), and more than 100 million U.S. dollars (n = 45) in sales revenue. Table 2 presents the descriptive data of the sample used in the study.

Insert Table 2 about here

Measures

Creation capacity – Creation capacity is an outcome of an organization's team orientation and learning orientation. Items measuring team orientation and learning orientation were obtained from Hult (1998). Creation capacity was operationalized by taking the product of mean of team orientation and learning orientation scales. Four items were used to measure both team orientation and learning orientation. A sample item for team orientation is: "we are committed to sharing our vision of the supply chain processes across all levels, functions, and divisions." A sample item for learning orientation is: "the sense around here is that employee learning is an investment, not an expense."

Dispersion capacity – Dispersion capacity is an outcome of an organization's memory orientation and system orientation. The dispersion capacity was operationalized by taking the product of the mean of system orientation and memory orientation. Items measuring system orientation and memory orientation were obtained from Hult (1998). Four items were used to measure both system orientation and memory orientation. A sample item for system orientation is: "we have a good sense of the interconnectedness of all parts of the supply chain processes." A sample item of memory orientation is: "we have specific mechanisms for sharing lessons learned in the supply chain processes from project to project."

Exploration practices– Exploration practices were measured using four items obtained from Kristal et al. (2010). Respondents were asked to rate their level of agreement on statements regarding supply chain practices over the past 12 months that enable firms to experiment and search for new opportunities. A sample item measuring exploration is: “to improve our supply chain, we continually explore for new opportunities.”

Exploitation practices – Exploitation practices were measured using four items, which were obtained from Kristal et al. (2010). Respondents were asked to rate their level of agreement on statements regarding supply chain practices over the past 12 months that emphasize the best utilization of existing firm’s resources. A sample item of exploitation is: “our managers focus on developing stronger competencies in our existing supply chain processes.”

Market share and profit – Market share and profit are self-reported business performance measures used in this study. Items for both the variables were obtained from Kristal et al. (2010). Market share was measured using three items. Respondents were asked to rate their business performance on a scale of 1 (relatively weak) to 5 (market leader), relative to their competitor. A sample item for market share is: “your position on your sales growth rate compared to your competitors’.” Profit was measured using four items. Similar to market share, profit is also a relative performance measure. A sample item for profit is: “net profit position relative to competition.”

Control variables– We included industry type, manufacturing indicator (primarily manufacturing or primarily service firm), and company size (number of employees) as control variables. Some industries such as IT and electronics could be more dynamic in nature; therefore, learning may be more important for these industries. In contrast other industries could be relatively stable and may not require extensive learning. In terms of organizational size, larger firms could be rigid and have lower ability to accept the transformation yielded by exploration, while smaller organizations may be agile and responsive to change in the face of intense competition. On the other hand, some studies suggest that larger firms have more resources and are more likely to devote resources to both exploitation and exploration. Indeed, prior research indicates that the impact of learning on innovation might be greater for smaller and service firms compared to larger and manufacturing firms (Jiménez-Jiménez and Sanz-Valle, 2011).

RESULTS

We used regression analysis to analyze the relationship between various constructs. Although the regression analysis, based on the availability of the data in the current study, does not provide the insight on the causality of a relationship, it provides the strength of association between variables. We also used structural equation modeling to test the mediation effects and testing model fit (Anderson and Gerbing, 1988).

For regression, we evaluated our research model using IBM SPSS 23. Hypotheses tests were conducted using hierarchical linear regression. Correlation and composite reliabilities of variables are presented in Table 3. Composite reliabilities (CR) of variables range from 0.827 to 0.958, which is more than 0.70 threshold as suggested by (Fornell & Larker, 1981; Hair et al. 1998). CR of creation capacity and dispersion capacity are 0.865 and 0.827 respectively. CR of exploration and exploitation are 0.957 and 0.894, respectively. CR of market share and profit are 0.928 and 0.958, respectively.

Insert Table 3 about here

Table 4 provides the test of hypotheses for the proposed model. In the table, model 1, model 3, model 6, and model 8 tests the impact of three control variables (industry type, number of employees, and manufacturing indicator) on exploration, exploitation, market share, and profit, respectively. The results demonstrate that only one of the control variables – number of employees – has a positive and statistically significant relationship with market share ($\beta = 0.335$; $p = .000$; model 6) and profit ($\beta = 0.204$; $p = .020$; and model 8).

Insert Table 4 about here

We conducted post hoc power analysis using the online tool provided by Soper (2018) which incorporates guidelines provide by Cohen (1988) and Cohen et al. (2003). This tool requires the following inputs: number of predictors, observed R-squared, probability level, and sample size. For our model, these inputs were 2, 0.200, 0.05, and 128 respectively. The power obtained for our sample of 128 was 0.999, indicating that the sample size was quite adequate.

Test of hypotheses

Hypothesis 1 presents that creation capacity is positively associated with exploration. Model 2 contains all the control variables, an independent variable – creation capacity - and a dependent variable. The result demonstrates that Hypothesis 1 is supported ($\beta = 0.590$; $p < .001$). Hypothesis 2, which states that dispersion capacity is positively associated with exploitation capacity, is also supported ($\beta = 0.691$; $p < .001$; model 4). Hypothesis 3 states that exploration is positively associated with exploitation. This hypothesis is supported as well ($\beta = 0.805$; $p < .001$; model 5). Hypotheses 4 and 5 state that exploration is positively associated with market share ($\beta = 0.298$; $p < .001$; model 7) and profit ($\beta = 0.377$; $p < .001$; model 9). These hypotheses are also supported. Lastly, Hypothesis 6 states that market share is positively associated with profit ($\beta = 0.872$; $p < .001$; model 10). The result provided support for the Hypothesis 6.

Insert Figure 2 about here

We also conducted path analysis (Figure 2) to evaluate the path-analytic structure of the hypothesized research model using AMOS 21. The results support the hypothesized research model as the fit indices for the model ($\Delta\chi^2$ (df) = 51.828 (25), $p \leq 0.001$; CFI = 0.943; RMSEA = 0.111; SRMR = 0.090) were close to suggested cutoffs (Kline, 2004). Comparisons of path coefficients obtained from the regression analysis and structural equation modeling are provided in Table 4.

Insert Table 5 about here

We assessed the influence of common method bias using an apriori marker variable from leisure literature. We compared our hypothesized model with the marker variable to the model without the marker variable. We used a measure of leisure as our marker variable. The impact of the marker variable on our hypothesized research model was not significant ($\Delta\chi^2$ (df) = 10.738 (9), $p = 0.294$), indicating that common method bias may be of lower concern for our study.

Test of total indirect effect using bootstrapping

In addition to testing the direct effect hypotheses, bootstrapping technique was used to test the overall indirect effects to test for the mediation hypotheses. The indirect effect of exploration → profit (β = 0.243; p = .012), and exploration → market share (β = 0.192; p = .012) through exploitation were statistically significant, providing support for our Hypotheses 7 and 8 respectively. Lastly, the indirect effect of exploitation → profit (β = 0.244; p = .007; see Table 5) was also statistically significant.

Insert Table 6 about here

Test of individual indirect effect using Sobel test

We tested the individual indirect using the Sobel test (Sobel, 1982). The results demonstrate that all the individual indirect effects were statistically significant. The indirect effects along with Sobel test statistics are 1) creation capacity → exploration → exploitation (β = 0.475; p = .000); 2) dispersion capacity → exploitation → market share (β = 0.206; p = .000); 3) dispersion capacity → exploitation → profit (β = 0.261; p = .000); 4) exploration → exploitation → market share (β = 0.240; p = .000); 5) exploration → exploitation → profit (β = 0.304; p = .000; 4th and 5th indirect effect supports hypotheses 8 and 7 respectively); 6) and, exploitation → market share → profit (β = 0.260; p = .000).

Post hoc analysis

We undertook a post hoc latent class analysis to understand what kind of learning behaviors are represented in our sample of firms. The latent class analysis was conducted using the four dimensions of supply chain organizational learning. The analysis produced four classes of learning behaviors (Table 7). Class 1 is comprised of firms who equally emphasize all dimensions of learning but at a low level. We label these firms comprehensive, but developing, learners. Class 2 is comprised of firms that have a very low emphasis on all of the learning dimensions. We call these firms non-learners. Class 3 is comprised of firms that heavily emphasize all dimensions of supply chain organizational learning. We label these firms developed comprehensive learners. Class 4 is comprised of firms that greatly emphasize systems and memory dimensions of supply chain organizational learning but have a low emphasis on the learning and team dimensions of supply chain organizational learning. We label these firms exploitative learners.

Insert Table 7 and Figure 3 about here

Next, we conducted covariate-based latent class analysis for the four-class model discussed above using variables from our hypothesized research model. The variables were: market share, profit, exploration, and exploitation. This analysis helps us expose the relative performance of the four latent classes of learners with respect to these variables. The resulting graphs are provided Figure 3. Four takeaways from the graphs are: (i) Non-Learners do the worst on each of the covariates; (ii) Exploitative Learners have a lot of market share but not much profit. They put twice as much importance on exploitation as compared to exploration; (iii) Developing Comprehensive Learners have low market share, low profits, low ability to explore or exploit; and (iv) Developed Comprehensive Learners have higher market share, higher profits, and achieve higher levels of both exploration and exploitation.

DISCUSSION

We draw on a supply chain organizational learning framework to examine how four supply chain learning orientations are uniquely employed to develop an organization's creation and dispersion capacities to facilitate exploration and exploitation. Exploration and exploitation are distinct practices and require distinct skills (March, 1991; Levinthal and March, 1993; Shalley, and Gilson, 2017); we proposed the creation-dispersion capacity framework. We argue that learning orientation and team orientation emphasize more collaboration and long-term learning and develop creation capacity to enhance exploration practices. On the other hand, dispersion capacity is developed through system orientation and memory orientation by providing mechanisms for knowledge sharing and facilitating understanding of the interconnectedness of various events and activities, therefore supporting exploitation practices. Moreover, we argue that, at least in a supply chain context, firms sequentially explore and exploit, and that both exploration and exploitation practices enhance organizational performance

– exploration practices indirectly influence performance, while exploitation practices directly impact performance. The hypotheses are supported in the results.

Theoretical Contributions

This study contributes to the literature on organizational learning in supply chains and makes four important theoretical contributions. First, our findings are consistent with studies that suggest that exploration and exploitation practices require different skills, structures, management systems, cultures, capabilities, and even organizational routines (Bierly and Chakrabarti, 1996; O'Reilly and Tushman, 2013). It is important to understand that when firms perform either exploration or exploitation practices (or both), resources, skills, and orientations should be aligned with each of the practices (O'Reilly and Tushman, 2007). Researchers in the past have examined the antecedents of exploration and exploitation practices and found that exploitation practices benefit from a formal organizational structure (Jansen et al., 2006), generic resources (Voss et al., 2008) and transactional leadership (Jansen et al., 2009). Exploration practices, on the other hand, benefit more from informal social relations (Jansen et al., 2006), rare and unabsorbed resources (Voss et al., 2008), and transformational leadership (Jansen et al., 2009).

We did not find studies that examine the distinct supply chain learning orientations that are the most pertinent to perform exploration as opposed to exploitation practices. Our study addresses this research gap and demonstrates that learning dimensions, instead of being used as a collective, can be parsed, individually developed, and leveraged to create aligned strategic resources. We argue that team orientation and learning orientation work together to improve creation capacity and positively influence exploration practices while system orientation and memory orientation enhance dispersion capacity and positively influence exploitation practices.

Second, this study contributes to resource management theory. By developing specific supply chain learning orientations to enhance exploration or exploitation capabilities, a firm can cultivate valuable, intangible, and differentiating capabilities that may lead to competitive advantage. The resource-based view argues that simply acquiring and inventorying resources which are valuable, rare, inimitable, and non-substitutable is not sufficient to generate and sustain competitive advantage (Barney, 1991). Rather, managers must structure the portfolio of resources, bundle (or integrate) those resources to develop capability, and leverage capabilities to create value (Hansen et al., 2004; Sirmon et al., 2011). We argue that the presence of learning as a resource should be directed toward enhancing practices that support both short-term and long-term goals of organizations.

Third, the study contributes to the literature on supply chain management. Supply chain related activities may be involved in the selection, development and implementation of a new process or technology (exploitation) – the result of a previous search practice (exploration), which has been characterized as a sequential approach to exploration and exploitation (O'Reilly and Tushman, 2013; Rothaermel and Deeds, 2004; Simsek, et al., 2009). We find that organizations that engage in exploration activity will ultimately engage in sequential exploitation. Within a supply chain organization and possibly other organizations within a company (i.e., marketing or planning), it is not uncommon that all of these approaches and practices would be occurring at the same time.

Fourth, the arguments in this study contribute to the performance implication of exploration and exploitation studies. The cornerstone of March's (1991) argument is that exploration activities yield long-term gains such as market share growth, whereas exploitation practices generate short-term returns such as return on assets (Auh and Menguc, 2005). We provide arguments that exploration practices can only indirectly influence firm performance in supply chain context. Exploration practices (search, explore, experiment) yield new knowledge and ideas, but only after the ideas are exploited (selected, implemented, produced) can they create value (Kornish and Ulrich, 2014; Tatiknoda and Rosenthal, 2000; Teece, 1986; Utterback, 1994). Therefore, while exploration and exploitation practices happen simultaneously in most organizations, a given exploration initiative or idea must sequentially proceed to exploitation in order to generate economic value. The temporal nature of exploration and exploitation resonates with March's argument that the benefits of exploration are realized only in the long term, as the new knowledge evolves through several iterations of refinements and improvements before the performance benefits are realized. Our latent class analysis further uncovers the importance of the co-occurrence of high levels of exploration and exploitation to optimize performance.

Managerial Implications

Our paper provides information to practitioners regarding the importance of proactively developing and managing supply chain learning orientations that uniquely support exploration and exploitation practices. The allocation of resources to each learning orientation should align with the firm's strategic goals and overall resource allocation between exploration and exploitation activity.

Our suggestion to managers is that leveraging the existing competencies of a firm is important to profitability and market share. While continuous refinement of existing knowledge is important, the generation and utilization of new knowledge is what leads to the realization of increased value (profits) and competitive advantage.

LIMITATIONS AND CONCLUSIONS

As with most of the research studies, the study has limitations. First, we present that the concept of sequential ambidexterity which allows firms to explore new ideas and subsequently implement those ideas. Furthermore, we argue that it is only through exploitation that gains in market share and profitability are achievable. Albeit intuitive and bolstered through our arguments, the robustness of the sequential nature of exploration and exploitation could be strengthened through longitudinal study. Collecting the data related to exploration in time t1, exploitation in time t2, and market share and profitability in time t3 may provide an improved assessment of sequential ambidexterity.

The second limitation of this paper emanates from the lower sample size and the limited ability to generalize results. Although the power analysis supports the use of the study's sample size (128), the results that are obtained may not be generalizable across various industries especially when the distribution of sample across various industries ranges from one to 14.

The third limitation is related to the use of a single respondent to assess various variables used in the study. The measures – organizational learning, exploration and exploitation, and firm performance – were assessed by the same respondent. Such an approach might lead respondents to feel that they are obliged to select a high rating for profitability and market share (performance indicator), knowing that enough resources have been invested in developing organizational learning. They may feel embarrassed to report that with such a high degree of learning, their organization's profitability/market share is somewhat lower. Using the single respondent for data collection may trigger social desirability bias, whereby respondents are likely to select those responses which are socially desired rather than what is correct (Fisher, 1993). To lower social desirability bias, we suggest future researchers collect data using multiple respondents to address the issue.

Conclusions

While supply chain learning orientations, collectively, are beneficial to firms, some combinations of certain learning orientations are more aligned with exploration, others with exploitation. By better understanding the learning orientation required to foster either exploration or exploitation, a manager can better allocate scarce resources. We argue that learning orientations and team orientations develop an organization's creation capacity, which helps to generate skills and enhance employees' willingness to explore new opportunities and problem solve more innovatively. On the other hand, memory orientations, which is the storage of knowledge and its dissemination across the organization, and system orientations strengthen dispersion capacity to foster exploitation practices. It is when the explored ideas are implemented in the exploitation stage that firms are able to reap the benefit of newly created approach to solve novel problems. Therefore, exploitation practices enhance firms' performance directly and indirectly through exploration, indicating that exploration creates value through exploitation to influence firm performance.

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Appendix A. Operationalization of constructs

ORGANIZATION LEARNING (HULT, 1998). A 7-point Likert scale is used to measure all the four dimensions of organizational learning.

Team Orientation

Please indicate your level of agreement with the following statements about the focus on teamwork in your supply chain.

1. A team spirit pervades our ranks in the supply chain processes.
2. There is a commonality of purpose in the supply chain processes.
3. There is total agreement on our organizational vision in the supply chain processes.
4. We are committed to sharing our vision of the supply chain processes across all levels, functions, and divisions.

Learning Orientation

Please indicate your level of agreement with the following statements about the emphasis on learning in your supply chain.

1. The sense around here is that employee learning is an investment, not an expense.
2. The basic values of the supply chain processes include learning as a key to improvement.
3. The collective wisdom involved in the supply chain processes is that once we quit learning, we endanger our future.
4. We basically agree that our ability to learn is the key to improvement in the supply chain processes.

System Orientation

Please indicate your level of agreement with the following statements related to the focus on interrelation and interdependence of the various activities in your supply chain.

1. All activities that take place in the supply chain processes are clearly defined.
2. We understand the contribution of the various supply chain processes towards the basic value chain and how our work fits into that chain.
3. We have a good sense of the interconnectedness of all parts of the supply chain processes.
4. We understand where all activities fit in the supply chain processes.

Memory Orientation

Please indicate your level of agreement with the following statements related to communication and distribution of knowledge in your supply chain.

1. There is a good deal of supply chain conversation that keeps alive the lessons learned from history.
2. We always keep records of unsuccessful supply chain endeavors and communicate the lessons learned widely.
3. We have specific mechanisms for sharing lessons learned in the supply chain processes from project to project.
4. We have formal routines that we use to uncover faulty assumption that we have made about the supply chain processes.

AMBIDEXTERITY (KRISTAL ET AL., 2010). A 5-point Likert scale was used to measure two dimensions of ambidexterity – exploration and exploitation.

Exploration

Listed below are supply chain management practices that may affect firms' ability to compete in an industry. Please indicate your level of agreement with these statements about your business unit's supply chain practices over the past 12 months.

1. We proactively pursue new supply chain solutions.
2. We continually experiment to find new solutions that will improve our supply chain.
3. To improve our supply chain, we continually explore for new opportunities.
4. We are constantly seeking novel approaches in order to solve supply chain problems.

Exploitation

Listed below are supply chain management practices that may affect firms' ability to compete in an industry. Please indicate your level of agreement with these statements about your business unit's supply chain practices over the past 12 months.

1. In order to stay competitive, our supply chain managers focus on reducing operational redundancies in our existing processes.
2. Leveraging of our current supply chain technologies is important to our firm's strategy.
3. In order to stay competitive, our supply chain managers focus on improving our existing technologies.
4. Our managers focus on developing stronger competencies in our existing supply chain processes.

PERFORMANCE (KRISTAL ET AL. 2010)

How do you perceive your business unit's performance relative to your competitors (1 = relatively weak, 3 = average, 5 = market leader)?

Market Share

1. Your position on your sales growth rate compared to your competitors'.
2. Your satisfaction with your sales growth rate compared to your competitors'.
3. Your market-share gains relative to your competitors'.

Profit Level

1. Return on corporate investment position relative to competition.
2. Net profit position relative to competition.
3. ROI position relative to competition.
4. Return on sales position relative to competition.

Figure 1. A Creation-Dispersion View of Supply Chain Organizational Learning and Its Influence on Ambidexterity, and Performance

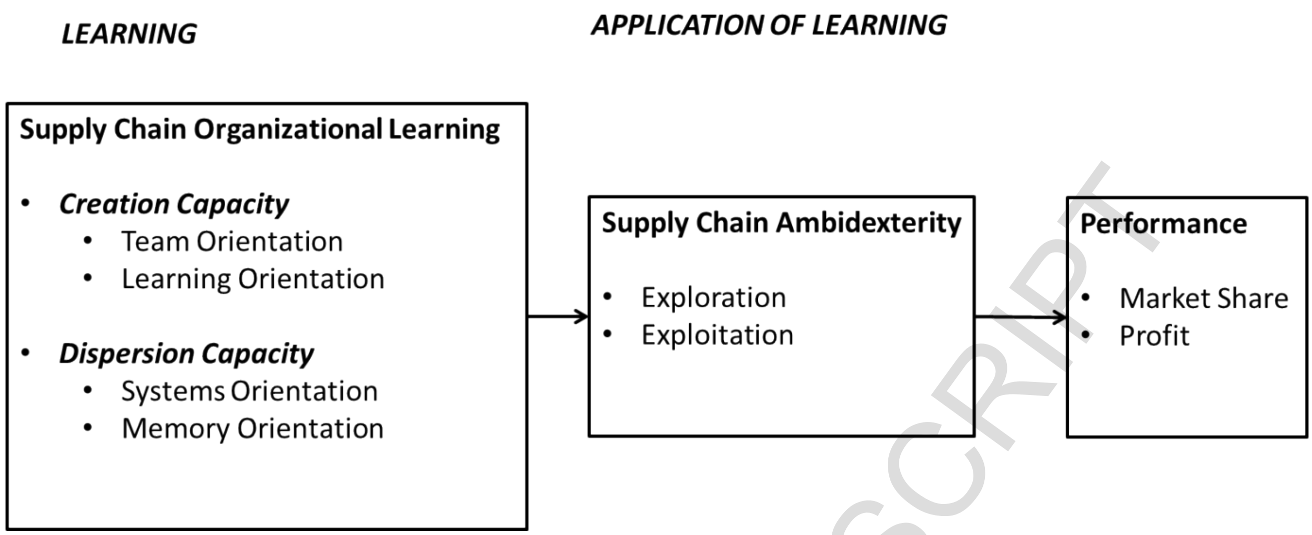
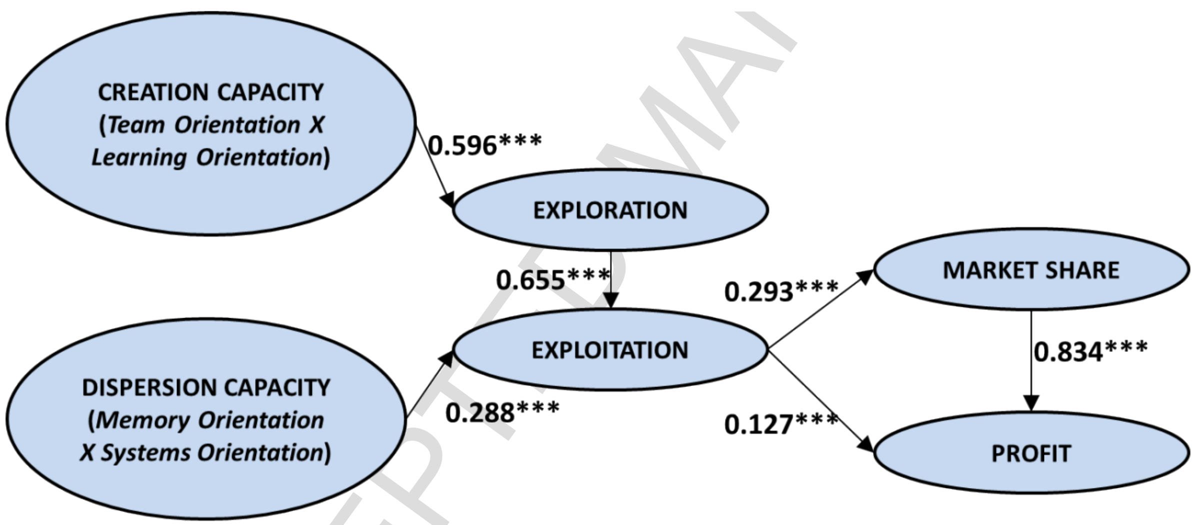


Figure 2. Path Analysis: Hypothesized Research Model



Control Variables:

a) Effect on Market Share
1. **Industry** (β = -0.073^{ns})
2. **Manufacturing Indicator** (β = -0.004^{ns})
3. **Number of Employees** (β = 0.327***)

b) Effect on Profit
1. **Industry** (β = -0.043^{ns})
2. **Manufacturing Indicator** (β = -0.043^{ns})
3. **Number of Employees** (β = -0.080^{ns})

1. X^2 (df) = 51.828 (25), p ≤ 0.001; CFI = 0.943; RMSEA = 0.111; SRMR = 0.090
2. *** p ≤ 0.001; ns = Not significant

Figure 3. Effect of latent classes on market share, profit, exploration, and exploitation

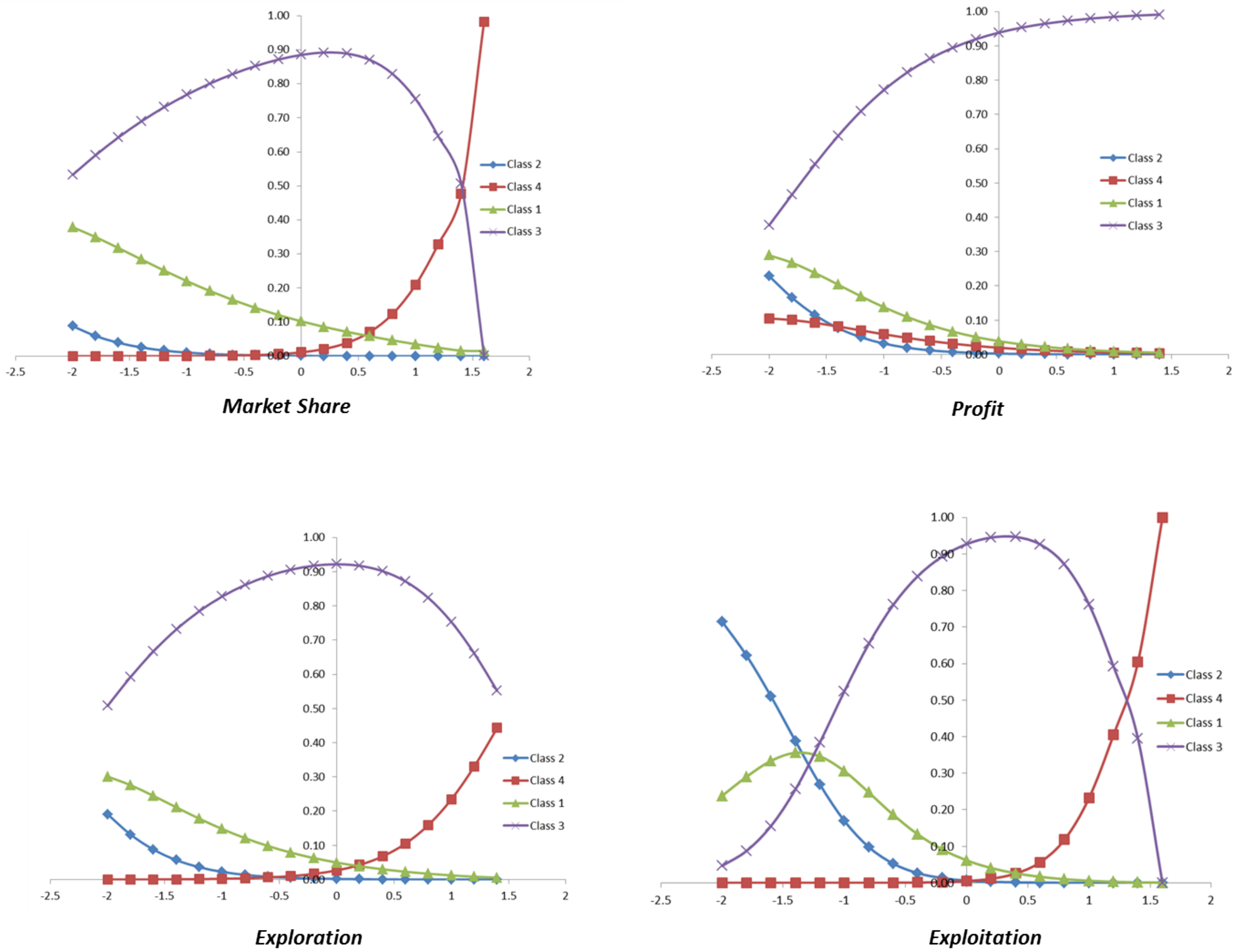


Table 1. Operational Definitions and constructs

Constructs	**Operational definition**
1. Creation capacity	Creation capacity represents the search and production of new knowledge to be utilized for new products or processes, using individuals and teams and their knowledge as the tools of production.
1.1. Learning orientation	*Learning orientation* emphasizes a learning culture within an organization and acknowledges learning as an investment (Hult and Ferrell, 1997).
1.2.Team orientation	*Team orientation* provides a learning environment supportive of team collaboration and cooperation to develop better outcomes than would be generated from individuals on their own (Hult and Ferrell, 1997).
2. Dispersion capacity	Dispersion capacity represents the organization's ability to distribute knowledge and skills that are learned, throughout the organization, and to store knowledge for future access, extension and refinement.
2.1.System orientation	*System orientation* enables workers to understand where their work fits into the overall system – understanding the interconnectedness of all the activities (Hult and Ferrell, 1997).
2.2.Memory orientation	*Memory orientation* represents the capacity to store and disseminate learned lesion across the organization (Hult, 1998).
3. Exploration	Exploration refers to the pursuit of new knowledge, of things that might come to be known (Levinthal and March, 1993).
4. Exploitation	Exploitation refers to the use and development of things already know (Levinthal and March, 1993)
5. Market share	Market share is a business performance measure capturing sales growth relative to competitors.
6. Profit	Profit is a business performance measure capturing profit position relative to competitors.

Table 2. Sample characteristics

Sales		**Type of business unit**	
Less than $5 million	51	Total Corporation (all divisions)	22
$5 million to < $10 million	9	Group (several divisions)	23
$10 million to < $20 million	8	Single division or Company (in a multi-divisional corporation)	45
$20 million to < $50 million	10	Single Division or Company (not in a multi-divisional corporation)	25
$50 million to < $100 million	5	Manufacturing Plant	5
$100 million or more	45	Other	8
Total sample	**128**	**Total sample**	**128**

Industry		**Number of employees**	
Automotive	6	Under 100	49
Aviation/Aerospace	11	100 – 249	14
Electrical	5	250 – 499	18
Electronics	3	500 – 999	4
Healthcare/Medical Devices	8	1000 or more	43
Food/Beverages	8	**Total sample**	**128**
Transportation	4		
Metal Fabrication	2	**Types of Workforce**	
Plastics/Rubber	1	Unionized Production	13
Software/Hardware	14	Non-Unionized Production	95
Other	66	Combination	20
Total sample	**128**	**Total sample**	**128**

Types of operations			
Manufacturing	43	Make to stock	54
Service	85	Make to order	74
Total sample	**128**	**Total sample**	**128**

Table 3. Correlation and composite reliabilities

Variables	1	2	3	4	5	6	7	8	9
1. Industry type	--								
2. Number of employee	-0.067	--							
3. Manufacturing indicator	0.353***	-0.158	--						
4. Creation capacity	-0.001	0.077	-0.054	***0.865***					
5. Dispersion capacity	0.04	0.044	-0.124	0.745***	***0.827***				
6. Exploration	-0.009	0.059	-0.127	0.596***	0.665***	***0.957***			
7. Exploitation	-0.094	0.074	-0.187*	0.626***	0.695***	0.813***	***0.894***		
8. Market share	-0.12	0.349***	-0.129	0.356***	0.381***	0.371***	0.331***	***0.928***	
9. Profit	-0.166	0.231*	-0.181*	0.421***	0.417***	0.415***	0.411***	0.856***	***0.958***

Note. *** $p < .001$; ** $p < .01$; * $p <. 05$

Composite reliabilities are presented along the diagonal

Table 4. Test of hypotheses

	Exploration		Exploitation			Market Share		Profit		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Control Variables										
Industry type	0.034	0.022	-0.038	-0.102	-0.066	-0.078	-0.066	-0.112	-0.098	-0.044
	(.716)	(.776)	(.685)	(.133)	(.232)	(.381)	(.432)	(.220)	(.247)	(.362)
Number of employees	0.041	0.000	0.046	0.029	0.013	0.335***	0.321***	0.204*	0.186*	-0.088
	(.646)	(.997)	(.605)	(.658)	(.806)	(.000)	(.000)	(.020)	(.022)	(.075)
Manufacturing indicator	0.124	0.091	0.162	0.054	0.062	0.061	0.013	0.123	0.062	0.07
	(.196)	(.240)	(.088)	(.434)	(.236)	(.494)	(.881)	(.182)	(.471)	(.154)
Creation /Dispersion Capacity										
Creation Capacity		0.590***								
		(.000)								
Dispersion Capacity				0.691***						
				(.000)						
Exploration/Exploitation										
Exploration					0.805***					
					(.000)					
Exploitation							0.298***		0.377 ***	
							(.000)		(.000)	
Firm Performance										
Market Share										0.872***
										(.000)
F-value	0.708	17.475***	1.561	30.990***	63.249***	6.437***	8.700***	4.048**	8.995***	90.682***
R-squared	0.017 (*a*)	.362 (*b*)	.036(*c*)	.502 (*d*)	.673 (*e*)	.135 (*f*)	.221 (*g*)	.089 (*h*)	.226 (*i*)	.747 (*j*)
	(0.549)	(0.000)	(.202)	(.000)	(.000)	(.000)	(.000)	(.009)	(.000)	(.000)
Δ *R-squared*		0.345 *(b-a)*		0.466 *(d-c)*	0.637 *(e-c)*		0.086 *(g-f)*		0.137 *(i-h)*	0.658 *(j-h)*

Note. *** $p < .001$; ** $p < .01$; * $p < .05$

Table 5. Comparison of coefficients

Relationship	SEM path loading	Regression coefficients
Creation capacity→Exploration	0.596***	0.590***
Dispersion capacity →Exploitation	0.288***	0.691***
Exploration → Exploitation	0.655***	0.805***
Exploitation → Market share	0.293***	0.298***
Exploitation → Profit	0.127***	0.377***
Market share → Profit	0.834***	0.872***

*Note. *** p < .001; ** p < .01; * p <. 05*

Table 6. Bootstrapping test of indirect effects

Note: β (p-value)

	Dispersion Capacity	Creation Capacity	Exploration	Exploitation
Exploitation	--	0.390 (0.009)	--	--
Market Share	0.084 (0.003)	0.114 (0.008)	0.192 (0.012)	--
Profit	0.107 (0.005)	0.145 (0.009)	0.243 (0.012)	0.244 (0.007)

Table 7. Latent classes and probabilities

Class Name	Non-Learners	Exploitative Learners	Developing Comprehensive Learners	Developed Comprehensive Learners
Class Number	2	4	1	3
Team Orientation	0	0	0.8515	1
System Orientation	0	1	0.6131	0.9644
Learning Orientation	0.5644	0.439	0.8884	1
Memory Orientation	0	1	0.6732	1

RESEARCH HIGHLIGHTS

- Team and learning orientations enable creation capacity and SC exploration
- System and memory orientations enable dispersion capacity and SC exploitation
- SC Exploration is positively influences SC exploitation
- SC Exploration indirectly affects performance through SC exploitation
- SC-Supply chain