

THE AGILE NEXUS: UNLOCKING COMPETITIVE EDGE THROUGH SUPPLY CHAIN INNOVATION IN PAKISTAN'S MANUFACTURING SECTOR

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ABSTRACT

This study explores the transformative potential of supply chain innovation (SCI) in achieving competitive advantage (CA), positioning organizational agility (OA) as the essential bridge between innovation and impact. In the manufacturing sector of Pakistan a landscape marked by volatility, resource constraints, and relentless global pressures SCI is more than a collection of advancements; it is a reimagining of the supply chain as a living system, continuously evolving to anticipate and respond to change. However, the study reveals that innovation, in isolation, is inert without the animating force of agility, which breathes life into processes and empowers organizations to navigate complexity with precision. The results show that OA is the dynamic mediator that transforms SCI's potential into long-term CA. Agility is the mechanism by which creative supply chains transcend disruption and connect with the rhythms of a constantly changing marketplace in Pakistan's particular industrial climate, where adaptation frequently determines survival.

By converting SCI's ideas into capabilities—swift decision-making, operational resilience, and the capacity to grasp momentary opportunities—agile increases the impact of SCI. In addition to securing competitive positioning, this synergy transforms how businesses handle problems and promotes a continuous preparedness and renewal mindset. Fundamentally, this study provides a philosophical perspective on competitive advantage, arguing that it is attained through the smooth integration of innovation and adaptability rather than their isolation. Manufacturing companies who are adept at the choreography of innovation and agility in the dance of change not only outperform their competitors but also establish new benchmarks for resilience in an uncertain world. Pakistani manufacturers are encouraged by this study to reconsider their supply networks as potential ecosystems where innovation and flexibility come together to create long-term success.

Keywords: Supply Chain Innovation, Competitive Advantage, Organizational Agility

INTRODUCTION

New issues and challenges are becoming more prevalent in modern supply networks. For instance, the majority of businesses now have to cope with unforeseen supply chain disruptions brought on by the COVID-19 outbreak (Velayutham et al. 2021).

To handle these new issues and challenges, supply networks must innovate in response to the growing unpredictability and complexity of logistics and supply chains (Wang, Cheeseman, et al. 2020). For any organization to continue to succeed, innovation

is essential. According to Wong and Ngai (2019), supply chain innovation has grown in significance in business-to-business marketing research and practice and is frequently linked to a variety of issues.

The term supply chain innovation (SCI) describes how new technology, procedures, and practices are incorporated into the supply chain to increase its sustainability, responsiveness, and efficiency. Process innovation, which emphasizes optimizing workflows and reducing waste, and technology innovation, which includes the use of AI, IoT, and blockchain for increased automation and transparency, are some of its many facets. SCI also includes sustainability-driven innovation, which lessens the environmental impact of supply chain activities, and product innovation, which aims to optimize design for supply chain efficiency. Additionally, success and a competitive edge are fostered by innovation in organizations, supply chains, goods, and services (Porter 1990; Kim and Chai 2017). According to Tan et al. (2015), supply chain innovation aids organizations in improving supply chain performance.

According to Lee, Lee, and Schniederjans (2011), supply chain innovation is a complicated process that uses technology and process innovation to create new logistics services and information processing in order to meet customer needs and find new methods to improve processes. As a platform for developing supply chain strategy and a source of competitive advantage for a firm's success, supply chain innovation is seen in this study as a sort of supply chain capacity. One crucial supply chain skill is innovation (Wang, Asian, et al. 2020). According to Wang (2016), it is also regarded as a strategic instrument that businesses employ to preserve a competitive edge. There are various definitions of supply chain innovation in the literature, and it is thought of as a multilayered term that encompasses supply chain, organizational, and individual levels (Wong and Ngai 2019).

A key factor in gaining a competitive edge in the fast-paced, unstable economic world of today is supply chain innovation, or SCI. Even though a lot of research shows how SCI can improve customer happiness and operational efficiency, little is known about the underlying mechanisms that connect SCI to competitive advantage. Organizational agility—specifically, the capacity to react swiftly and

efficiently to shifts in the external environment—is becoming more widely acknowledged as a mediator that might improve this relationship. Nevertheless, there aren't many empirical studies that look at agility as a dynamic capability that converts creative supply chain strategies into a long-term competitive advantage (Michael Wang, et al. 2023). Additionally, previous studies have tended to concentrate on discrete elements of supply chain management, ignoring a comprehensive perspective that incorporates innovation, agility, and competitive advantage. By examining how SCI, mediated through organizational agility, generates competitive advantage, this study fills these gaps and offers fresh perspectives on how innovation and adaptation interact in supply chains. By doing this, it adds to the continuing discussion about creating supply chains that are robust and flexible in unpredictable market conditions.

Teece, Pisano, and Shuen (1997) developed the Dynamic Capabilities Theory (DCT), which highlights an organization's capacity to integrate, develop, and reorganize internal and external competences in response to quickly changing circumstances. SCI stands for an organization's ability to stay competitive in the supply chain by implementing new procedures, technologies, or practices. This is consistent with DCT's focus on developing and utilizing distinctive abilities to adjust to changing environmental conditions. An essential dynamic quality that enables businesses to recognize and react to market shifts is organizational agility. By empowering the company to use innovations to quickly satisfy market demands, it mediates the relationship between SCI and competitive advantage. Innovation and adaptation together give businesses a long-term competitive advantage, claims DCT. Differentiation and response to market demands are ensured by the supply chain's capacity for innovation and agility in adaptation.

Literature Review:

Supply Chain Innovation and Competitive Advantage

For businesses to adapt to the quick changes in goods and services as well as the needs and issues of their customers, innovation is essential (Kim et al., 2015; Christopher, 2005). For businesses to adapt to the quick changes in goods and services as well as the

needs and issues of their customers, innovation is essential (Kim et al., 2015; Christopher, 2005). Innovation typically takes place in organizational structures, services, technology, processes, and strategies (Rogers, 2003). In particular, SC innovation includes technologically enhanced outbound SC processes and procedures as well as modifications to products, processes, or services that increase productivity or boost customer satisfaction (Seo et al., 2004).

The multifaceted concept of SC innovation can be divided into two categories: process innovation and technological innovation (Hazen et al., 2012; Flint et al., 2009; Paton and McLaughlin, 2008). For both manufacturers' logistics departments and logistics intermediaries, the capacity to oversee technological and process innovation is becoming essential (Lin, 2008).

Companies are at two extremes, given the option of pursuing either a cost leadership or a differentiation strategy to attain competitive advantage. Competitive advantage is the degree to which a corporation can develop a defensible position over its rivals. A low-cost approach is focused on cutting costs wherever feasible, but a differentiation strategy seeks to achieve higher quality and image (even at significant cost) (Yamin et al., 1999). Cost, growth, dependability, quality, time-to-market, new production introduction, product line breadth, order fill rate, order/shipment information, improved customer service, effective capital deployment, delivery dependability, and flexibility are some of the factors that are being used to increase competitive advantage (Li et al., 2006; Tracey et al., 1999).

In today's business environments, supply chain innovation (SCI) has drawn a lot of attention as a strategic mean of attaining competitive advantage. By encouraging resource sharing and co-innovation, collaborative innovations such as partnerships and joint ventures have further reinforced supply chains and allowed businesses to quickly adjust to changing market needs. Businesses that use Supply chain innovation are more likely to attain cost leadership, differentiation, and agility all of which are crucial factors in determining competitive advantage, according to empirical data.

H1: *There is a positive impact of supply chain innovation on competitive advantage.*

Supply chain innovation and Organizational agility

To improve the development of new value for stakeholders, supply chain innovation (SCI) entails alterations to supply chain networks, technology, or procedures (or combinations of these). As a result, SCI offers fresh approaches to organizational, decision-making, and daily routines. SCI, according to (J. Hall, 2006) is the process by which a customer-focused company adjusts to changes in its surroundings. Companies use SCI to explore novel concepts for goods, services, procedures, etc. Companies use SCI to explore novel concepts for goods, services, procedures, etc. Businesses' capabilities are pushed to the limit by this exploitation of novel concepts. SCI may involve the adoption or development of new automation tools and software platforms, as well as the use of eco-friendly and sustainable methods, (Hahn, G. J. 2020) (Loonam, J., & O'Regan, N. (2022)). In addition to helping businesses find opportunities early and address any issues brought on by shifts in external markets, Organizational Agility encompasses a variety of actions taken by businesses to generate value in unstable and turbulent circumstances.

This calls for supply chains that are flexible and adaptive, able to react swiftly to interruptions, changes in demand, and other unforeseen circumstances. (Bouguerra, A., Gölgeci, İ., Gligor, D. M., & Tatoglu, E. (2019))and (Clauss, T., Abebe, M., Tangpong, C., & Hock, M. (2019) shown that organizational agility is a crucial element of competitiveness since it allows businesses to quickly and continuously adjust and respond to changes in the market and aids in the expansion of their product offerings. To increase organizational efficiency and responsiveness in dynamic contexts, companies must adopt supply chain innovation and make use of state-of-the-art tools and procedures. Businesses can increase their capacity to react swiftly to shifting market conditions by putting social media tools and creative supply chain methods into practice. As a result, it can improve firms' organizational agility.

H2: *There is a positive impact of Supply chain innovation on Organizational Agility.*

Organizational Agility and Competitive advantage

According to Nejatian, Zarei, Nejati, and Zanjirchi (2018), organizational agility refers to a company's dynamic capabilities that serve as screening or

funneling processes or routines for unforeseen changes in the market or industry. This implies that businesses can be somewhat flexible in terms of their internal systems, procedures, structures, and industry standards. From a relative advantage, competitive advantage has developed. It denotes possessing unique skills or the ability to create or launch something novel, which could be a new product, service, way of doing things, or even a novel strategy. Competitive advantage is what makes it possible for businesses to innovate and adjust to their shifting environment, as well as to compete successfully. Stated differently, a firm's competitive advantage is found in a particular position within the market or sector where competitors are unable to replicate the sources of the advantage and where the company can obtain long-term benefits. Porter (1991) asserts that examining a competitive position in terms of three competitive strategies—leadership strategy, differentiation strategy, and focus strategy—as well as five competitive factors can help one gain a competitive edge.

Agility drivers, as defined by Zhang and Sharifi (2000), are changes in the business environment that motivate companies to maintain their competitive edge. The traits or qualities that a company has that could enable it to react to agility drivers are referred to as dynamic capabilities. A company's ability to adapt to change drivers is one of these dynamic skills, along with its absorptive capacity. The study of the gap between capabilities and change drives leads to agile suppliers. Nonetheless, organizational agility in the context of the present study refers to the firm's dynamic ability to react to both internal and external changes in the market or company. sources of competitive advantage, and this competitive advantage position can provide the business with long-term benefits. But when an agile business is appropriately matched with a firm's structural, relational, and human capital components, that's what turns a position into a value advantage.

H3: *There is a positive impact of Organizational agility on Competitive advantage*

Mediating Role of Organizational Agility

The ability of a company to recognize opportunities and challenges and quickly assemble the necessary organizational resources is known as organizational agility (Overby et al. 2006; Sambamurthy et al. 2003). A company's ability to see opportunities and dangers, gather the resources and skills necessary to respond appropriately, weigh the advantages and disadvantages of taking action, and carry out plans with competitive speed and success are all examples of agility. A company that consistently seizes competitive opportunities to improve performance, defends against rivals' competitive moves, and builds barriers to the erosion of its dominant competitive advantage is said to have a sustainable competitive advantage (Piccoli and Ives 2005; Reed and DeFillippi 1990). According to study, a firm's capacity to maintain a competitive edge is essential to its profitability.

Organizational agility has emerged as a key mediator in the well-researched relationship between supply chain management (SCM) and competitive advantage. Good supply chain management techniques, such as demand forecasting, inventory optimization, and supplier integration, improve operational effectiveness and lay the groundwork for agility (Christopher, 2000). A key factor in converting SCM efficiency into competitive advantage is organizational agility, which is the capacity to quickly adjust to changes in the market environment. According to research, agile firms use SCM innovations to reduce risks, take advantage of new opportunities, and react quickly to customer needs (Teece et al., 1997). According to research by Gligor et al. (2015), organizational agility increases the advantages of supply chain management (SCM) by bridging the gap between strategy responsiveness and organizational efficiency, which results in a competitive advantage. This mediating function emphasizes the significance of developing organizational agility that places a high value on flexibility and adaptation in addition to streamlining supply chain operations.

H4: Organizational Agility mediates the relationship between Supply chain innovation and Competitive advantage.

Research Model:



Methodology:

One of the study's main tools was a web-based questionnaire that was created using measurement models. A cross-sectional survey design was used to collect empirical data from manufacturing companies in Pakistan. One respondent filled out the survey at one particular moment (Rindfleisch et al. 2008). Researchers can cut down on response time, survey expenses, and data input time by using an online data collection method. Data can be gathered online using a variety of techniques, including Web-based surveys and email surveys. To oversee the online data collection for this study, we employed a Web-based survey. The data was collected using the sample random sampling approach. In a similar setting, quantitative analysis was carried out using sample random sampling. Our sample size, as determined by G power analysis, was 271. In the beginning, 384 questioners were distributed, yielding a 71% response rate.

Measures:

Supply Chain Innovation

SCI was measured using a 6-item scale created by Kwak, D. W., Seo, Y. J., & Mason, R. (2018). The example item is We seek a state-of-the-art information-integrating system (SCI1). A five-point Likert scale is used, with 1 denoting "strongly disagree," 2 "disagree," 3 "neutral," 4 "agree," and 5 "strongly agree."

Competitive Advantage

Using a 16-item scale created by Li et al. (2006), competitive advantage was measured. The sample of inquiries. A five-point Likert scale is used, with 1 denoting "strongly disagree," 2 "disagree," 3 "neutral," 4 "agree," and 5 "strongly agree."

Organizational Agility:

The firm's capacity to react promptly to both the internal and external environment was evaluated by the organizational agility measurement items (Gligor et al. 2016).

The organizational agility elements were modified from Yang (2014), Rai and Tang (2010), and Mikalef and Pateli (2017).

Results and Demographic Variables

The variables' mean, standard deviation, and correlation are shown in Table 1. Data was not multicollinear, as indicated by the correlation. Furthermore, the dependability ratings are displayed diagonally, indicating that the information was reliable and suitable for additional examination.

Based on the demographic analysis, 80% of the participants in this study were men and 20% were women. Overall, 40% of the workforce was in the 20–30 age range, 25% was in the 31–40 age range, 25% was in the 41–50 age range, and 10% was 51 years of age or over. Fifty-two percent of employees had zero to one year of experience, thirty percent had two to five years, fifteen percent had five to ten years, and three percent had ten years or more.

Table No: 1 Correlation and Reliability Analysis

Variables	Mean	SD	1	2	3
SCI	4.0	1.2	(.82)		
OA	3.6	1.4	.42**	(.87)	
CA	4.1	.92	.36**	.44**	(.90)

Table 1 displays the correlations, means, and standard deviations for each variable. The

information displayed relates to variables; the independent variable, SCI, has a mean value of 4.0

and a standard deviation of 1.2. The CA dependent variable has a standard deviation of 92 and a mean of 4.1. The mean value of organizational agility is 3.6, with a standard deviation of 1.4. According to the correlation coefficient analysis, supply chain innovation and competitive advantage have a .36** correlation at $p < 0.01$, while supply chain innovation and organizational agility have a positive association with a value of .42** at $p < 0.01$. Table 1 also shows the reliabilities of the variables. This study's construct has the fellow's alpha value. SCI (.82), organizational agility (.87), and CA (.90)

Statistical Path Analysis

Competitive advantage is positively impacted by supply chain innovation (H1). Table 2 displays the findings of the direct and mediation analyses. Hayes & Preacher (2005). H1 and H2 were tested on Model 4. The regression coefficient (β value) is 0.20, and

the p-value is 0.000. The p-value of 0.000 indicates that the association is extremely significant. H2 shows that SCI and OA are positively correlated. The regression coefficient (β value) is .52 and the p-value is 0.000. The 0.000 p-value indicates that there is an undesirable connection.

At levels (β value = .24 at $p = 0.000$), there is a positive correlation between OA and CA. Consequently, hypothesis 3 is accepted. Hypothesis demonstrates that agile response mediates the relationship between Digital Leadership and Sustainable creative performance. The outcomes show in Table 2 show that the indirect effect of digital leadership and sustainable creative performance has a LL of confidence of interval and UL of confidence of interval, .05, and two 0.18. Both ULCI and LLCI have the same sign that is a positive sign. Therefore, we can determine from here that mediation occurs.

Table No:2 Statistical Path Analysis

Direct Effect	B	S.E	P	LLCI	ULCI
SCI → CA	.20	.03	.00	.13	.33
SCI → OA	.52	.06	.00	.40	.69
OA → CA	.24	.04	.00	.15	.35
Indirect Effect	B	S.E		LLCI	ULCI
SCI → OA → CA	.10	.03		.04	.16

Discussions:

According to the study's findings, organizational agility (OA) works as a crucial mediator between supply chain innovation (SCI) and competitive advantage (CA) in Pakistan's manufacturing sector. In order to solve operational inefficiencies and satisfy market expectations, SCI in Pakistan entails the deployment of cutting-edge technologies, creative procedures, and strategic frameworks. SCI helps businesses to improve operational efficiencies and create unique skills in light of the nation's manufacturing sector's issues, which include growing costs, supply disruptions, and unpredictable demand. Previous studies demonstrate how important SCI is in promoting CA through better cost control and value generation, especially in developing nations like Pakistan (Sammuel, S. and Kashif, 2013). In sectors like textiles and automotive, where quick changes in global demand

and trade conditions necessitate that businesses effectively pivot their operations, agility-driven reactions are particularly important. This study emphasizes that while SCI offers the frameworks and tools for innovation, agility makes sure that these tools are used efficiently to preserve operational resilience and take advantage of new opportunities in a market that is highly competitive (Sun.et.al,2022)

Theoretical implications

The study adds to the body of knowledge on supply chain management by demonstrating how organizational agility acts as a mediator between supply chain innovation and competitive advantage in order to highlight how innovation and agility work together to produce long-term competitive advantage, it incorporates ideas from dynamic capabilities theory. The study, which connects supply chain management and organizational

behavior, emphasizes agility as a dynamic quality that businesses need in order to effectively react to changes in the market and the environment. demonstrates the mediating function of agility through empirical data, confirming its significance in converting supply chain innovation into quantifiable competitive advantages. as a basis for further research, the study suggests and confirms a novel conceptual framework that connects creativity, agility, and competitive advantage.

Practical implications

Innovative supply chain techniques, such as process optimization and technology integration, should be given top priority by businesses since they improve their competitive positioning. Since agility mediates the relationship between innovation and Competitive advantage, investments in characteristics that increase agility—such as flexible procedures and adaptive decision-making are essential. Agile businesses are better able to match supply chain innovations to changing consumer needs. Invest in training staff members at all levels to improve their ability to make quick decisions and adjust to changing circumstances. Agility can be operationalized through abilities like scenario planning, cross-functional cooperation, and rapid problem-solving. supply chain innovations to meet local market conditions and particular consumer expectations. Agility guarantees that these technologies offer specific competitive advantage. Agility gives the company a competitive edge by ensuring that sustainability initiatives are in line with shifting customer and regulatory needs

Programs that teach supply chain experts how to strike a balance between innovation and flexibility should be created by policymakers and educational institutions. By using agility, you can provide better client experiences, such quicker delivery, more individualized product options, or quicker answers to questions and grievances. This enhances the edge over competitors that comes from innovation.

Limitations and Future directions

The results of the study are based on a particular industry or, if relevant, a particular region. This restricts the applicability to other industries or international settings. Compared to the cross-sectional method, a longitudinal design may be able

to capture dynamic interactions across time more effectively. The study ignores other possible mediators like knowledge exchange or supply chain resilience in favor of concentrating only on organizational agility as the mediator. To investigate how these links change over time, particularly in sectors that are undergoing rapid change like technology or healthcare, conduct longitudinal study. Extend the study to compare outcomes between developed and emerging economies, or between various industries like manufacturing, retail, and services. Incorporate factors such as supply chain sustainability, collaborative culture, and knowledge sharing as mediators to increase your comprehension of the dynamics of competitive advantage. Examine whether scalability influences the realization of competitive advantage and how agility strategies scale in small versus large enterprises.

Conclusion

The study emphasizes how supply chain innovation plays a crucial role in creating competitive advantage and how organizational agility plays a crucial part in facilitating this relationship. The study adds to the field of supply chain management both theoretically and practically by empirically validating these connections. Although the results provide insightful information, they also highlight the difficulty of gaining a competitive edge in dynamic settings, pointing to areas that require more research. In order to effectively capitalize on their inventions, businesses seeking to maintain competitive edges must not only innovate but also maintain agility. Adaptability and creativity are critical resources for organizational growth and resilience in a global marketplace that is marked by fast change. This study emphasizes how crucial it is to match agility and supply chain innovation in order to successfully handle complexity. Businesses may increase operational efficiency and guarantee an unbeatable competitive edge by investing in these capabilities. These results open the door for more scholarly investigation while offering scholars and practitioners a road map for attaining supply chain management excellence through practical tactics.

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