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### **Transformational leadership and supply chain ambidexterity: mediating role of supply chain organizational learning and moderating role of uncertainty**

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# **Transformational Leadership and Supply Chain Ambidexterity: Mediating Role of Supply Chain Organizational Learning and Moderating Role of Uncertainty**

## **ABSTRACT**

This paper examines the impact of top management transformational leadership on supply chain organizational learning and supply chain ambidexterity. We also evaluate the influence of uncertainty, present in the operating environment, on these relationships. Integrating multiple perspectives of organizational behavior relating to learning and leadership, we develop our research model and evaluate it using survey data. Results from our analysis support the notion that supply chain organizational learning orientations fully mediate the relationship between transformational leadership and supply chain ambidexterity. Also, uncertainty in the operating environment positively moderates the relationship between transformational leadership and supply chain learning.

**Keywords:** Transformational leadership, supply chain organizational learning, supply chain ambidexterity, structural equation modeling, moderated mediation

## 1. INTRODUCTION

To avoid using, old, suboptimal, processes linked with excessive reliance on exploitation and as well as the instability associated with over-reliance on exploration, firms need to strike the right balance between exploration and exploitation (Levinthal and March, 1993). Exploitation involves reducing operational redundancies and leveraging supply chain technology while exploration involves pursuing new supply chain solutions and exploring new opportunities (Kristal et al., 2010). When organizations overly rely on an exploitation strategy, they experience short-run advantages as they can make the best use of existing resources. In the long-run, however, these organizations are likely to fail due to increased competition, obsolete technologies, and overused resources. In contrast, organizations that rely excessively on an exploration strategy can become stuck in a vicious cycle of search, change and failure (Levinthal and March, 1993). Thus, to improve firm performance, firms should emphasize the balance of both exploration and exploitation practices (Gibson and Birkinshaw, 2004). Achieving the twin, but apparently conflicting, goals of exploration and exploitation simultaneously within the supply chain is referred to as supply chain ambidexterity (Kristal et al., 2010).

Following March's (1991) seminal piece on organizational ambidexterity, several studies have examined the importance of ambidexterity, its antecedents, and its consequences. Based on our literature review, we found studies that examined the role of organizational ambidexterity on a firm's ability to maintain competitive advantage (O'Reilly and Tushman, 2011), enhance organizational performance (Boumgarden et al., 2012; Junni et al., 2013), discover new knowledge (Borzillo et al., 2012), promote high performance work practices (Patel et al., 2013) and develop new products (Wei et al., 2014). Other researchers identified antecedents of organizational ambidexterity by studying factors such as alignment of knowledge assets (Lin, et

al., 2017), top management diversity (Li, 2013), and strategic orientations in decision-making (Kortmann, 2015). Still, other studies, that are conceptual in nature, use organizational ambidexterity as a framework to study organizational dynamism (Ricciardi et al., 2016), relative ambidexterity (D'Souza et al., 2017) and innovation (Zhang et al., 2017; O'Reilly III and Tushman, 2013; Parikh, 2016; Xu et al., 2013; Smits et al., 2015). Research on supply chain ambidexterity, specifically, is limited; the only paper addressing the issue is by Lee and Rha (2016) who explore the role of supply chain ambidexterity on supply chain resilience.

Prior research also indicates that organizations' ability to simultaneously pursue both exploration and exploitation practices depends in part upon top management support and leadership style (Gibson and Birkinshaw, 2004; Nemanich and Vera, 2009; Volberda et al., 2001). What is missing from this existing literature, however, is an understanding of why and under what conditions top management leadership influences ambidexterity. Given that leadership influences organizational outcomes through its effect on employees' attitudes and behaviors (e.g. Bass et al., 2003), employees are likely to be essential factor in explaining the relationship between leadership and ambidexterity. We propose that certain leadership styles, specifically transformational leadership, may serve to enhance employees' abilities and their perception of importance of a task, advancing their learning orientation (Kim, 1998) and supporting ambidexterity efforts.

Researchers have examined how organizational learning supports the overall goals of organizations (Hult and Ferrell, 1997) as well as the impact of leadership on exploration and exploitation (Nemanich and Vera, 2009). Researchers have also examined the role of organizational learning in addressing specific challenges of supply chain organizations such as improving the overall environmental performance of supply chain partners (Gavronski et al.,

2012), making the supply chain adaptive to environmental changes (Giannoccaro, 2015), and enhancing new product performance (Li et al., 2013). Additionally, scholars have argued that learning fosters the conditions for ambidexterity (Gupta et al., 2006). However, past research has been inconclusive on the role of learning in this process and has not focused on learning in long-term organizational settings (Nemanich and Vera, 2009); thus, we know little about whether learning is an important intervening process between leadership and supply chain ambidexterity. Given past work demonstrating the importance of learning for supply chain outcomes, we seek to explore whether those benefits extend to supply chain ambidexterity and whether transformational leadership might help to foster the conditions for supply chain learning, and through learning, ambidexterity.

While learning processes may help to explain *why* top management leadership influences supply chain ambidexterity, contextual factors may condition *when* these relationships are likely to be stronger or weaker. Past work finds that the influence of leadership on organizational outcomes is contingent on the external environment, specifically the degree of uncertainty in the operating environment (e.g. Waldman et al., 2001). Because transformational leadership inspires followers to rethink their assumptions and engage in innovative behaviors, this leadership style is likely to be particularly important under conditions of uncertainty (Pieterse et al., 2010). Thus, we also examine whether uncertainty in the operating environment moderates the proposed mediated relationship between transformational leadership, organizational learning, and supply chain ambidexterity.

Our study provides at least three key contributions to the supply chain as well as the leadership literature. First, we examine how top management transformational leadership helps support supply chain ambidexterity. This contributes to past findings (e.g. Gibson and

Birkinshaw, 2004) that internal firm context influences supply chain ambidexterity by demonstrating the role of leadership in creating that context. Second, we further build on prior work by assessing how supply chain organizational learning helps to explain the influence of transformational leadership on supply chain ambidexterity. In doing so, we contribute to research on supply chain organizational learning by identifying a key antecedent of learning as well as research on ambidexterity by establishing the mechanism explaining how leadership relates to supply chain ambidexterity. Finally, we contribute to these literatures by identifying a potential boundary condition – specifically, uncertainty – for these relationships. In doing so, we integrate both internal and external contextual factors that influence the likelihood of achieving supply chain ambidexterity.

## **2. THEORY AND HYPOTHESES**

Below, we develop the explanatory logic for our hypotheses and describe how we ground our theory building in research relating to contextual ambidexterity, transformational leadership, and supply chain learning (c.f. Sparrowe & Mayer, 2011; Sutton & Staw, 1995). We first place the transformational leadership literature in the domain of the contextual ambidexterity literature so that we can show how the dimensions of transformational leadership create the social and performance contexts and enable contextual ambidexterity. This lays the foundation for our explanatory arguments relating to the relationship of transformational leadership with supply chain ambidexterity as well as transformational leadership to organizational learning. Weaving the social and performance contexts, borrowed from the contextual ambidexterity literature, throughout our theory building sections provides theory-based arguments for the hypothesized relationships.

## **2.1 Creating the Context for Supply Chain Ambidexterity**

While early research proposed that there is a trade-off between exploration and exploitation practices (March, 1991), the current school of thought suggests that organizations can practice both exploration and exploitation (Gupta et al., 2006; Li, 2013; Kortmann, 2015; Parikh, 2016). Raisch et al. (2009, p. 685) have summarized the recent trend in the ambidexterity literature as organizations having the capability of “simultaneously exploiting existing competencies and exploring new opportunities.” In the supply chain context, Kristal and colleagues (2010, p. 415) operationalize supply chain exploitation as “the set of practices that refine and extend existing skills and resources,” and supply chain exploration as “practices that develop new supply chain solutions.” In supply chains, refinement of existing skills and resources can be achieved through reducing operational redundancies and improving and leveraging current technologies. On the other hand, new supply chain solutions can be achieved through experimenting, exploring new opportunities, and seeking new solutions to a problem (Kristal et al., 2010).

As researchers have now started to examine the importance of ambidexterity in the supply chain literature, they have found that ambidextrous supply chains where supply chain partners identify new customers need and adapt to changing business environment, are able to mitigate the disruptions in supply chain and enhance business performance (Lee and Rha, 2016). Similarly, Wong et al. (2013), based on ambidexterity literature, found evidence that external integration, which involves information sharing and joint collaboration with suppliers and customers, and internal integration, which involves the collaboration of internal functional units, enhances a firm’s ability to introduce innovative products. Internal integration, which is key

ingredient of ambidexterity, may be facilitated by transformational leadership (Podsakoff et al., 1990).

Drawing from Gibson and Birkinshaw (2004), we contend that this simultaneous emphasis on exploration and exploitation may be facilitated by the organizational context, specifically through the organization's performance context and social context, which can be fostered by top management leadership. Gibson and Birkinshaw (2004) describe performance context as the behavioral attributes of *discipline*, a voluntary focus on commitments, and *stretch*, the desire to exceed expectations. Additionally, in their model, social context captures the degree of *support*, the willingness of employees to show tolerance and lend assistance to other employees, and *trust*, employees' reliance on each other's commitment. We build on their work and propose that top management transformational leadership provides the organizational context (performance and social) that enables supply chain partners to achieve ambidexterity (Figure 1). We also contend that transformational leadership influences supply chain ambidexterity not only directly, as Gibson and Birkinshaw (2004) suggested, but also indirectly through supply chain organizational learning orientations (Ghoshal and Bartlett, 1994). Finally, we propose that the strength of the influence of transformational leadership on this process is contingent on the external context, specifically uncertainty.

<Insert Figure 1 About here>

<Insert Table 1 about here>

## **2.2 Transformational Leadership and Supply Chains**

Bass (1985) conceptualized transformational leaders as those who arouse individuals' higher level needs and make them aware of the importance of the consequences of their behavior. In doing so, transformational leaders help individual transcend their self-interest for the

overall benefit of an organization (Bass, 1985). These leaders do not necessarily champion what is popular and acceptable at the current time, but do adhere to what is right and good. They are also inspirational, considerate of their followers' needs, and intellectually stimulate their followers (Judge and Piccolo, 2004).

Posokoff and colleagues (1990) built on this work and established six dimensions of transformational leadership. These six dimensions include: 1) identifying and articulating a vision, which refers to leaders identifying new opportunities and “developing, articulating, and inspiring others with [their] vision of the future”; 2) providing an appropriate model, which describes how the leader “sets an example for employees to follow that is consistent with values the leaders espouses”; 3) fostering the acceptance of group goals, which involves promoting collaboration among employees so that they can work toward a unified goal; 4) setting high-performance expectations as demonstrated through leader's behavior, which is aimed at encouraging followers to enhance performance and quality of outcome; 5) providing individualized support, which demonstrates that leaders emphasize with their employees' personal feelings; and 6) intellectually stimulating employees, which “challenges followers to re-examine some of their assumptions about their work and rethink how it can be performed” (p. 112).

Transformational leaders have an ability to increase their followers' motivation and move them to go beyond their regular in-role job performance. As a result, followers exhibit higher extra-role performance (Podsakoff et al., 1990). Transformational leaders evoke extra-role performance by inspiring their followers with their vision, demonstrating a good model for followers to follow, and setting high-performance expectations. They also intellectually stimulate their followers to find a novel approach to task accomplishment, provide individualized support

to their followers, and foster the acceptance of group goals to promote cooperation among employees (Podsakoff et al., 1990).

Prior research has established the relevance of transformational leadership to supply chain processes and performance. For example, Defee et al. (2010) found that transformational leaders working in the context of the supply chain positively influence information availability, foster informal communication, and encourage holistic performance. Additionally, in supply chain settings, transformational leadership strengthens the relationship between a) buyers and suppliers, and b) internal users and buyers (Hult et al., 2000). Similarly, transformational leaders who are charismatic, inspirational, and considerate of individual feelings strengthen the relationship between the buying centers (decision-making units of the purchasing organization) and supply chain performance (Hult et al., 2007).

Given these qualities of transformational leaders, we propose that top management transformational leadership creates the performance and social contexts that facilitate supply chain ambidexterity. We next discuss the six-dimensional conceptualization of transformational leadership (Podsakoff et al., 1990) and how it is likely to foster the four specific organizational contextual elements, namely, discipline, stretch, support and trust. Discipline and stretch represent aspects of the performance context whereas support and trust are part of the social context (see Table 1 for an overview of how transformational leadership relates to the contextual elements identified by Gibson and Birkinshaw, 2004).

### **2.2.1 How Does Transformational Leadership Create Performance Context: Discipline and Stretch?**

Through the transformational leadership dimensions of *high performance expectations* and *providing an appropriate model*, transformational leadership can establish the performance

contextual factor, *discipline*. Gibson and Birkinshaw (2004) propose that *discipline* can be instilled in employees by setting clear standards of performance, providing open and honest feedback, and demonstrating consistency in the application of sanctions. As transformational leaders arouse higher level needs among individuals, they make them aware of the importance of consequences, and guide them toward goal attainment (Bass, 1985). Transformational leaders can also reinforce discipline through recognition of employees' contributions toward organizational goals, which reflects the high levels of expectations they place upon their subordinates (Podsakoff et al., 1990).

Research suggests that transformational top management leadership can also guide followers and instill discipline in them through behavior modeling, which is “the observation by a subject of another person performing the desired behavior” (Johnson and Marakas, 2000, p. 403; Salas et al., 2006). According to Bandura's (1977) social learning theory, the effectiveness of modeling depends on the distinctiveness of the model, perceived usefulness of the model, and learners' characteristics. Because they possess a high level of authority in the organization, top management leaders can provide an appropriate model that encompasses the characteristics of distinctiveness and usefulness. Consequently, employees tend to emulate the behavioral example set forth by top management leadership.

The second dimension of the performance context, *stretch*, can be enhanced through the dimensions of *identifying and articulating a vision*, *high performance expectations* and *intellectual stimulation*. Stretch is generated by three key organizational ingredients: shared ambitions, collective identity, and knowledge of personal contribution towards organizational goals (Gibson and Birkinshaw, 2004). Transformational leadership helps create a shared organizational vision through inspirational motivation of employees (Elkins and Keller, 2003).

Inspirational motivation allows employees to persist with the organizational vision and creative efforts in difficult times (Waldman and Bass, 1991).

Transformational leaders also encourage stretch by creating a highly intellectually stimulating environment. This environment is attained by promoting idea generation and experimentation. Leaders' encouragement for employees empowers them psychologically (Ramus and Steger, 2000). Leaders must provide support, stimulation, and challenging environments (all consistent with transformational behaviors) to enhance creativity and ensure it is maintained (Elkins and Keller, 2003; Soliman, 2011). At a group level, transformational leaders encourage collaboration among team members and develop team attitudes and motivation in favor of a common goal (Podsakoff and MacKenzie, 1994).

### **2.2.2 How Does Transformational Leadership Create Social Context: Support and Trust?**

The organizational context of *support* can also be generated through top management transformational leadership behaviors, particularly the dimension of *individualized support*. In Gibson and Birkinshaw's (2004) model, support describes an element of organizational context that encourages organizational members to assist each other. We argue that transformational leaders play a critical role in developing such a context by assisting and supporting their followers. Within the transformational leadership work, individualized support refers to the degree to which leaders empathize with their employees by considering and respecting their personal feelings (Podsakoff et al., 1990). Transformational leaders provide individualized support to their followers by being considerate and attentive toward their employees' feelings (Bass, 1985). Evidence suggests that individualized support is a strong predictor of trust in the leader (Podsakoff et al., 1996), which helps to generate a wider atmosphere of trust in the organization. Transformational leaders also develop trust by promoting collaboration among

team members and fostering a team spirit that glues members together to achieve a common goal. Specifically, another dimension of transformational leadership – *fostering the acceptance of group goals* – contributes to trust in the leader (Podsakoff et al., 1990) and to a climate of trust among organizational members.

### **2.2.3 How Do Performance and Social Contexts Create Supply Chain Ambidexterity?**

Drawing from the above arguments, top management transformational leadership likely supports the performance and social context for supply chain ambidexterity. The four aspects of an organizational context-discipline, stretch, support, and trust must be simultaneously present for an organization to become ambidextrous (Gibson and Birkinshaw, 2004). While discipline and stretch ensures alignment and drive towards organizational goals; support and trust work together to provide the necessary organizational climate for risk taking and efficient coordination.

The importance of top management support for an organizational ambidextrous orientation through the creation of the performance and social contexts has been found in both small and large firms. Lubatkin et al. (2006) argue that the learning orientation of small and medium enterprises (SMEs) is different from that of larger firms. They argue that the abilities of top management to synchronize social (support and trust) and task (discipline and stretch) processes, to manage joint decisions, and to encourage quality information exchange are what makes SMEs ambidextrous. In larger firms, top management reconciles the trade-off between exploration and exploitation practices by working holistically with all the members of an organization for strategic renewal (Volberda et al., 2001). Such renewal involves unlearning the previous approach and thinking in a new way. Unlearning of older approaches requires strict discipline so that one does not fall back towards old ways of doing things. Newer thinking

requires employees to stretch their ability of out-of-box thinking for innovation and higher performance. Moreover, both unlearning and new learning requires the use of advanced technologies that entails the support and trust of top management and fellow employees as these efforts require overcoming organizational inertia. Organizational inertia is hard to overcome in the absence of firm-wide support for the change, and thus, top management support is crucial to this process.

Regardless of the size of an organization, transformational leaders play a critical role in creating the performance and social contexts for supply chain ambidexterity within the organization and specifically in supply chain processes. By fostering these contexts, top management transformational leadership establishes the conditions for supply chain ambidexterity. Therefore, we hypothesize that:

***H1: Top management transformational leadership positively influences supply chain ambidexterity.***

### **2.3. Dimensions of supply chain learning**

Supply chain organizational learning is comprised of four different, but interrelated, learning dimensions of supply chain partners – team orientation, systems orientation, learning orientation, and memory orientation (Hult, 1998). *Team orientation* involves collaboration and cooperation among team members. Highly intelligent individuals working together may not be sufficient to produce expected outcomes if the partners in the supply chain do not have shared vision (Senge, 1997). Only when employees work together for an organization's shared vision they are able to produce desired results. *System orientation* requires human cognition to understand the broader picture. To understand the broader picture, individuals must understand interrelationships among various events and underlying complexities (Senge, 1997). Process

automation, which requires individuals to develop a social skill required to work in a team, was enhanced through two dimensions of organizational learning – team orientation and systems orientation (Fang et al., 2016) A *learning orientation* describes team members' focus on a learning process for the organization's long-term prosperity. The learning process involves continuous learning of new skills and implementation of those skills for the organization's prosperity (Hult, 1998). For employees' learning orientation to be effective, Senge (1997) argues that emphasis should be on thinking beyond their familiar learning pattern. A *memory orientation* requires continuous communication and knowledge sharing among employees to ensure the learning of new skills and effective performance of routine tasks. A memory orientation ensures that the new skills that employees develop are readily accessible across an organization (Hult, 1998). Furthermore, a memory orientation, with the help of learning tools such as database, ensures that the learned lessons are transferred from one project to the next project (Ayas, 1997).

Supply chain organizational learning involves learning new processes and techniques to accomplish tasks. It also encompasses the willingness to relearn when previous learning becomes insufficient or irrelevant (Hult, 1998). Supply chain organizational learning occurs when all the partners in a supply chain emphasize the four dimensions of organizational learning - learning orientation, systems orientations, team orientations, and memory orientations. While previous work focuses on the direct relationship between organizational contextual elements and ambidexterity (Gibson and Birkinshaw, 2004), we propose that the performance and social context fostered by transformational leaders also influences ambidexterity through its effect on supply chain learning. Below, we describe how the context enabled by transformational leadership enhances overall supply chain learning.

### **2.3.1 Transformational leadership, organizational context, and supply chain organizational learning**

As argued before (in Sections 2.2.1 and 2.2.2), transformational leadership creates the performance context as well as social context in an organization. Just as these contexts establish the positive conditions for supply chain ambidexterity, they also provide a context that encourages supply chain learning. We now provide the arguments for how these performance and social contexts created by transformational leaders positively influence supply chain learning.

*Performance Context: Discipline & Stretch:* Through setting high expectations, transformational leaders can establish discipline and stretch in the performance context of the organization. Discipline is important to orient employees to continuous learning. Researchers have suggested that the support for learning that employees receive from their leader improves their absorptive capacity, which is their “ability to evaluate and utilize outside knowledge” (Cohen and Levinthal, 1990; p. 128), and their ability to transfer knowledge (Minbaeva et al., 2003; Sarah and Day, 2007). Often times, transformational leaders through higher expectations stretch their followers’ efforts by inspiring them to challenge traditional norms and find newer ways to solve the existing problems (Hult, 1998; Jansen et al., 2009). Transformational leaders encourage risk taking as they set higher performance expectations and intellectually stimulate employees to solve old problems in newer ways. Followers, as a result, are more likely to develop an orientation that is guided toward experimentation, and search for novel opportunities (Jansen et al., 2009).

Modelling also helps to encourage learning, and transformational leaders who “do” rather than “tell” are better able to enhance employee performance. Such modeling behavior improves

employees' attitudes and behavior (Rouwette et al., 2011) and their problem-solving ability (Collins et al., 2009). Moreover, through behavioral modeling, leaders are able to clearly demonstrate expected performance standards. As a result, leaders are able to reinforce discipline among their followers (Gibson and Birkinshaw, 2004). As discipline is induced in followers, they "strive to meet all expectations generated by their explicit or implicit commitment." (p. 213). This emphasis on striving focuses employees on the need to continuously learn to meet the leader's expectations for performance.

***Social Context: Support & Trust:*** Transformational leaders create trust among their followers through motivation, encouragement, and recognition, which also fosters a positive environment for learning. For learning to have tangible outcomes, intent and effort have to come from both learner and facilitator. Scaduto et al. (2008) stated that leader-member engagement acts as an impetus for intent and effort to learn. Their findings indicated that a leader has the capacity to motivate and manage outcome expectancy from his or her followers.

Transformational leaders can encourage employees to not only enhance their performance (Ramus and Steger, 2000), but also arouse their need to contribute to the team by promoting group cohesiveness (Bass, 1985), idea sharing, and setting measurable and clear goals. Such encouragement may help orient employees towards organizational learning and improve employees' cognitive ability (Zagorsek et al., 2009), knowledge acquisition and dissemination (Simonin and Özsomer, 2009), and cross-functional teamwork.

Commending employees when they are doing better than average is an example of non-monetary support (Podsakoff and MacKenzie, 1994) that may be used by transformational leader to foster high performance expectations. Employee recognition and positive feedback and support from leaders act as guidance for employees to maintain their good work practices as well

as strive to further improve them. When employees know that they have met these performance expectations, they may contribute more to cross-functional teamwork and knowledge sharing. Therefore, transformational leaders' recognition of employees will improve overall supply chain organizational learning.

Fostering the acceptance of group goals is another dimension of transformational leadership that encourages collaboration and cooperation among employees (Podsakoff et al., 1990), which supports a team orientation, a key aspect of supply chain learning. Encouraging employees to be team players enhances team spirit, resulting in all supply chain members working in cohesion toward a common and a unified goal. One of the ways in which leaders can foster the acceptance of group goals is by developing integrity among team members through enforcing a set of guiding principles. With the presence of these principles, each team member is assured that other members could be dependable and relied upon in completing a task, creating an environment of trust. The more those members are able to make an assessment of others' adherence to a set of principles, the greater their trust in the team. Trust is particularly important for employees to cooperate and achieve a unified objective (Smith et al., 1995) by reducing opportunistic behavior and developing long-term cooperation (Ojha et al., 2016), as emphasized by team orientation, to complete their task. Overall, the different dimensions of transformational leadership create the right performance and social context for developing supply chain organizational learning. Based on the discussion, we hypothesize that:

***H2: Top management transformational leadership positively influences supply chain organizational learning.***

## **2.4 Leadership, Learning, and Supply Chain Ambidexterity**

Tokman et al. (2007) state that organizations' cooperative relationship portfolio (CRP) – that is, “the entire spectrum of cooperative firm relationship maintained by a firm” (p. 27) – allows a firm to explore new market opportunities, develop synergy by integrating various resources of cooperating firms, and learn and improve firm's existing activities. Similarly, interfirm relationships with distributors that emphasize knowledge acquisition and collaboration also enhance a firm's ability to explore and exploit (Hernández-Espallardo et al., 2011). Overall, the different elements of CRP and the interfirm relationship are reflected in the organizational learning literature as well. The collaboration and cooperation of supply chain partners and their willingness to understand the importance and synergy of various supply chain process are reflective of a cooperative relationship between supply chain partners and integration of diverse knowledge. In the supply chain organizational learning literature, team orientation emphasizes that supply chain partners maintain a collaborative relationship, systems orientation and memory orientation emphasize their willingness to integrate and share learned knowledge across all the supply chain partners, and learning orientation emphasizes partners' willingness to continuously explore for the long term prosperity of a firm.

#### **2.4.1 Supply chain organizational learning and supply chain ambidexterity**

Supply chain organizational learning synergizes activities involved in the transformation of goods from raw material to the end user stage. Hult and colleagues (2000) stated that different stages of manufacturing not only involve a physical transformation of goods, but also involve information flows. Raw information, in turn, is transferred into knowledge and action through organizational learning process (Škerlavaj et al., 2007; Yu et al., 2013). By effectively managing the chain of interrelationships between users, buyers and suppliers, and the information that flows among those players, organizations generate new knowledge (Borzillo et al., 2012) which

may be a source for competitive advantage. Hult and colleagues adopted the four dimensions of organizational learning developed earlier by Hult (1998) to examine the impact of learning on customer orientation and relationship commitment in two relationships: a) the user-buyer and b) the buyer-supplier. They found that overall organizational learning significantly impacts customer orientation and relationship commitment.

Knoppen et al. (2010) argue that inter-organizational learning may lead to inter-organizational adaptation. The inter-organizational adaptation in the supply chain relationship between the buyers and suppliers helps to reduce cost, increase revenues and create dependence. They identify two approaches to learning – ‘learning from’ and ‘learning with’. The former refers to individual companies transferring existing knowledge to another company. The later refers to the learning that takes place as a result of collaboration between various companies. When members of organizations collectively learn new skills, a new approach to accomplishing a task institutionalizes within an organization (McKee, 1992; Lin et al., 2017). Employees are better able to make the use of internal resources and explore opportunities. Firms are able to leverage from “network competition” by managing and coordinating network organization (Christopher, 2000, p. 39). As a result, organizations become adept at managing ambidextrous practices.

Thus, through collective learning, an organization’s capability to explore and exploit simultaneously will increase. Employees will be better prepared to work with cross-functional teams, understand the meaningfulness of their activities in their units, know where their work fits into overall process, accept learning to be a key to performance improvement, be involved in continuous learning, and share learned knowledge with other members (Hult, 1998). These individuals are likely to be better able to exploit internal resources and explore external

opportunities. Based on this discussion, we conclude that collective learning by organizations enhances organizational ability to perform dual tasks. Therefore, we hypothesize the following:

***H3: Supply chain organizational learning positively influences supply chain ambidexterity.***

#### **2.4.2 Mediating Role of Supply Chain Organizational Learning**

Leaders who possess a clear vision are adept at exploring opportunities and leveraging internal resources (Tushman and O Reilly, 1996). However, yet another question arises: do leaders alone enable organizations to be ambidextrous or are there other factors explaining the relationship? In order to make the best use of internal resources and to adapt to turbulent external environments (Benner and Tushman, 2003), organizations not only require leadership support but also capable employees to link new knowledge with the current competence of a firm (Danneels, 2002). De-linking the competence that pivots around current products and re-linking it with new products ensures “full exploitation” of available competence (2002, p. 1115), including that of employees.

Researchers who have argued that there is a trade-off between exploration and exploitation assert that companies have limited resources and limited mindsets at their disposal to execute multiple actions. Therefore, they suggest that companies make implicit or explicit decisions regarding which strategy – exploitation or exploitation – is viable for their organizations. However, Gupta et al. (2006) suggested that ambidextrous practices are attainable through learning, improvement and acquisition of new knowledge. Thus, we examine supply chain learning as a possible mediator between top management transformational leadership and supply chain ambidexterity.

Nemanich and Vera (2009) attempted to address a similar issue in the context of an acquisition but did not find support for a learning culture mediating the relationship between transformational leadership and the twin goals of exploration and exploitation. They attributed this unexpected result to the data collection context, which was firm acquisition. That context, which allows for assessing only short-term relationships, was not adequate for measuring learning culture because such culture requires time to develop (Sinkula, 1994). Furthermore, their conceptualization of learning culture focused on climate for interpersonal risk-taking and decision participation rather than the specific learning processes that have been established to be effective in the supply chain context (e.g. Hult, 1998). Consequently, it is still not clear from prior studies what role a transformational leadership and learning play in organizational ambidexterity, or supply chain ambidexterity, specifically.

Building on our above arguments, we suggest that fostering a context for learning is a key mechanism through which transformational leaders influence supply chain ambidexterity. Through motivating employees to engage in continuous learning, transformational leaders are able to support their organizations in effectively balancing exploration and exploitation. While H2 proposes a direct relationship between transformational leadership and supply chain ambidexterity, our discussion above also points to the relationship being partially mediated by supply chain learning. Therefore, we hypothesize that

***H4: Supply chain organizational learning mediates the relationship between top management transformational leadership and supply chain ambidexterity.***

## **2.5 The Moderating Role of Uncertainty**

From its origins, transformational leadership has focused on leader behaviors that transform followers and inspire them to accomplish more than what is usually expected (Bass,

1985). For organizations, and for supply chains, specifically, the need to change and achieve difficult goals is likely enhanced under uncertainty, and the ability of transformational leaders to provide a vision and stimulate follower performance can help to meet those needs. Evidence suggests that top management charismatic leadership, a component of transformational leadership, is related to performance only under higher uncertainty (Waldman et al., 2001). Transformational leadership has also been shown to increase employee innovative behavior (Pieterse et al., 2010), and under uncertain conditions, transformational leaders can guide followers to meet the needs for changing responses and increased effort (de Hoogh et al., 2004). These increased efforts likely stimulate greater learning in the supply chain.

Previous research (Hayes and Wheelwright, 1979) has established that make to order environments where products are built to customers specifications have high level of uncertainty as the operating systems have to conform to the highly variable customer demand. On the other hand, in the make to stock environment the level of uncertainty is low as the operating systems follow internal forecast of demand rather than the actual customer demand. In high uncertainty environments, top management transformational leadership is likely more strongly related to the learning processes that enable supply chain ambidexterity. Thus, we propose:

***H5: Uncertainty moderates the mediated relationship between top management transformational leadership and supply chain ambidexterity.***

The research model, based on our above discussion, is provided in Figure 2.

<Insert Figure 2 About here>

## **4. METHOD**

### **4.1 Sample and Procedures**

Similar to other work evaluating top management transformational leadership (e.g. Engelen et al., 2015) as well as supply chain processes, we used a key informant approach in our research. The possible respondents were drawn from the alumni database of a large public university in the southwestern United States. To address the key informant selection issue, in which informants should be competent about the issues under study (Kumar et al., 1993), we pre-screened each respondent to ensure they were involved in or responsible for the strategic supply chain decision-making process for their extended supply chain organization. Those respondents who did not meet the screening criteria were not included in the final survey sample.

To collect data, we used an online survey, which was created using Qualtrics software and we e-mailed the survey link to 300 participants who met the screening criteria. There were a total of 150 respondents. After deleting 22 surveys that had missing data on one or more survey items, the final sample size was 128, a net response rate of 42.6%. The titles of the respondents included supply chain manager, supply chain analyst, materials manager, operation manager, production manager, VP operation and other similar titles.

The demographic data for the sample has been provided in Table 2. The sample firms represent various industries such as software/hardware, aviation, healthcare, food and beverage, automotive, electrical, transportation, metal fabrication and plastic/rubber. The majority of firms where participants worked ( $n = 95$ ) had a non-unionized workforce. Sample firms were of various sizes in terms of the number of employees – 49 companies had less than 100 employees, 36 companies employed between 101 and 1,000 employees, and 43 companies employed more than 1,000 employees. In terms of their sales revenue, 51 firms made less than 5 million dollars, 20 firms made between 5 and 50 million dollars, 5 between 50 and 100 million dollars, and 47 firms made more than 100 million dollars in sales revenue. A majority of the firms in the sample

(71%) generated more than 50% of their sales revenue from the sales of services. Service based provides a context that fosters learning and innovation, as is found in the previous studies (Chen et al., 2016; Wang et al., 2016). Table 2 presents the demographic data of the sample used in the study.

< **Insert Table 2 about here** >

To assess the generalizability of our sample we compared the industry distribution of our sample with that of Kristal et al.'s (2010) study sample of 3200 Institute for Supply Management members. The high correlation ( $r = 0.956$ ) of the frequencies of industries in various categories across two samples indicates that our sample is representative of a similar population.

#### **4.2 Measures**

**Top Management Transformational Leadership.** We used Podsakoff et al.'s (1990) scale to measure top management transformational leadership (see Appendix). Participants were asked to rate their top management on the scale's six dimensions - identify and articulate a vision, provide an appropriate model, fostering the acceptance of group goals, high performance expectations, provide individualized support, intellectual stimulation. A 7-point Likert scale is used to measure transformational leadership for all the 23 items of the scale ( $\alpha = .91$ ).

**Supply Chain Organizational Learning.** We used Hult's (1998) scale to measure supply chain organizational learning (see Appendix). A 7-point Likert scale measured all four dimensions of supply chain organizational learning, namely team orientation, system orientation, learning orientation and memory orientation. A total of 16 items were used to measure supply chain organizational learning ( $\alpha = .92$ ).

**Supply Chain Ambidexterity.** We used Kristal et al.'s (2010) scale to measure organizational ambidexterity (see Appendix). A 5-point Likert scale measured two dimensions of organizational

ambidexterity – exploitation practice and exploration practice. Respondents responded to survey items based on their views about their business unit's supply chain practices over the past twelve months. Eight items were used to measure organizational ambidexterity ( $\alpha = .94$ ).

**Uncertainty.** We used manufacturing environment-make to stock versus make to order- to capture uncertainty in the operating environment. Make to order environments where the products are built to customers' specifications have high levels of uncertainty, as the operating systems have to conform to the highly variable customer demand (Hayes and Wheelwright, 1979). In the make to stock environment, the level of uncertainty is low, as the operating systems follow internal forecasts of demand rather than the actual customer demand. The internal forecast buffers the operating system from the variable and uncertain customer demand. Therefore, we have conceptualized uncertainty as a dichotomous variable with low level of uncertainty corresponding to make to stock environment and high level of uncertainty corresponding to make to order environment.

**Control Variables.** Industry type, manufacturing indicator (i.e., primarily manufacturing or primarily service firm) and company size in terms of number of employees were used as control variables. Prior research has demonstrated that supply chain organizational learning varies substantially across industries (Dutton and Thomas, 1984). Job complexity inherent to certain industries may vary both the need to learn and ability of employees to learn. Differences also persist between manufacturing and service sectors in approaching innovative processes (Ettlie and Rosenthal, 2011). Similarly, leadership support may vary due to the size of a company. Leaders in a large sized company may not be able to encourage, provide feedback, and be a role model to their employees as much as those in a small-sized company can. In a nutshell, employees exposed to feedback, encouragement and role modeling may vary significantly across

organizations with respect to company size, industry type and company type (service versus manufacturing). To ensure that these differences did not impact relationships we examined, the effect of company size, industry type, and company type (manufacturing/service) were entered as control variables in the analyses.

## **5. RESULTS**

We evaluated our research model using two different analyses. First, we evaluated the nomological structure of the model along with hypotheses 1 to 4 using structural equation modeling (AMOS 20) and Sobel test for indirect effect. Second, we evaluated the moderated mediation hypothesis (Hypothesis 5) using process analysis suggested by Hayes (2015).

Correlations and descriptive statistics are presented in Table 3. The composite reliabilities of the constructs ranged from 0.936 to 0.914 and average variance extracted ranged from 0.642 to 0.880 providing evidence of convergent validity (Table 3). Also, the comparison of the omnibus fixed and free measurement model indicated that the free model is better ( $\Delta\chi^2$  (df) = 18.753 (3);  $p \leq 0.01$ ), providing evidence of discriminant validity.

**<Insert Table 3 about here>**

### **5.1 Test of hypotheses**

The results of the structural equation modeling (SEM) analysis are provided in Figure 2. To set up our structural equation model, we used prior literature to determine the factor structures of the constructs. We used the conceptualization of transformational leadership suggested by Podsakoff et al. (1990), which has transformational leadership as the second order factor with six first order dimensions – Identify and Articulate a Vision (VI), Provide an Appropriate Model (MO), Foster the Acceptance of Group Goals (GO), Set High Performance Expectations (EX), Provide Individualized Support (SU), Encourage Intellectual Stimulation

(ST). For supply chain organizational learning, we used the factor structure suggested by Hult (1998), which has supply chain organizational learning as a second order factor with four first order dimensions – Team orientation (TE), Systems Orientation (SY), Learning Orientation (LE), Memory Orientation (ME). Our supply chain ambidexterity factor structure was as suggested by Kristal et al. (2010) with supply chain ambidexterity as a second order construct with two first order dimensions, Supply Chain Exploitation Practices (EXI) and Supply Chain Exploration Practices (EXR).

**<Insert Figure 2 about here>**

The SEM analysis showed that the control variables – industry type ( $\beta = -0.007$ ,  $p = 0.914$ ), manufacturing indicator ( $\beta = -0.096$ ,  $p = 0.177$ ), and company size ( $\beta = -0.056$ ,  $p = 0.397$ ) – did not have a significant impact on the supply chain organizational learning and supply chain ambidexterity. The comparison of the structural model with controls, to the one without it, yielded an insignificant chi-square difference ( $\Delta\chi^2$  (df) = 160.911 (141),  $p = 0.120$ ). The fit indices of the structural model are quite satisfactory ( $\Delta\chi^2$  (df) = 1757.053 (1058),  $p \leq 0.001$ ; CFI = 0.904; RMSEA = 0.072; SRMR = 0.072), providing support for the nomological validity of the hypothesized structural model.

Hypothesis 1, which states that transformational leadership positively influences supply chain ambidexterity, was not supported ( $\beta = -0.144$ ,  $p \leq 0.308$ ). Hypothesis 2, which states that transformational leadership positively influences supply chain organizational learning, was supported ( $\beta = 0.796$ ,  $p \leq 0.001$ ). Hypothesis 3, which predicts that supply chain organizational learning positively influences supply chain ambidexterity, was supported ( $\beta = 0.902$ ,  $p \leq 0.001$ ). Also, the indirect effect of transformation leadership on supply chain ambidexterity through supply chain organizational learning was significant ( $\beta = 0.718$ ,  $p \leq 0.001$ ). These results suggest

that, the relationship between transformational leadership and supply chain ambidexterity is fully mediated (mediation effect:  $\beta = 0.589, p \leq 0.001$ ) by supply chain organizational learning. Therefore, Hypothesis 4 which states that supply chain organizational learning mediates the relationship between top management transformational leadership and supply chain ambidexterity was supported.

We also looked at the influence of *common method bias* on the model using the marker variable methodology (Lindell and Whitney, 2001). Our marker variable was derived from leisure literature so that it would be theoretically unrelated to the constructs in our research model. We compared the model with marker variable to the one without it. Even though the chi-square difference in fit was significant ( $\Delta\chi^2 (df) = 64 (46), p = 0.041$ ); the differences in CFI and RMSEA fit indices for the two models were only 0.002 and 0.001 respectively, indicating common method bias not affecting the model adversely (Cheung and Rensvold, 2002). Moreover, when we include the marker variable in our SEM model the support for our hypotheses does not change. The path loading for the three hypothesized relationships transformational leadership  $\rightarrow$  supply chain learning, transformational leadership  $\rightarrow$  supply chain ambidexterity, and supply chain learning  $\rightarrow$  supply chain ambidexterity were respectively 0.792 ( $p \leq 0.001$ ), -0.132 ( $p = 0.354$ ), and 0.881 ( $p \leq 0.001$ ). These *path loadings for the model with the marker variable* were not statistically different from the corresponding *path loadings in the model without the marker variable*. Therefore, our results were well supported.

We use the Kim (2005) procedure for determining the minimum sample size using the degrees of freedom (1058), p-value (0.05), and target power (0.80). The minimum sample size based on their procedure is 47 for our hypothesized SEM model. Our sample size of 128 far exceeds this threshold. We also use power analysis procedure suggested by McCullum et al.,

(1996) to assess the adequacy of the size of our final sample. This procedure uses degrees of freedom (1058), p-value (0.05), final sample size (128), RMSEA for the null model (0.072), and RMSEA for the alternate model (0.226) to determine the power needed to identify significant effects. The power obtained was 1 indicating the suitability of the sample size. Moreover, our result of fully mediated relationship does not change whether we used the SEM model with the marker variable or the moderated mediation analysis.

### **Moderated mediation Analysis**

Figure 1 presents a mediation model where the effect of *transformational leadership* ( $X$ ) on *supply chain organizational learning* ( $M$ ) is moderated by *uncertainty* ( $W$ ). *Supply chain ambidexterity* ( $Y$ ) is a dependent variable. Figure 1a represents the conceptual model, whereas Figure 1b represents the statistical model. The statistical model also includes three covariates, *company size* ( $U_1$ ), *manufacturing indicator* ( $U_2$ ), and *industry* ( $U_3$ ), to control for the effect of these variables on the outcome variables- supply chain organizational learning and ambidexterity. The statistical model represents two linear equations for the outcome variables- supply chain learning and ambidexterity-as provided in equations (1) and (2).

$$\begin{aligned} \text{Supply chain organizational learning} = & i_{\text{supply chain organizational learning}} + \\ & a_1(\text{Transformational leadership}) + a_2(\text{Uncertainty}) + \\ & a_3(\text{Transformational leadership} * \text{Uncertainty}) + a_4(\text{Company size}) + \\ & a_5(\text{Manufacturing indicator}) + a_6(\text{Industry}) + e_{\text{supply chain organizational learning}} \end{aligned} \quad (1)$$

$$\begin{aligned} \text{Supply chain ambidexterity} = & i_{\text{supply chain ambidexterity}} + \\ & c'(\text{Transformational leadership}) + b_1(\text{Supply chain organizational learning}) + \\ & b_2(\text{Company size}) + b_3(\text{Manufacturing indicator}) + b_4(\text{Industry}) + \\ & e_{\text{supply chain ambidexterity}} \end{aligned} \quad (2)$$

<Insert Figure 4 about here>

<Insert Table 4 about here>

Table 1 presents the estimated regression coefficients. Results provide evidence that by controlling the effect of covariates – company size, manufacturing indicator, and industry – the supply chain organizational learning positively influence the outcome variable, supply chain ambidexterity ( $b_1 = 0.5220$ , 95%CI = 0.3858 to 0.6581,  $p = 0.000$ ). Moreover, the results also demonstrate that the moderation of the transformational leadership on supply chain organizational learning by uncertainty is statistically significant ( $a_3 = 0.2850$ , 95%CI = 0.0511 to 0.5188,  $p = 0.0173$ ). The confidence interval of the interaction regression coefficient ( $a_3$ ) does not include zero. The index of moderated mediation,  $a_3b_1 = 0.1487$  (95%CI = 0.0312 to 0.2663), shows statistically significant moderated mediation effect as the 95% bootstrap confidence interval does not include zero. Therefore our results provide the support for Hypothesis 5. Hence, we can conclude that the indirect relationship between transformational leadership ( $X$ ) and ambidexterity ( $Y$ ), which is mediated by supply chain organizational learning ( $M$ ) is also moderated by uncertainty ( $W$ ).

The indirect effect of transformational leadership on supply chain ambidexterity through supply chain organizational learning is a product of conditional effect of transformational leadership on organizational learning from equation 1, and the effect of supply chain organizational learning on supply chain ambidexterity controlling the effect of transformational leadership from equation 2 (Hayes, 2015). This could be written down in an equation as,

$$\omega = [a_1 + a_3(\text{Uncertainty})]b_1 = a_1b_1 + a_3b_1(\text{Uncertainty}) = 0.3947 + 0.1487(\text{Uncertainty})$$

(3)

Equation (3) shows that the indirect effect is a linear function of uncertainty with the intercept  $a_1b_1 = 0.3947$  and slope  $a_3b_1 = 0.1487$ . In Figure 2, we have depicted this function graphically. The graph demonstrates that the indirect effect of transformational leadership on ambidexterity through supply chain organizational learning increases with the increase in uncertainty, as the slope of the line is positive.

**<Insert Figure 5 about here>**

We also used simple slopes to evaluate the conditional indirect effect of transformational leadership on supply chain organizational learning. Our uncertainty variable was dichotomous. The effect sizes at low and high levels of uncertainty are provided in Table 2. Figure 3 provides the simple slope representation of the conditional effect. The simple slope of the relationship of transformational leadership with supply chain organizational learning at low level of uncertainty was  $\beta_{\text{low}} = 0.3384$  (95% CI = 0.2248 to 0.4749). The simple slope of the relationship of transformational leadership with supply chain organizational learning at high level of uncertainty was  $\beta_{\text{high}} = 0.4852$  (95% CI = 0.3543 to 0.6396). Since the 95% bootstrap confidence intervals for the simple slopes, at high as well as low level of uncertainty, did not include zero we conclude that the simple slopes are statically different from zero. It is evident from the figure that transformational leadership has significant positive influence on organizational learning and this influence is enhanced as the level of uncertainty increases.

**<Insert Table 5/Figure 6 about here>**

The impact of transformational leadership on ambidexterity, however, is not significant in the presence of supply chain organizational learning, which is a mediating variable ( $a_1 = 0.0176$ , 95% CI = -0.1463 to 0.1816). This leads us to conclude that the moderated supply chain

learning fully mediates the relationship between transformational leadership and ambidexterity.

## **6. DISCUSSION**

In this study, we argue that transformational leadership (Podsakoff and MacKenzie, 1994) helps to foster an organizational context (Gibson and Birkinshaw, 2004) that enhances supply chain ambidexterity (Kristal et al., 2010). We also contend that influence of transformational leadership on supply chain organizational learning is enhanced with increasingly uncertain demand.

### **6.1 Contribution to Theory**

We evaluated our research model using survey data and found evidence for a significant positive impact of transformational leadership behaviors on supply chain organizational learning. Our results also indicate that supply chain organizational learning positively influences supply chain ambidexterity. Results, however, did not support the direct influence of transformational leadership on supply chain ambidexterity, indicating a full mediation effect. Our findings indicate that supply chain organizational learning is a mechanism through which leadership support influences organizational ambidexterity. This result is consistent with other work, such as Grant (2012) and Noruzy et al. (2013), who suggest mechanisms through which transformational leadership impacts performance outcomes. In both those studies, the mechanisms included behaviors encompassed in organizational learning orientations. These learning behaviors represent routines that need to be executed to achieve exploration and exploitation activities. Transformational leadership only creates the environment for exploration and exploitation to occur. This environment should be accompanied by action, as encompassed

in the learning routines, to achieve the goals of exploration and exploitation. In the absence of the learning routines, an organization will be devoid of any action towards its goal of ambidexterity.

By including supply chain organizational learning as a mediating variable, we distinguish this study from other studies where researchers tend to link leadership attributes directly with organizational performance. Despite many studies relating leadership traits and leaders behaviors to job performance (DeRue et al., 2011; Piccolo and Colquitt, 2006; Tierney et al., 1999), studies that examine the mechanisms through which leadership attributes impact employees outcomes are largely missing (Avolio et al., 2009). To answer the question regarding how leadership attributes foster a learning environment for organizational performance, we test the mediation effect of supply chain organizational learning, which has four dimensions. When the leaders focus on improving team orientation, system orientation, learning orientation and memory orientation, a learning environment is promoted. Such orientations not only allow employees to understand their day-to-day activities, but also help them to generate relevant skills, collaborate with a team, transfer lessons that are learned, and acknowledge the importance of all the members of a supply chain organization for completing a task. These dimensions of supply chain organizational learning may be viewed as prosocial tangible outcomes, whereby supply chain partners could relate how a vision envisaged by their transformational leaders has a meaningful contribution to their workplace (Grant, 2012). As Grant (2012) pointed out, in the absence of tangible outcome of a vision, it would simply be rhetoric.

The dimensions of transformational leadership include the ability to identify and articulate a vision, leading by setting an example, and providing an appropriate model for

followers to achieve that vision. Moreover, transformational leaders not only expect high performance standards from their employees, but also provide individualized support to them. Because it involves intellectual stimulation and pushing followers to higher levels of motivation, transformational leadership is an important leadership style to integrate into our understanding of ambidexterity, given its inherent complexities. The results of our study reinforce the concept that transformational leadership enhances the behavioral outcomes of job performance in the form of enhanced supply chain organizational learning and firms' ability to pursue both exploration and exploitation strategy. These findings contribute to and extend past work suggesting that transformational leaders can lift organizations to higher levels of learning and performance (García-Morales et al., 2012).

Our evaluation of the moderation effect of uncertainty shows that the relationship between transformational leadership and supply chain organizational learning is strengthened with an increase in uncertainty. This result suggests that uncertainty acts as a boundary condition for supply chain organizational learning mediating the influence of transformation leadership on supply chain ambidexterity. These findings indicate that there is an increasing value of transformational leadership in dynamic environments, providing guidance to firms on how to choose leaders in conditions of increased uncertainty.

This study also contributes to the study of behavioral operations. Croson et al. (2012, p. 1) defined behavioral operations as “the study of potentially non-hyper-rational actors in an operation context, having the element of both operations and behavior.” According to them, behavior that employees demonstrate should be beyond their self-interest, and should not be measured in monetary terms. Constructs used in our study are consistent with what Croson et al.

(2012) defined as non-hyper-rational being. For example, measurement of employees' understanding of sourcing processes and their resultant knowledge sharing behavior was neither motivated by employee's self-interest nor measured in monetary terms. Furthermore, such employee behavior was studied in a supply chain setting. Employee learning behavior is, therefore, relevant to studying operational behavior. Lastly, since the leaders who are transformational in nature may not be involved in transactional activities, we studied the independent impact of transformational leadership on supply chain organizational learning.

This research also contributes to the organizational ambidexterity literature. Scholars in the ambidexterity literature have contradictory viewpoints regarding the concept of ambidexterity. One of the differences relates to the static versus dynamic perspective of ambidexterity. Researchers who believe ambidexterity is a static process argue that organizations pursue exploration and exploitation activities simultaneously (e.g., Gibson and Birkinshaw, 2004; Gupta et al., 2006); whereas others argue that a firm has to go through a temporal cycle of exploration and exploitation. They believe that organizational ambidexterity is a dynamic and sequential process (e.g., Brown and Eisenhardt, 1998; March, 1991). We present the concept of organizational ambidexterity as a static process in the current study, as the respondents were required to indicate their level of agreement/ disagreement regarding both the exploration and exploitation supply chain practices of their business units over the past 12 months. The results supported our argument that managers can attain the twin goal of exploration and exploitation during the one-year period by developing supply chain organizational learning capability. However, we are not sure whether or not exploration and exploitation practices that were occurring concurrently were based on same products, services, or concepts. Organizations

could have been exploiting its current resources or capabilities, but, at the same time, experimenting with novel approaches to enhancing the efficiency of a supply chain.

## **6.2 Contribution to Practice**

One of the major challenges that managers face is the obsolescence of products and services because of the dynamic nature of the business environment and changing customer tastes and preferences. Due to shorter product life cycles, demand declines, making the current production volume of existing products simply not feasible. As in the case of Apple, a continuous introduction of a newer version of smartphones not only cannibalized the market share of Apple's own product – iPad – but also resulted in decline of worldwide tablet shipments by 12.3% according to International Data Corporation, an American research company that conducts research on consumer technology markets. The shrinkage of product life cycle, especially in technology-based industries, makes it imperative that management constantly explores new opportunities, but at the same time continues generating revenues from its existing business operations by making the best use of existing competencies. Conducting these dual tasks, however, is not an easy feat to achieve, especially when organizational resources are limited. We found evidence that such challenges may be overcome by the presence of visionary leaders who not only set high-performance expectations but who also act as a role model and set an example by “doing” rather than “telling.” Moreover, these leaders challenge employees to solve an existing problem in newer and more efficient ways, but, at the same time, they are cognizant of employees' personal feelings and instill a team spirit among them so that the burden of exceeding performance standards is distributed across all team members.

The results also suggest that leaders should first focus on enhancing the development of four dimensions of supply chain organizational learning – team orientation, system orientation, learning orientation, memory orientation (Hult, 1998). These findings are similar with what companies like Uber Technologies Inc. are doing. Uber, which is the U.S. based company that provides taxi and limo services allowing users to request taxi using their smartphone, seeks to introduce fully autonomous cars by 2021. Co-founder and former Chief Executive Officer of Uber Travis Kalanick's was dedicated to achieving this goal by encouraging partners in value chain such as researchers, auto manufacturer and other suppliers to work together. Moreover, the data collected from both the internet and by a co-pilot is aimed at improving maps and navigation system. These systems set a foundation whereby Uber is able to keep records of unsuccessful endeavors and communicate the learned lesson across all the partners in a value chain. In summary, the partners in Uber's value chain emphasize continuous learning, collaboration, joint contributions and knowledge sharing.

### **6.3 Limitations and Future Research**

This study has a number of limitations, which also open up avenues for future research. First, we have not examined the differential impact of supply chain organizational learning on exploration and exploitation practices. The impact of supply chain organizational learning is examined on overall organizational ambidexterity. Supply chain organizational learning may not equally impact both exploration and exploitation practices. Therefore, by treating organizational ambidexterity as one construct, we fail to account for the differences in the amount of variance of exploitation and exploration explained by supply chain organizational learning.

Second, although there are four dimensions of supply chain organizational learning, we considered them to be one construct. Leader supportive behavior may or may not impact all of these learning dimensions, or they may not impact some dimensions of supply chain organizational learning at all. Understanding the sourcing process of the supply chain, for example, may be the result of employee's self-efficacy and not a result of leadership support. The same problem might be true for the transformational leadership measure. Hence, we recommend future researchers to study the differential impact of leadership support on each dimension of supply chain organizational learning.

Third, though we controlled for, and evaluated, the impact for common method bias but it still could be issue for the study as the construct measurement approach required individuals to rate the items that measured all constructs (Doty and Glick, 1998). A single response assessing both leadership support and supply chain organizational learning may encourage respondents to respond in a socially desirable manner. This response may not provide the actual representation of constructs under consideration. Therefore, we suggest that future researchers collect data from two different sources. Since followers are able to evaluate leadership support, the measurement of such behavior should be taken from the employees' perspective. Similarly, since leaders appropriately identify the degree of supply chain organizational learning (collective learning by all employees) it might be more appropriate to assess supply chain organizational learning from the leader's perspective. Finally, items measuring exploitation and exploration practices seek responses of employees' perception of strategic business unit (SBU) practices for the past 12 months. Recall bias, therefore, may persist in this study (Coughlin, 1990). Although there are some existing studies that use longitudinal data (e.g., Voss and Voss, 2013), and longitudinal

case studies (e.g., Medlin and Törnroos, 2015; Pellegrinelli et al., 2015) to examine the sequential nature of ambidexterity, additional longitudinal studies will benefit exploration and exploitation literature. Also, the use of convenience sample may be a source of bias. We tried to assess this bias by comparing our sample with another larger sample relating to supply chain. The industry distribution across the two samples had very high correlation indicating sampling bias may not be a very significant factor in our study.

Another potential area of future research is to use the four dimensions of organizational learning to study the different impacts of learning on ambidexterity. This will be a very exciting area of research as it will open the black box of how individual learning dimensions have varying impact on exploration versus exploitation. Such research would provide valuable guidance to managers on how to match the various type of learning to a goal (exploration versus exploitation) more pertinent to their context. For example, a firm in a mature industry producing commodities may want to focus more on exploitation whereas a firm in fast moving industry such as electronics may want to focus more on exploration.

## **7. CONCLUSION**

The present study demonstrates that transformational leadership is pivotal to supply chain organizational learning and for employees to engage in exploration and exploitation practices. Therefore, transformational leaders should focus on enhancing employees' capability to collaborate with a team (team orientation), focus on learning behaviors (learning orientation), store and share information within and across the organization (memory orientation), and

understand the overall sourcing process (system orientation). Moreover, role of transformational leadership is enhanced with the increase in the levels uncertainty in the operating system.

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## APPENDIX

### SCALES

#### **TRANSFORMATIONAL LEADERSHIP (PODSAKOFF ET AL., 1990)**

##### ***Identify and Articulate a Vision***

*Please indicate your level of agreement with the following statements about the ability of your top management to identify and articulate a vision.*

1. Our top management has a clear understanding of where we are going.
2. Our top management paints an interesting picture of the future for our group.
3. Our top management is always seeking new opportunities for the organization.
4. Our top management inspires others with his/her plans for the future.
5. Our top management is able to get others committed to their dream.

##### ***Provide an Appropriate Model***

*Please indicate your level of agreement with the following statements about the ability of your top management to provide an appropriate model.*

1. Our top management leads by “doing,” rather than simply by “telling.”
2. Our top management provides a good model for me to follow.
3. Our top management leads by example.

##### ***High Performance Expectations***

*Please indicate your level of agreement with the following statements about your top management’s expectations about high performance.*

1. My top management shows us that he/she expects a lot from us.
2. My top management insists on only the best performance.
3. My top management will not settle for second best.

##### ***Fostering the Acceptance of Group Goals***

*Please indicate your level of agreement with the following statements about the degree to which your top management fosters the acceptance of group goals.*

1. Our top management fosters collaboration among work groups.
2. Our top management encourages employees to be “team players.”
3. Our top management gets the group to work together for the same goal.
4. Our top management develops a team attitude and spirit among employees.

##### ***Provide Individualized Support***

*Please indicate your level of agreement with the following statements about the degree to which your top management provides individualized support.*

1. Our top management acts without considering my feelings.
2. Our top management shows respect for my personal feelings.
3. Our top management behaves in a manner thoughtful of my personal needs.
4. Our top management treats me without considering my personal feelings.

##### ***Intellectual Stimulation***

*Please indicate your level of agreement with the following statements about the degree to which your top management provides an intellectually stimulating work environment.*

1. Our top management challenges me to think about old problems in new ways.

2. Our top management asks questions that prompt me to think.
3. Our top management has stimulated me to rethink the way I do things.
4. Our top management has ideas that have challenged me to reexamine some of basic assumptions about my work.

## **SUPPLY CHAIN ORGANIZATIONAL LEARNING (HULT, 1998)**

### ***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.

### ***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.

### ***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.

### ***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.

## **Supply chain ambidexterity (Kristal et al., 2010)**

### ***Supply Chain Exploitation Practices***

*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.

### ***Supply Chain Exploration Practices***

*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.

## TABLES

**Table 1 Organizational Contextual Elements Facilitated by Transformational Leadership**

TRANSFORMATIONAL LEADERSHIP (Podsakof et al., 1990)	ORGANIZATIONAL CONTEXT (Gibson and Birkinshaw, 2004)
<p><b>PROVIDE AN APPROPRIATE MODEL</b></p> <p>Behavior on the part of the leader that sets an example for the employees to follow that is consistent with the values the leader espouses</p> <p><b>HIGH PERFORMANCE EXPECTATIONS</b></p> <p>Behavior that demonstrates the leader’s expectation for excellence, quality, and /or high performance on the part of the followers</p> <p><b>IDENTIFYING AND ARTICULATING A VISION</b></p> <p>Behavior on the part of the leader that is aimed at identifying new opportunities for his/her unit/division/company, and developing, articulating, and inspiring others with his or her vision of future</p> <p><b>HIGH PERFORMANCE EXPECTATIONS</b></p> <p>Behavior that demonstrates the leader’s expectation for excellence, quality, and /or high</p>	<p style="text-align: center;"><b>PERFORMANCE CONTEXT</b></p> <p><b>DISCIPLINE</b></p> <p><b>Definition:</b> Voluntarily strive to meet expectations  <b>Generated by :</b> 1) clear standard of performance 2) system of open, honest feedback 3) consistency in application of sanctions</p> <p><b>STRETCH</b></p> <p><b>Definition:</b> Voluntarily strive to exceed expectations  <b>Generated by :</b> 1) shared ambition 2) collective identity 3) personal contribution towards mission</p>

performance on the part of the followers

### **INTELLECTUAL STIMULATION**

Behavior on the part of the leader that challenges followers to re-examine some of their assumptions about their work and rethink how it can be performed

### **PROVIDE INDIVIDUALIZED SUPPORT**

Behavior on the part of the leader that indicates that he/she respects followers and is concerned about their personal feelings and needs.

### **FOSTERING THE ACCEPTANCE OF GROUP GOALS**

Behavior on the part of the leader aimed at promoting cooperation among employees and getting them to work together towards a common goal

### **SOCIAL CONTEXT**

### **SUPPORT**

**Definition:** Lend assistance and show tolerance to others

**Generated by :** 1) resource sharing 2) autonomy 3) participative leaders

### **TRUST**

**Definition:** Reliance on commitment of others

**Generated by :** 1) fairness and equity 2) participatory decision making 3) creation of trust-based culture

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**Table 2 Demographic data**

<b>Type of Operations</b>	<b>Frequency</b>	<b>Percent</b>		<b>Frequency</b>	<b>Percent</b>
Manufacturing	43	33.6	Make to stock	54	42.2
Service	85	66.4	Make to order	74	57.8

<b>Type of business unit</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative Percent</b>
Total Corporation (all divisions and companies)	22	17.2	17.2
Group (several divisions)	23	18.0	35.2
Single Division or Company (in a multi-divisional corporation)	45	35.2	70.3
Individual Company (not in a multi-divisional corporation)	25	19.5	89.8
Manufacturing Plant	5	3.9	93.8
Other	8	6.3	100.0

<b>Type of Industry</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative Percent</b>
Automotive	6	4.7	4.7
Aviation/Aerospace	11	8.6	13.3
Electrical	5	3.9	17.2
Electronics	3	2.3	19.5
Healthcare/Medical Devices	8	6.3	25.8
Food/Beverages	8	6.3	32.0
Transportation	4	3.1	35.2
Metal Fabrication	2	1.6	36.7
Plastics/Rubber	1	.8	37.5
Software/Hardware	14	10.9	48.4
Other	66	51.6	100.0

<b>Type of Workforce</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative Percent</b>
Unionized Production	13	10.2	10.2
Non-Unionized Production	95	74.2	84.4
Combination	20	15.6	100.0

<b>Number of Employees</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative Percent</b>
Under 100	49	38.3	38.3
100 – 249	14	10.9	49.2
250 – 499	18	14.1	63.3
500 – 999	4	3.1	66.4
1000 or more	43	33.6	100.0

<b>Annual Sales</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative Percent</b>
Less than \$5 million	51	39.8	39.8
\$5 million to < \$10 million	9	7.0	46.9
\$10 million to < \$20 million	8	6.3	53.1
\$20 million to < \$50 million	10	7.8	60.9
\$50 million to < \$100 million	5	3.9	64.8
\$100 million or more	45	35.2	100.0

**Table 3 Descriptive Statistics, Correlations, and Reliability Coefficient of Major Variables**

Variables	Mean	SD	AVE	1	2	3	4	5	6
1. Manufacturing Indicator <sup>1</sup>	0.333	0.473							
2. Industry type <sup>2</sup>	8.970	3.994		-0.354**					
3. Company size <sup>3</sup>	2.840	1.725		0.150	-0.054				
4. Transformational Leadership	5.166	1.070	0.642	0.069	-0.051	0.120	0.914		
5. Organizational Learning	4.963	1.158	0.709	0.101	0.014	0.073	0.763**	0.924	
6. SC Ambidexterity	3.579	0.855	0.880	0.162	-0.050	0.069	0.566**	.727**	0.936

Note: n = 128, Reliability coefficients are presented along the diagonal.

\*\*Correlation is significant at the 0.01 level (2-tailed).

<sup>1</sup>Manufacturing Indicator was coded as follows: '1' represents companies that generate 50 percent or more of their revenue from the sales of products; '0' represents companies that generate more than 50 percent of revenue from the sales of services.

<sup>2</sup>Industry type represents industries in which the participants' products primarily compete.

<sup>3</sup>Company size was determined on the basis of number of employees employed, which was grouped into five categories: Category 1 has less than 100 employees, 2 has 100 – 249 employees, 3 has 250 – 499 employees, 4 has 500 – 999 employees, and 5 has 1,000 and more employees.

**Table 4 OLS Regression Coefficient with Confidence Intervals (Standard Errors in Parentheses) Estimating Supply Chain Organizational Learning and Ambidexterity.**

	Supply chain organizational learning ( <i>M</i> )			Supply chain ambidexterity ( <i>Y</i> )		
		Coeff.	95% CI		Coeff.	95% CI
Transformational leadership ( <i>X</i> )	$a_1 \rightarrow$	0.7561*** (.0562)	.6449, .8674	$c' \rightarrow$	.0176 (.0828)	-.1463, .1816
Supply chain organizational learning ( <i>M</i> )				$b_1 \rightarrow$	.5220*** (.0688)	.3858, .6581
Uncertainty ( <i>W</i> )	$a_2 \rightarrow$	.1239 (.1405)	-.1542, .4020			
<i>X</i> * <i>W</i>	$a_3 \rightarrow$	.2850* (.1181)	.0511, .5188			
Company size ( <i>U</i> <sub>1</sub> )	$a_4 \rightarrow$	-.0368 (.0437)	-.1234, .0498	$b_2 \rightarrow$	-.0017 (.0353)	-.0716, .0682
Manufacturing indicator ( <i>U</i> <sub>2</sub> )	$a_5 \rightarrow$	-.2146 (.1680)	-.5472, .1181	$b_3 \rightarrow$	-.1406 (.1069)	-.3523, .0711
Industry ( <i>U</i> <sub>3</sub> )	$a_6 \rightarrow$	.0032 (.0205)	-.0373, .0437	$b_4 \rightarrow$	-.0056 (.0126)	-.0305, .0193
Constant	$i_M \rightarrow$	5.4936*** (.3902)	4.7210, 6.2661	$i_Y \rightarrow$	1.2841** (.4800)	.3340, 2.2343
		$R^2 = .6135$			$R^2 = .5464$	
		$F(6,121) = 39.2074, p < .001$			$F(5,122) = 35.7473, p < .001$	

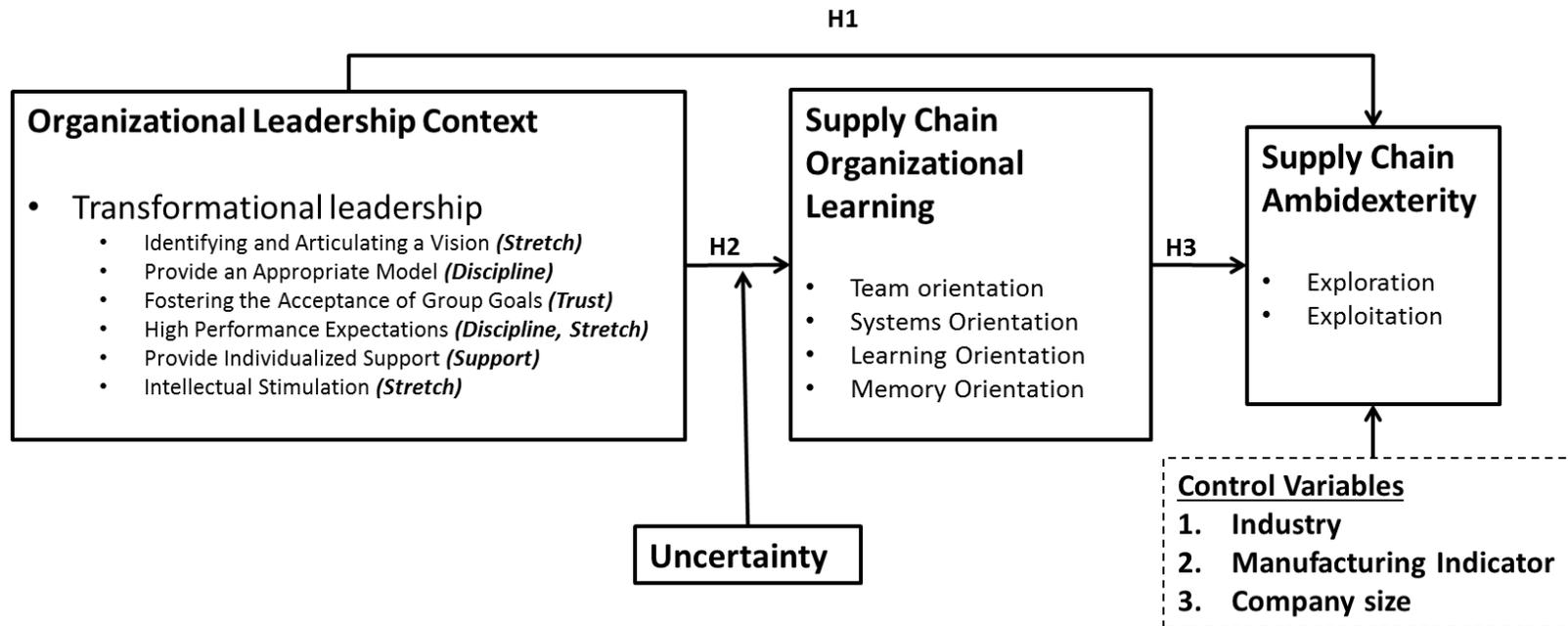
+ $p < .01$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

**Table 5 Conditional effect of Transformational Leadership on Supply chain learning at low and high levels of Uncertainty**

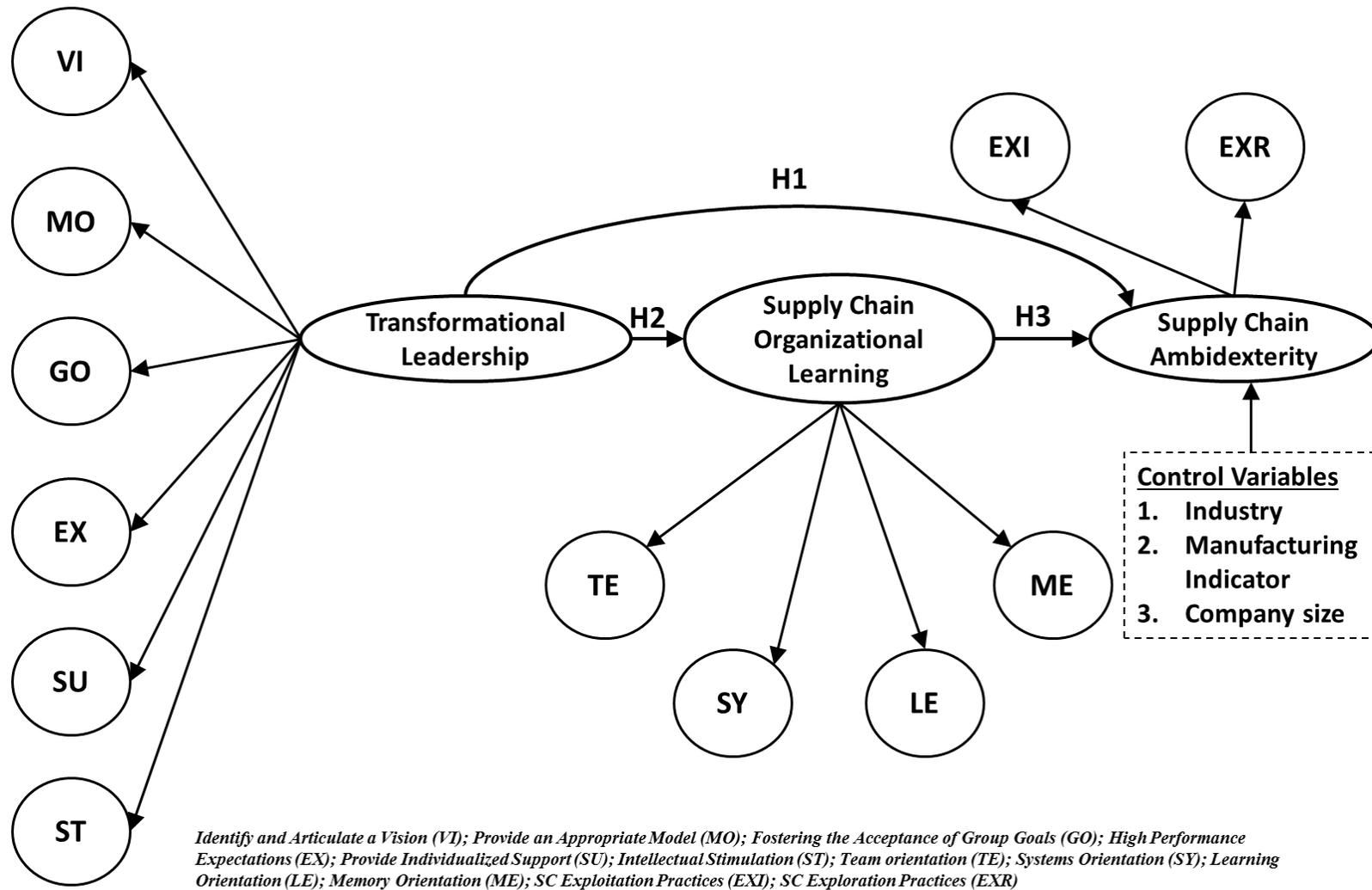
<b>Uncertainty</b>	<b>Effect</b>	<b>Boot SE</b>	<b>BootLLCI</b>	<b>BootULCI</b>
Low	0.3384	0.0635	0.2248	0.4749
High	0.4852	0.0719	0.3543	0.6396

## FIGURES

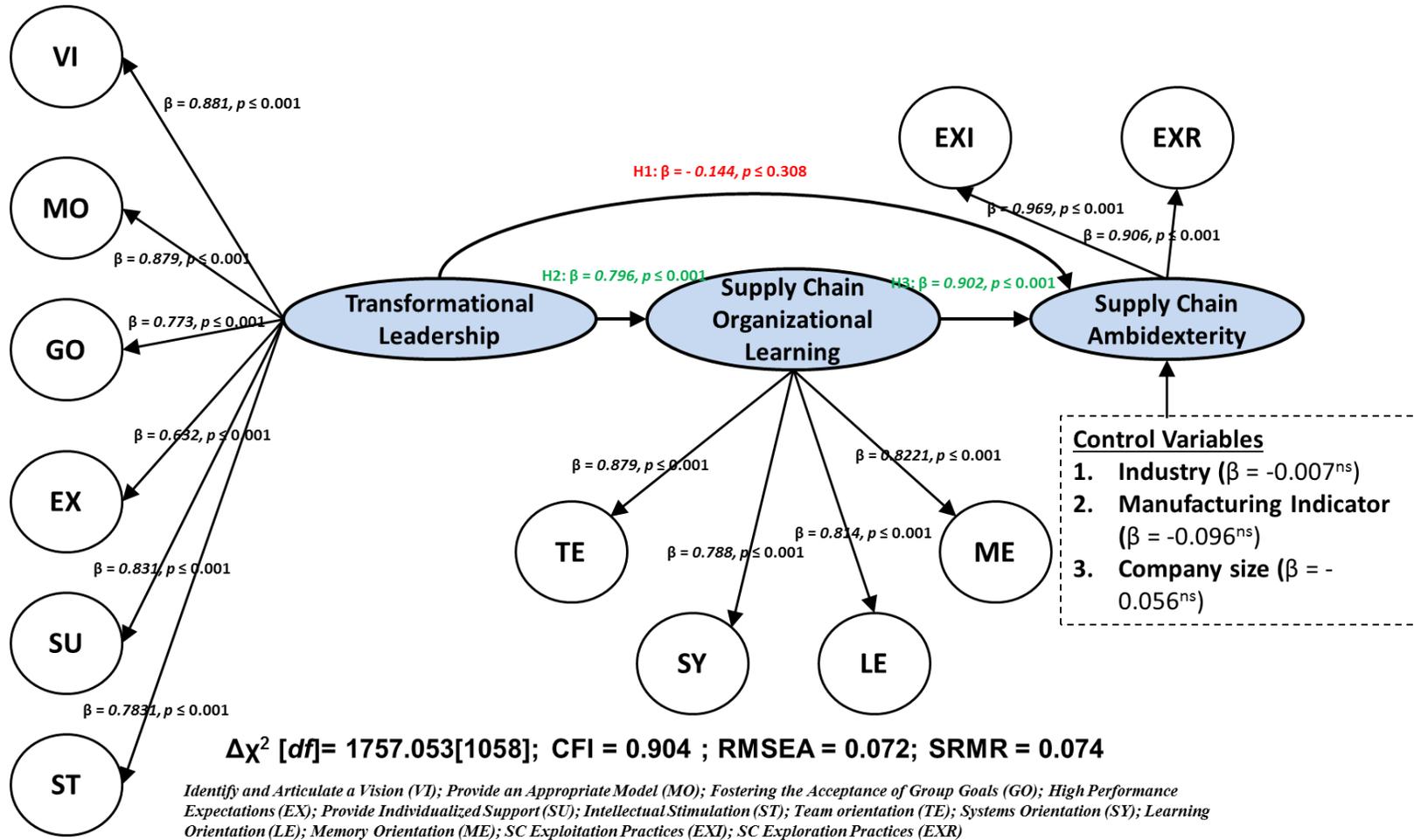
Figure 1 Theoretical Model-Organizational Leadership Context and Supply Chain Ambidexterity



**Figure 2 Research Model**



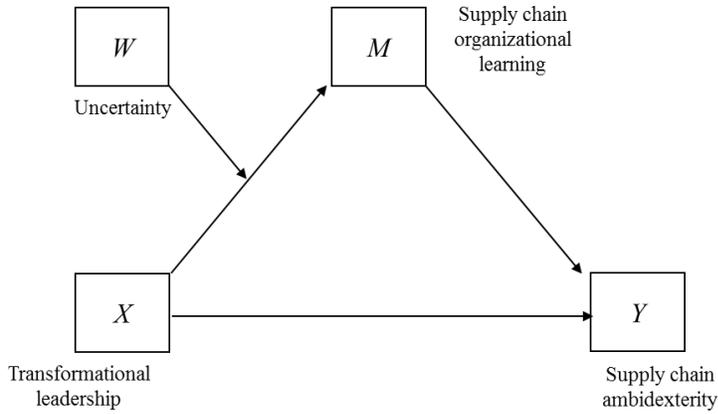
**Figure 3 Research Model with Path Loadings**



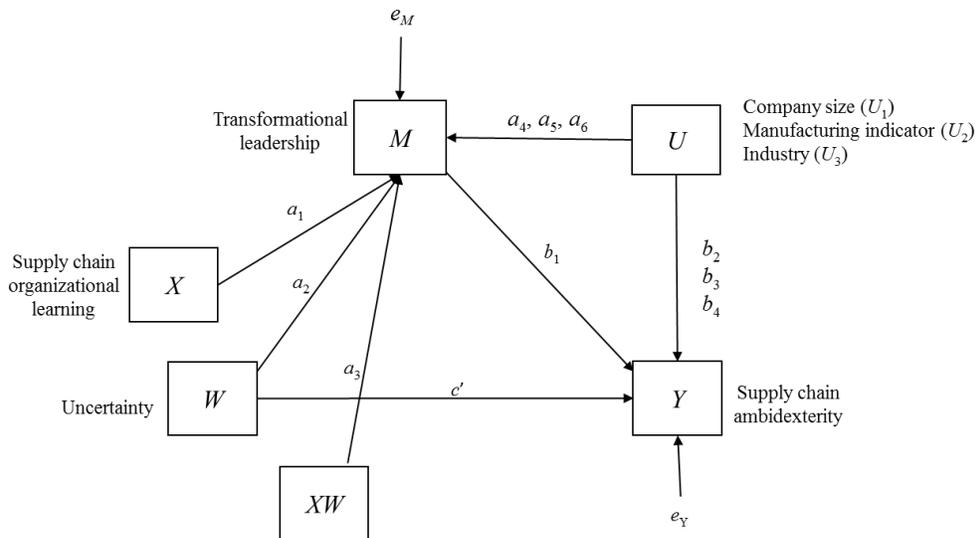
ns-not significant

**Figure 4 A first stage moderated mediation model in conceptual (a) and statistical (b) model**

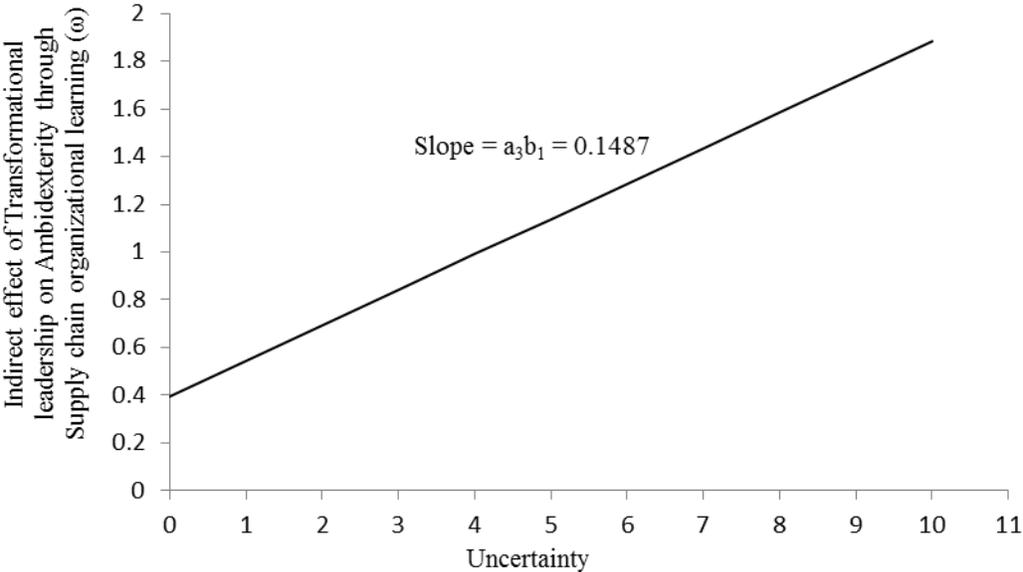
**a. Conceptual Model**



**b. Statistical Model**



**Figure 5 Visual representation of the linear function relating Uncertainty to the indirect effect of Transformational leadership on Ambidexterity through Supply chain organizational learning**



**Figure 6 Conditional effect of Transformational Leadership on Supply chain learning at low and high levels of Uncertainty**

