Supply Chain Management and Innovation Practices as Core Strategies for Business Competitiveness and Performance

Heira Georgina Valdez Bocanegra[1]

Abstract

The purpose of the study was to analyze the effects of supply chain management and business innovation on business competitiveness and performance. Preliminary notes expose a deep historical review of the theoretical and empirical research addressing the relationships between the variables that are being subject of study. The empirical study was conducted in 230 manufacturing SMEs located in Mexico and data analysis was performed using Structural Equation Modeling (SEM). For the assessment of the reliability and validity a Confirmatory Factor Analysis (CFA) was applied, using the maximum likelihood estimation (MLE) with the support of the EQS 6. Main findings conclude that implementing supply chain management and business innovation strategies are vital for business competitiveness and performance. At the final part of this paper, conclusions address the main implications of current research findings for enterprises and government.

---

[1] Department of Administration and Finance, Division of Social and Administrative Sciences. Universidad de Guanajuato, Guanajuato, Mexico.

1. Introduction

Nowadays, most compelling evidence states that the role of innovation is so meaningful that the economic atmosphere considers it one of the key factors for the development of business competitiveness (Kus, 2020). Considering current market conditions, enterprises are obliged to continuously innovate to survive (Seyhan et al., 2021). In fact, Veckalne and Tambovceva (2023) believe that the promotion of innovation is a critical element in advancing economic development and can significantly contribute to this progress.

In economics, the term 'innovation' is used frequently but not often defined, despite that this concept is the cornerstone of business growth and development, and a way for companies to guarantee strategic competitiveness (Bigliardi, et al. 2020). In this context, literature distinguishes between five types of innovations: new products, new methods of production, new sources of supply, exploitation of new markets, and new ways to organize business. Literature so far has focused on the first two types of innovation (e.g., Shan, et at. 1994; Banbury and Mitchell, 1995; Eisenhardt and Tabrizi, 1995; Schroeder, 1990; Katila and Chen, 2008; Leiblein and Madsen, 2009; Roberts, 1999; Adner and Kapoor, 2010; Leiponen and Helfat, 2010; Zhou and Wu, 2010).

Within this framework, López and Oliver (2023) consider that a business strategy needs innovation, and a business innovation needs its own strategy. Therefore, it is convenient to include innovation strategy into the business strategy to improve performance productivity, and sustainability. In other words, the innovation strategy is enclosed in a multidimensional way, and the innovation strategies should be included in the business plan. In addition, when formulating an innovation strategy, the top-management must analyze the internal and external factors that influence their decisions.

In other words, to remain competitive, small, and medium-sized enterprises (SMEs) must transform their business models and for this purpose SMEs frequently need to collaborate with external partners (Albats, et al. 2023) and it is fundamental that managers take time to study consumer behavior so they can focus on meeting customer requirements (Geng, et al. (2021). At a firm level when implementing innovation practices managers must contemplate firm size, collaboration, and a formal training for employees so they can be prepared to successfully deploy the initiatives (Tajeddini, et al. (2020).

Supply chains form the backbone of the global economy and promote trade, consumption, and economic growth. Due to highly globalized context, intersupply chain competition has intensified. In this scenario, enterprises that want to remain competitive and survive, strive to deliver the best value to customers with improved efficiency at the lowest cost. In addition, communication with suppliers plays a fundamental role in many organizations (Mentzer, et al. 2001; Wu et al. 2014).

In fact, supply chain management is a much broader concept than that of logistics management, because of its dynamic structure, it embraces the process of conceiving, developing, optimizing, and managing internal and external components of acquisition, transformation of material and distribution of finished products or services considering business strategic goals (Mitrović and Mitrović, 2021).

In other words, the context of a business environment influenced significantly by globalization, along together with the turbulent economic environment, many multinational companies worldwide are focusing on supply chain performance, taking advantage of opportunities, and addressing challenges. Therefore, some opportunities include technology applications and human and knowledge capitals (Choi, et al. 2012).

Supply chain management is so important, that in the context of the Covid-19 pandemic SCM practices saved millions of lives globally by making accessible essential medicines in many countries (Bigdeli, et al. 2013). Certainly, supply chain management is a key management tool in corporations; however, the literature recognizes that, it seems to be more used in small and medium enterprises as well (Kot, et al. 2020).

Considering all the previously described supply chain management application regarding the SMEs functioning strategy becomes vital because the operations of supply chain incorporate all activities and actions interlinked with the products' flow and transformation, starting from the extraction of raw material through various processing stages and to reach the end consumers (Kot, et al. 2020). Some academic and scientists suggest that supply chain risk management has a significant impact on supplier integration, internal integration, and customer (Duong and Ha, 2021). In general terms, it can be said that supply chain innovation has a positive and significant impact on competitive advantage and firm performance (Mehregan, et al. 2023).

Finally, another key point is that the study of innovation for a competitive advantage has been studied throughout the history and has resulted in many in-depth studies published in research papers in the field. However, the increase in the number of empirical studies conducted is far from meeting the need in this field (Seyhan, et al. 2021). Therefore, the main purpose of this research paper is to study the effects of innovation and supply chain management on competitiveness and performance in the context of Mexico using empirical evidence of 230 SMEs manufacturing companies located in the State of Aguascalientes in Mexico, to provide deeper understanding the relationships of the variables subject of study.

2. Preliminary Notes

The preliminary notes expose a historical review of the theoretical and empirical research of the relationships between the variables that are being subject of study in the present research: innovation, supply chain management, competitiveness, and business performance.

2.1 Innovation and Competitiveness

In the actual business context, innovation practices in companies are crucial for business growth and development, are essential for the long-term competitiveness of organizations and have a positive impact on employee engagement and retention. In this context, it is crucial that government implement strategies to promote innovation capabilities in the SMEs, because innovation is a vital element to promote a sustainable society. In addition, entrepreneurship and innovation can be suitable vehicles for competitiveness (Urbancová and Vrabcová, 2023; Vrabcová,

et al. 2021; Bigliardi, et al., 2020); Wang, et al. 2019; Gupta et al., 2016; Rossi and Raimondi, 2007). Table 1 presents several results of the theoretical research on the innovation–competitiveness relationship.

Table 1: Results of theoretical research on the innovation-competitiveness relationship

Author	Findings
Urbancová and Vrabcová (2023)	Innovation is a vital element to promote a sustainable society and essential for the long-term competitiveness of organizations.
	In specific, continuous innovation can support the sustainability of organizations, which represents a key area for every corporation and for the entire society.
Vrabcová, Urbancová, and Petříček (2021)	The implementation of a sustainable business strategy through innovation creates a competitive advantage and has a positive impact on employee engagement and retention.
Bigliardi et al. (2020)	Innovation practices are crucial for growth and business development and represents a reliable way through which companies can gain competitiveness in the marketplace.
Wang, Lin, and Li (2019)	Government support plays a crucial role in enhancing regional innovation capabilities and creating distinctive innovation clusters.
Gupta et al. (2016)	These authors believe that there is a relationship between competitiveness and innovation in the marketing practices of large manufacturing companies that offer their branded products in a foreign market by engaging a network of local small and medium-sized enterprises (SMEs) as resellers of their brand.
Rossi and Raimondi (2007)	Entrepreneurship and innovation can be suitable vehicles for competitiveness.

Source: Own elaboration.

In addition to the theoretical research on the innovation-competitiveness relationship, there are several empirical research studies that had been conducted through the history and that provide several findings. In first instance, considering the global context, research findings confirm that high-income and upper-middle-income countries that have the budget to implement innovation practices are achieving high innovation competitiveness (Zhang, et al. 023). In fact, the macroeconomic stability can be employed to enhance the positive effect of innovation on competitiveness (Khyareh and Rostami, 2022). In this context, Cho, Leem & Shin (2008) also point out that manufacturing innovation must be implemented at the national level supported by the government and should not be left to the discretion of manufacturing firms.

Second, Franco (2020) study data analysis corroborates that a favorable institutional context can successfully support companies in their innovation strategies and investments. In addition, when implementing innovation in organizations, the main sources for the innovation process include benchmarking and applied research (Urbancová & Vrabcová, 2023), which implies that learning from other companies is vital to remain competitive. Furthermore, it is also important that organization human resources learn from each other, particularly in small size firms, where it is challenging to find qualified human resources, particularly high-skilled workers, and this is representing a relevant obstacle to the innovation process (Franco, 2020).

Finally, Hermundsdottir and Aspelund (2021) confirm that here are several studies that found a positive relationship between sustainability innovations and firm competitiveness. Hence, the findings support that sustainability innovations can create win-win conditions for a firm. Therefore, it is vital that companies focus on implementing environmental innovation strategies that enhance green competitiveness (Wang, et al. 2022). Table 2 summarizes the empirical research on the innovation-competitiveness relationship.

Table 2: Results of empirical research on the innovation-competitiveness relationship

Author	Findings
Zhang, Wang and Wang (2023)	The research findings confirm that the means of achieving high innovation competitiveness output are more diversified for high-income and upper-middle-income countries. In other words, the countries at these two economic levels are achieving high innovation competitiveness.
Urbancová and Vrabcová (2023)	The results have shown that the main sources of innovation are benchmarking, primary and applied research, innovation programmes focused on employees as well as customers and stakeholders involved in the sales chain.
Wang, Zhang, and Wang (2022)	The study conducted focuses on the importance of environmental innovation strategy in the context of sustainable development, specifically in green competitiveness. The empirical results concluded that environmental innovation strategy has a positive effect on green competitiveness. In other words, organizational green learning is vital to enhance green competitiveness in implementing environmental innovation strategies.
Khyareh and Rostami (2022)	The empirical analysis was conducted in 16 emerging countries using the general method of moment (GMM) considering data covering 12 years (2007-2018). The main findings corroborate that there is an unconditional positive impact of innovative activities on competitiveness. They also found that the macroeconomic stability can be employed to enhance the positive effect of innovation on competitiveness.
Hermundsdottir and Aspelund (2021)	The research included examining several studies related to innovation terms and variables related to competitiveness. The authors found that here are several studies that found a positive relationship between sustainability innovations and firm competitiveness. Hence, the findings support that sustainability innovations can create win-win conditions for a firm.
Franco (2020)	The study was conducted through a survey on the investments of industrial enterprises in the Emilia-Romagna region, from which emerges a potential relationship between firms' investments and competitiveness. Data analysis corroborates that a favorable institutional context can successfully support companies in their innovation strategies and investments. Main findings conclude that in small size firms it is challenging to find qualified human resources, particularly high-skilled workers, and this is relevant obstacle to the innovation process.
Valdez-Bocanegra, Maldonado-Guzmán, and Valdez-González (2020)	The empirical study was conducted considering a sample of manufacturing companies from the automotive and auto parts industry in Mexico. The results confirm that innovation has a positive influence on competitiveness and performance.
Cho, Leem, and Shin (2008)	This research focused on assessing the relationships among manufacturing innovation, competitiveness, and business performance in the Korean manufacturing industries on an empirical basis including machinery, automobile, and electronic industries. The authors concluded that the introduction of manufacturing innovation in the mold, machinery, automobile, and electronic industry is unnecessary. They concluded that manufacturing innovation must be implemented at the national level and should not be left to the discretion of manufacturing firms.

Source: Own elaboration

Considering the information presented in the previous paragraphs of the relationship between innovation and competitiveness, the first hypothesis is the following:

H1: There is a positive and significant relationship between innovation and competitiveness.

2.2   Innovation and Business Performance

Considering the existent literature that explores the relationship between innovation and business performance, there are several studies that focus on the effects of open innovation on firm performance (Moretti and Biancardi, 2020). In fact, existent literature has revealed that there is a positive and significative effect on overall companies' performance when a firm's implement open innovation activities (Bigliardi, et al. 2020).

Considering the innovation ecosystem, the government must constantly and actively support the knowledge-based economy and the creation of innovation systems to be able to positively transform the economies. For this purpose, is vital to offer public funding for innovation activities in companies (Prokop, et al. 2021). In this context, it is convenient to mention that innovation performance in firms can be measured by the Innovation Patent Index (IPI) (Ponta, et al. 2021). In this context, it is fundamental that organizations increase the interactions with other companies as this generates greater access to new ideas, skills, technologies, and other intangible assets, as well as enhanced possibilities to innovate with success (Bigliardi et al., 2020).

Finally, according to Lichtenthaler (2009); Arora and Fosfuri (2003); and Kazuyuki (2016), when working on innovation, empirical results demonstrate that innovation behaviors measured by patenting are positively correlated with firm performance, therefore it is fundamental that companies patent their new ideas as this is a way to obtain economic returns and protect their ideas from their competitors. Table 3 presents several results of the theoretical research on the innovation–business performance relationship.

Table 3: Results of theoretical research on the innovation–business performance relationship

Author	Findings
Ponta, Puliga, and Manzini (2021)	Measuring companies' innovation performance is vital for enhancing the value and decision-making processes of firms. These authors propose a new measure of Innovation Performance called Innovation Patent Index (IPI), that is helpful to quantitatively summarize different aspects of firms' innovation.
Moretti and Biancardi (2020)	In the literature, there are several studies that focus on the effects of open innovation on firm performance. However, they consider there is still no consensus among authors on whether the relationship between openness and firm performance is positive, negative, or non-linear.
Bigliardi et al. (2020)	Existent literature has revealed that there is a positive and significative effect on overall companies' performance when a firm's implement open innovation activities. Therefore, it is crucial that organizations increase the interactions with other companies as this generates greater access to new ideas, skills, technologies, and other intangible assets, as well as enhanced possibilities to innovate with success.
Prokop, Striteska and Stejskal (2021)	It is fundamental that governments support the development of a knowledge-based economy, the creation of innovation systems, and collaboration among different types of entities because the economies are at a different level of transformation. Research must be conducted on how public funding impacts innovation activities in companies, so government can get feedback on this and propose next action items on the agenda to promote innovation.
Piroska y Kálmán (2013)	According to the literature there is a close relationship between innovation intellectual capital and sustainability.
Lichtenthaler (2009); Arora and Fosfuri (2003); Kazuyuki (2016)	Considering patent activities, empirical results demonstrate that innovation behaviors measured by patenting are positively correlated with firm performance. Therefore, moving innovation ideas and technological knowledge from the company in which they are located to external firms represents a way to obtain economic returns. In other words, there is an exploitation of internal knowledge by the stakeholders where there is company participation in new initiatives deriving from previously developed products through an external contribution. Examples involve the sale of patents or the granting of licenses.

Source: Own elaboration

In the literature, there are several empirical studies that have been conducted in different countries and contexts that have confirm the relationship between innovation and business performance, such as Bangladesh, Spain, India, Czech Republic, and Vietnam.

In Bangladesh they concluded that government enhances the innovation and sustainability performance of manufacturing industries (Zhou, et al., 2023). In Spain, research findings confirm that adopting types of green innovation strategies on a firm's innovation success and performance (Becker, 2023). In India, the research results indicate that the adoption of innovation practices positively influences the firms' innovation and overall performance (Narayan and Hungund, 2022). The Czech Republic empirical results confirm that the cooperation between government, public or private research institutes is vital for the innovation process (Prokop, et al. 2021). In Vietnam, they concluded that management accounting information has a significant positive effect on innovation capability and enhanced firm performance (Le, et al. 2020).

On the other hand, Xu, et al. (2015) concluded that it is fundamental to introduce information technology applications to capture the needs of the customers. This business strategy can be useful to understand better the preferences and behaviors of their customers, and foster loyalty in the long-term. Finally, Jimenez-Jimenez and Sanz-Valle (2011) confirm again that organizational learning and innovation can positively contribute to business performance. Table 4 summarizes the results of the empirical research on the innovation–business performance relationship.

Table 4: Results of empirical research on the innovation–business performance relationship

Author	Findings
Zhang and Jiang (2024)	The study finds evidence that investment deregulation stimulates innovation performance through two mechanisms: the escaping competition effect and the preemptive patenting effect. Therefore, investment deregulation may improve the innovation performance of private firms by encouraging investment in fixed capital.
Zhou et al. (2023)	The study was conducted using Structural Equation Modeling (SEM) to analyze data collected from the employees of manufacturing industries in Bangladesh. The results conclude that Environmental, Social and Governance (ESG) performance enhances the innovation and sustainability performance of manufacturing industries. In other words, the higher the ESG performance of a firm, the greater its innovation and sustainability performance.
Becker (2023)	This empirical study was conducted in Spain during 2008-2016. Research findings confirm that adopting types of green innovation strategies on a firm's innovation success and performance. However, it is vital the participation of the government in the generation of public policies that support green innovation strategies.
Narayan and Hungund (2022)	This research was conducted in the context of Indian biotechnology firms using a criteria-based snowball sampling method for data collection. The results indicate that the adoption of innovation practices positively influences the firms' innovation and overall performance.
Prokop, Striteska and Stejskal (2021)	The study was conducted using a sample of Czech manufacturing firms. Results confirm that the cooperation between government, public or private research institutes is vital for the innovation process. Government cooperation also includes providing public financial funding as this is necessary for the efficiency of knowledge.
Le, Nguyen and Hoang (2020)	The empirical study was conducted using a sample of 200 top-level and middle-level managers in Vietnamese SMEs. The results disclose that the cultural orientation of the management combined with management accounting information has a significant positive effect on innovation capability and enhanced firm performance.
Rajapathirana and Hui (2018)	This research was developed in the context of insurance companies and the study was tested on 379 senior managers belonging to this industry. Empirical results confirm a strong and significant relationship between innovation capabilities, innovation efforts and firm performance. In this context, to deliver more effective innovation outcomes, it is important to have highly skilled management that can lead effective innovation capability.
Xu, Ribeiro-Soriano, and Gonzalez-Garcia (2015)	Research findings confirm that firms who use technologies to capture the knowledge of the customers and transform it in innovation competences can obtain a better performance. In other words, one way to upgrade innovation competences in a firm is to introduce information technology applications oriented to capture the needs of the customers. By doing this, the marketing department of the company can understand better the preferences and behaviors of their customers, and this will foster loyalty.
Jimenez-Jimenez and Sanz-Valle (2011)	This empirical study confirm that organizational learning and innovation can positively contribute to business performance. Another finding of this study is that size and age of the firm, industry and environmental turbulence can also affect innovation.

Source: Own elaboration

Considering the information presented in the previous paragraphs of the relationship between innovation and business performance, the second hypothesis is the following:

H2: There is a positive and significant relationship between innovation and business performance.

2.3   Supply Chain Management and Innovation

According to Seyhan, et al. (2021) the business context requires innovation also in the supply chain; therefore, it is necessary to understand innovation in this context, de Souza, et al. (2023) consider that supply chain mindset is important to develop open innovation as well as is the contrary. Within this framework, Hunold and Shekhar (2022) consider that firms and competition authorities can take advantage from a deeper understanding of the incentives to foster supply chain innovations. Morcillo-Bellido, et al. (2021) firmly believe that innovation supports the development of Sustainable Supply Chains (SSCs) through Sustainability-Oriented Innovation (SOI) practices. Finally, Hao, et al. (2020) state that sharing of consumers' knowledge by retailers can help manufacturers improve the innovation level of products, thereby improving the performance of the whole supply chain. Table 5 presents several results of the theoretical research on the SCM–innovation relationship.

Table 5: Results of theoretical research on the innovation-SCM relationship

Author	Findings
de Souza et al. (2023)	Supply chain competencies/mindset is important to develop open innovation as well as is the contrary. In other words, there is a reciprocal practical and theoretical importance between the integration of the concepts. In addition, collaboration to manage the existing sources of knowledge in supply chains is an essential factor in improving the entire chain's integration and performance. In particular, the study of the flow of knowledge in supply chains from an OI perspective is an innovation in theory.
Hunold and Shekhar (2022)	Most compelling evidence confirms that firms and competition authorities can take advantage from a deeper understanding of the incentives to foster supply chain innovations. In detail, enterprises are potentially capable of supporting their suppliers in improving its efficiency.
Seyhan et al. (2021)	Currently innovation is a topic that is constantly analyzed by markets and academics because innovation strategies are key for enterprises to remain constantly renewed and be able to survive in the highly completive market. The business context requires innovation also in the supply chain; therefore, it is necessary to understand innovation in this context.
Morcillo-Bellido et al. (2021)	These authors consider that innovation supports the development of Sustainable Supply Chains (SSCs) through Sustainability-Oriented Innovation (SOI) practices. It is vital to foster innovation at SSCs.
Hao, Chen, and Yang (2020)	Sharing of consumers' knowledge by retailers can help manufacturers improve the innovation level of products, thereby improving the performance of supply chain. Only disadvantage is that the cost of collecting consumers' knowledge is very high and is complex to coordinate supply chain members effectively.

Source: Own elaboration

Regarding the relationship between innovation and supply chain management practices, in general terms Joshi, et al. (2023) research findings confirm that supply chain innovations in enterprises are vital and benefit the industry to survive in the long term. In the business context, Sukati, et al. (2023) believe that supply chain innovation is the new normal to improve SMEs performance.

Mehregan, et al. (2023) confirm that supply chain innovation practices enhance firm performance and competitive advantage and Hunold and Shekhar (2022) state that supply chain innovations increase supplier efficiency. Finally, Zhang, et al. (2022) empirical study conducted in China study results corroborate that supply chain agility is vital for green product and process innovation. Table 6 presents several results of the empirical research on the SCM–innovation relationship.

Table 6: Results of empirical research on the innovation-SCM relationship

Author	Findings
Sukati, Awain, and Ismaeel (2023)	The study proposes strategic partnerships with main suppliers (SPWMS) and supply chain innovation (SCI) in new normal and SMEs performance. In this context, strategic partnerships with target customers (SPWTC) are a significant predictor of SMEs performance.
Mehregan et al. (2023)	The study included 279 supply chain experts from small and medium-sized enterprises. Main research findings confirm that supply chain management practices enhance firm performance and competitive advantage through the improvement of supply chain innovation and Total Quality Management (TQM).
Joshi et al. (2023)	The study was conducted in the food sector. Research findings confirm that business strategy innovations and technological innovations are the most significant innovations that can bring resiliency to the companies, especially considering the post Covid-19 scenario. In other words, supply chain innovations in enterprises are vital and benefit the industry to survive in the long term.
Hunold and Shekhar (2022)	These authors studied what kind of incentives of competing downstream enterprises can foster supply chain innovations that increase supplier efficiency.
Zhang et al. (2022)	The study was conducted in China analyzing 405 Chinese manufacturing firms. Main research findings conclude that supply chain agility has a significant positive impact on green product and process innovation. Agility can be achieved by green supplier and customer integration. These results are valuable for manufacturing companies and government policymakers, so both actors can use this information for the implementation and promotion of green innovation practices.

Source: Own elaboration

Considering the information presented in the previous paragraphs of the relationship between innovation and supply chain management, the third hypothesis is the following:

H3: There is a positive and significant relationship between innovation and supply chain management.

2.4   Supply Chain Management and Competitiveness

This section examines the theoretical and empirical relationship between supply chain management and competitiveness. In the first place, considering the theoretical framework, Monnagaaratwe and Motatsa (2021) consider that in today's business context, supply chain management initiatives play a fundamental role in the success and business competitiveness of organizations. However, Gurtu and Johny (2021) state that it must be remembered that organizations face uncertainty and challenges in their supply chains because of the highly competitive business environment.

Mitrović and Mitrović (2021) believe that supply chain management is a source of numerous advantages for companies, especially when it comes to the creation of clusters that can effectively advance the competitive advantage enterprises and significantly influence regional and national economic competitiveness. Lahkani, et al. (2020) consider that including a blockchain solution into the global B2B (Business-to-Business) supply chain is a key strategy to improve the profitability and competitiveness of e-commerce companies. Table 7 presents several results of the theoretical research on the SCM–competitiveness relationship.

Table 7: Results of theoretical research on the SCM–competitiveness relationship

Author	Findings
Monnagaaratwe and Motatsa (2021)	In today's business context, supply chain management initiatives play a fundamental role in the success and business competitiveness of organizations in ensuring that the customer requirements are satisfied.
Gurtu and Johny (2021)	Organizations face uncertainty and challenges in their supply chains in a context characterized by a competitive business environment. Most compelling evidence confirm that risks associated with global supply chain management significantly affect the financial performance of the organizations and the economy of a nation.
Mitrović and Mitrović (2021)	Supply chain management is a new business philosophy in today's competitive business environment and a source of numerous advantages for companies. Certainly, improving supply chain management by the creation of clusters can effectively advance the competitive advantage enterprises and significantly influence regional and national economic competitiveness.
Mukhtar and Azhar (2020)	These authors developed a conceptual model that can assist managers in the development of competitive value chain using value co-creation and integration to make the whole supply chain competitive.
Lahkani et al. (2020)	Information technology advancements with the e-commerce supply chain allow participants in the business process to efficiently work with large volumes of data and control transactions. Certainly, to improve the profitability and competitiveness of e-commerce companies, a blockchain solution was incorporated into the global B2B (Business-to-Business) supply chain. Important to realize that implementing this increases the speed of payment and the reliability and transparency of data transfer.

Source: Own elaboration

Regarding the empirical research on the relationship between supply chain management and competitiveness, in the literature review there are several studies conducted in different countries that focus on the relationship between these two variables. There are empirical studies in India, South Africa, Saudi Arabia, and China.

In India, Sujatha and Maheswari (2023) supervised a study in hotels that concluded that green supply chain management practices in hotels have a positive impact on environmental sustainability and organizational competitiveness. In South Africa, the researchers Khoza, et al. (2022) did a study in the steel industry, and main conclusions include that the industry requires new business models and paradigms to improve its supply chain strategies and adopt international standards such as lean supply-chain management practices to become competitive.

On the other hand, Rehman, et al. (2020) directed a case study in Saudi Arabia where main research finding was that to achieve global and local success and overall competitiveness enterprises must improve their agility across supply chain activities. The study conducted in China by Li, et al. (2020) in the engineering equipment industry main conclusion was that supply chain management provides a reference for improving the industry competitiveness. Table 8 compiles the results of the empirical research on the SCM–competitiveness relationship.

Table 8: Results of empirical research on the SCM–competitiveness relationship

Author	Findings
Sujatha and Maheswari (2023)	The study was conducted in hotels located in India. The hypothesis was tested using Structural Equation Modeling (SEM) for data analysis. The results confirm that green supply chain management (GSCM) practices in hotels have a positive impact on environmental sustainability and organizational competitiveness.
Khoza, Mafini and Okoumba (2022)	The empirical research study was conducted in the steel industry in South Africa and the relationships that are investigated are between lean supply-chain management practices, lean culture, and supply-chain competitiveness. Data analysis was performed through correlations and regression analysis using SPSS version 27.0. Results of the study confirm that four lean practices (Just in Time, Total Quality Management, Strategic Partnerships and Waste Elimination) predict the establishment of a lean culture. In other words, lean culture predicts competitiveness in the steel supply chain. For instance, the industry requires new business models and paradigms to improve its supply-chain strategies and adopt international standards such as lean supply-chain management practices to become competitive.
Rehman et al. (2020)	The case study was conducted in Saudi Arabia manufacturing corporation using a fuzzy multi-criteria method. Authors define agility as the organization's ability to respond rapidly to customers' dynamic demands and volatile market changes. Main conclusions highlight that to achieve and sustain local and global success, enterprises must implement strategies to reduce its time to market, lower its total ownership costs, and boost its overall competitiveness through improving its agility across supply chain activities to foster sustainability.
Li, Qiao and Ding (2020)	This research was conducted using the data of China's Marine engineering equipment industry. Main results confirm that there are several key influencing factors, such as enterprise's operational, technical capabilities, enterprise's social recognition, enterprise's willingness to cooperate, trust between enterprises, communication and collaboration, opportunism, and external environment. Enterprise's operational and technical capabilities are the most critical factors. This study of supply chain management provides a reference for improving the industry competitiveness.

Source: Own elaboration

Considering the information presented in the previous paragraphs of the relationship between supply chain management and competitiveness, the fourth hypothesis is the following:

H4: There is a positive and significant relationship between supply chain management and competitiveness.

2.5   Supply Chain Management and Business Performance

Most compelling evidence of the study of the relationship between supply chain management and business performance confirms that enterprises can improve their business performance by occupying the core position in the supply chain network (Luo and Xie, 2021). In this context, for effective supply chain management, firms should put special attention on the relationship with their immediate stakeholders in the supply chain (Ahsan, et al., 2023).

In fact, a point often overlooked is that in the actual business context customers have a greening concern, therefore is fundamental that managers seek to create sustainable supply chains to improve overall business performance. Table 9 presents several results of the theoretical research on the SCM–business performance relationship.

Table 9: Results of theoretical research on the SCM – business performance relationship

Author	Findings
Yurtay et al. (2023)	At the present time, businesses recognize the relevance of business performance management (BPM) as an efficient business strategy to manage robust supply chain management process.
Ahsan et al. (2023)	For effective supply chain management, firms should put special attention on the relationship with their immediate stakeholders in the supply chain. In fact, the impact of customer and supplier concentration is a key strategy for sustainable financial growth.
Luo and Xie (2021)	Enterprises can improve their business performance by occupying the core position in the supply chain network.
Orr and Jadhav (2018)	Nowadays the greening concern in customers is growing in a context where supply chains (SC) are responsible for more than 50 percent of companies' environmental footprint. Therefore, it is crucial that managers seek to create sustainable supply chains (SSC) to improve overall business performance. In other words, management must ensure that logistics activities do not harm the environment.

Source: Own elaboration

There is numerous empirical research conducted around the globe to test the relationship between supply chain management and business performance. In Indonesia, Mukhsin (2023) study concluded that performance of the supply chain has a positive and considerable impact on firm performance. In Bosnia and Herzegovina, Bach, et al. (2023) research results confirm a positive relationship between supply chain management maturity (SCMM) and business performance.

In addition, Ruzo-Sanmartín, et al. (2023) main findings corroborate that supply chain performance impacts operational performance. In Mexico, Valdez-Bocanegra

(2023) empirically confirmed that supply chain management has a positive influence on competitiveness and performance of the manufacturing companies. In contrast, García-Alcaraz, et al. (2022) research findings indicate that there is not a relationship between implementing sustainable activities and performance.

In Indonesia, Siagian, et al. (2021) determined that supply chain management is crucial for restoring manufacturing performance quickly, which in turn will affect overall companies' business performance. In Greece, where Reklitis, et al. (2021) conducted a study in the context of the pandemic crisis, concluded that organizations' survival depends on the effectiveness of supply chain networks, and this is critical source of competitive advantage and a core strategy for improving organizational performance.

Finally, Jamaluddin and Saibani (2021) findings revealed the positive effects of collaborative relationships on supply chain performance, including financial, innovation, operational, environmental, social, and economic performances. Table 10 presents several results of the empirical research on the SCM–business performance relationship.

Table 10: Results of empirical research on the SCM – business performance relationship

Author	Findings
Mukhsin (2023)	The study was conducted in Indonesia using 100 actors in the broiler industry. The findings confirm that supply chain agility has a favorable impact on business and supply chain performances. In other words, performance of the supply chain has a positive and considerable impact on firm performance.
Bach et al. (2023)	The study was performed in Bosnia and Herzegovina and analyzed the connection between supply chain management maturity (SCMM) and business performance considering the balanced scorecard (BSC) framework. The research results confirm positive relationship between SCMM and business performance. Specifically, from the BSC perspective the results confirm that the level of state support does not influence the contribution of SCMM to business performance.
Ruzo-Sanmartín et al. (2023)	Main findings confirm that hierarchical organizational culture influences supply chain performance. Therefore, top management support and information technology department size influence internal integration, and that supply chain performance impacts operational performance.
Valdez-Bocanegra (2023)	The study was conducted in SMEs located in Mexico using structural equation modeling for data analysis. Results confirm that supply chain management has a positive influence on competitiveness and performance of the manufacturing companies.
García-Alcaraz et al. (2022)	The empirical research was conducted in Mexico in maquiladora industry and used structural equation model to test the study hypothesis. Main findings indicate that there is not a relationship between implementing sustainable activities and performance.
Siagian, Tarigan, and Jie (2021)	The study focuses on studying the effects of supply chain management on business performance in the context of the COVID-19 pandemic in Indonesia's manufacturing companies. Results conclude that supply chain integration affects supply chain resilience because of its ability to share complete product information. In addition, supply chain management is crucial for restoring manufacturing performance quickly, which in turn will affect overall companies' business performance.
Reklitis et al. (2021)	The study was conducted in Greece in the agri-food sector in the context of the pandemic crisis, were supply chain management has emerged as a critical source of completive advantage driving organizational performance. Main findings state that organizations' survival depends on the effectiveness of supply chain networks.
Jamaluddin and Saibani (2021)	The findings revealed the positive effects of collaborative relationships on supply chain performance, including financial, innovation, operational, environmental, social, and economic performances.

Source: Own elaboration

Considering the information presented in the previous paragraphs of the relationship between supply chain management and business performance, the fifth hypothesis is the following:

H5: There is a positive and significant relationship between supply chain management and business performance.

2.6   Business Performance and Competitiveness

Theoretical research has been conducted exploring the relationship between business performance and competitiveness. According to Leisner, et al. (2020), the adoption of new technology is necessary to achieve business performance and competitiveness.   In addition, Martincevic (2022) considers that implementing digital technology in business is vital to remain competitive and influence positively business performance. Chen, et al. (2021) also believe that leaders should apply competitiveness strategies to promote innovation, since innovation behavior can have significant effects business performance. Finally, Lee, et al. (2019) affirms that innovation capability can influence enterprises competitiveness. To sum up, Table 11 presents several results of the theoretical research on the business performance-competitiveness relationship.

Table 11: Results of theoretical research on the business performance –
competitiveness relationship

Author	Findings
Martincevic (2022)	Implement digital technology in business is key for organizations to remain competitive and ensure its long-term competitiveness that can have effects on overall business performance.
Chen et al. (2021)	Leaders must focus on applying competitiveness strategies to promote innovation (including technology-sharing) and formulate effective industrial policy for the government, as innovation behavior can influence business performance.
Leisner et al. (2020)	The adoption of new technology in companies is a challenge, but necessary to achieve business performance and competitiveness.
Lee et al. (2019)	These authors consider that innovation capability and competitiveness influence entrepreneurial orientation. In fact, entrepreneurial orientation leads to business success and influences business performance because it provides chances on innovative grounds that foster countries economy.

Source: Own elaboration

In addition to the previously described, there are several empirical studies that have been conducted in different parts of the world including Philippines, Serbia, Thailand and Republika Srpska to assess the relationship between business performance and competitiveness. In general terms, these two variables are closely related, because when a company is competitive this influences the overall business performance.

In the first place, German, et al. (2023) conducted a study in Philippines and conclusions include that innovation initiatives positively affects the firm's competitiveness and financial performance. Within this framework, Bakator, et al. (2019) focused on a study in Serbia manufacturing enterprises and main conclusions confirm that product innovation and development can create an environment where SMEs can achieve business performance and competitiveness.

Djalic, et al. (2021) performed a study in Republika Srpska, and main findings indicate that information systems and human resource management can affect competitiveness and business performance of enterprises. Additionally, Danurdara, et al. (2021) identified through an empirical study that digital innovation on competitiveness and business performance.

Thongrawd, et al. (2019) conducted a study in Thailand and main research findings include that green information technology capital improves the competitiveness of business and environmental performance. In this context, Bakator, et al. (2019) indicate that innovation initiatives depend on how many employees the enterprise has. Finally, Bibi, et al. (2020) found that employees' innovative behavior as well as its consequences on the firm's competitiveness and business performance. Table 12 summarizes the results mentioned regarding the empirical research on the business performance–competitiveness relationship.

**Table 12: Results of empirical research on the business performance –
competitiveness relationship**

Author	Findings
German et al. (2023)	This study was conducted in Philippines in the motor vehicle companies and concluded that the implementation of innovation initiatives positively affects the firm's competitiveness and financial performance.
Djalic et al. (2021)	The empirical study was conducted at manufacturing companies located at Republika Srpska. Main results indicate that information systems and human resource management can affect competitiveness and business performance of enterprises.
Danurdara, Darmawan and Kalsum (2021)	This research was directed in hotels located in Indonesia and examines quantitatively the effect of digital innovation on the competitiveness and performance. Results confirm that there is a positive and significant effect between digital innovation on competitiveness and business performance. These scientists found that improving business performance with enhancing competitiveness, to improve competitiveness can be done by increasing the execution of digital innovation.
Bibi et al. (2020)	The study empirically assesses the effects of the firm's innovative climate on organizational learning and employees' innovative behavior as well as its consequences on the firm's competitiveness and business performance. Main findings confirm that the firm's innovative climate has a significant positive relationship with organizational learning and employees' innovative behavior.
Thongrawd et al. (2019)	The study was done in Thailand focusing on the sports industry firms. Research findings state that investment on green information technology capital improves the competitiveness of business and environmental performance.
Bakator, Dordevic, and Cockalo (2019)	This research was focused on manufacturing enterprises from Serbia. Main conclusions confirm that product innovation and development can create an environment where SMEs can achieve business performance and competitiveness. Results indicate that this depends on how many employees the enterprise has.

Source: Own elaboration

Considering the information presented in the previous paragraphs of the relationship between business performance and competitiveness, the sixth hypothesis is the following:

H6: There is a positive and significant relationship between business performance and competitiveness.

Table 13 summarizes what was mentioned in the previous paragraphs of the literature review, regarding the relationship existent between the different variables of the present study, explored by different researchers through the history.

Table 13: Literature review on the relationship between Innovation, Supply Chain Management, Competitiveness and Business Performance

Relationship	Authors	
	Theoretical Research	**Empirical Research**
H₁: Innovation → Competitiveness	Urbancová and Vrabcová (2023) Vrabcová and Urbancová (2021) Bigliardi et al. (2020) Wang, Lin, and Li (2019) Gupta et al. (2016) Rossi and Raimondi (2007)	Zhang, Wang, and Wang (2023) Urbancová and Vrabcová (2023) Wang, Zhang, and Wang (2022) Khyareh and Rostami (2022) Hermundsdottir and Aspelund (2021) Franco (2020) Cho, Leem, and Shin (2008)
H₂: Innovation → Business Performance	Ponta, Puliga, and Manzini (2021) Prokop, Striteska & Stejskal (2021) Moretti and Biancardi (2020) Bigliardi et al. (2020) Piroska y Kálmán (2013) Lichtenthaler (2009) Arora and Fosfuri (2003) Kazuyuki (2016)	Zhang and Jiang (2024) Zhou et al. (2023) Becker (2023) Narayan and Hungund (2022) Prokop, Striteska and Stejskal (2021) Le, Nguyen and Hoang (2020) Rajapathirana and Yan Hui (2018) Xu, Ribeiro-Soriano and Gonzalez-Garcia (2015) Jimenez and Valle (2011)
H₃: Innovation → SCM	de Souza et al. (2023) Hunold and Shekhar (2022) Seyhan et al. (2021) Morcillo-Bellido et al. (2021) Hao, Chen and Yang (2020)	Sukati, Awain, and Ismaeel (2023) Mehregan et al. (2023) Joshi et al. (2023) Hunold and Shekhar (2022) Zhang et al. (2022)
H₄: SCM → Competitiveness	Monnagaaratwe and Motatsa (2021) Gurtu and Johny (2021) Mitrović and Mitrović (2021) Mukhtar and Azhar (2020) Lahkani et al. (2020)	Sujatha and Maheswari (2023) Khoza, Mafini and Okoumba (2022) Rehman et al. (2020) Li, Qiao and Ding (2020)
H₅: SCM → Business Performance	Yurtay et al. (2023) Ahsan et al. (2023) Luo and Xie (2021) Orr and Jadhav (2018)	Mukhsin (2023) Bach et al. (2023) Ruzo-Sanmartín et al. (2023) García-Alcaraz et al. (2022) Siagian, Tarigan, and Jie (2021) Reklitis et al. (2021) Jamaluddin and Saibani (2021)
H₆: Business Performance → Competitiveness	Martincevic (2022) Chen et al. (2021) Leisner et al. (2020) Lee et al. (2019)	German et al. (2023) Djalic et al. (2021) Danurdara, Darmawan, and Kalsum (2021) Bibi et al. (2020) Bakator, Dordevic, and Cockalo (2019) Thongrawd et al. (2019)

Source: Own elaboration

The theoretical framework presents a comprehensive historical analysis of the relationship existent in both, the literature, and the empirical studies, between all the variables of this study: innovation, supply chain management, competitiveness, and business performance. Figure 1 summarizes the six hypotheses of the present study.

Figure 1: General Model of Innovation, Supply Chain Management, Competitiveness and Business Performance
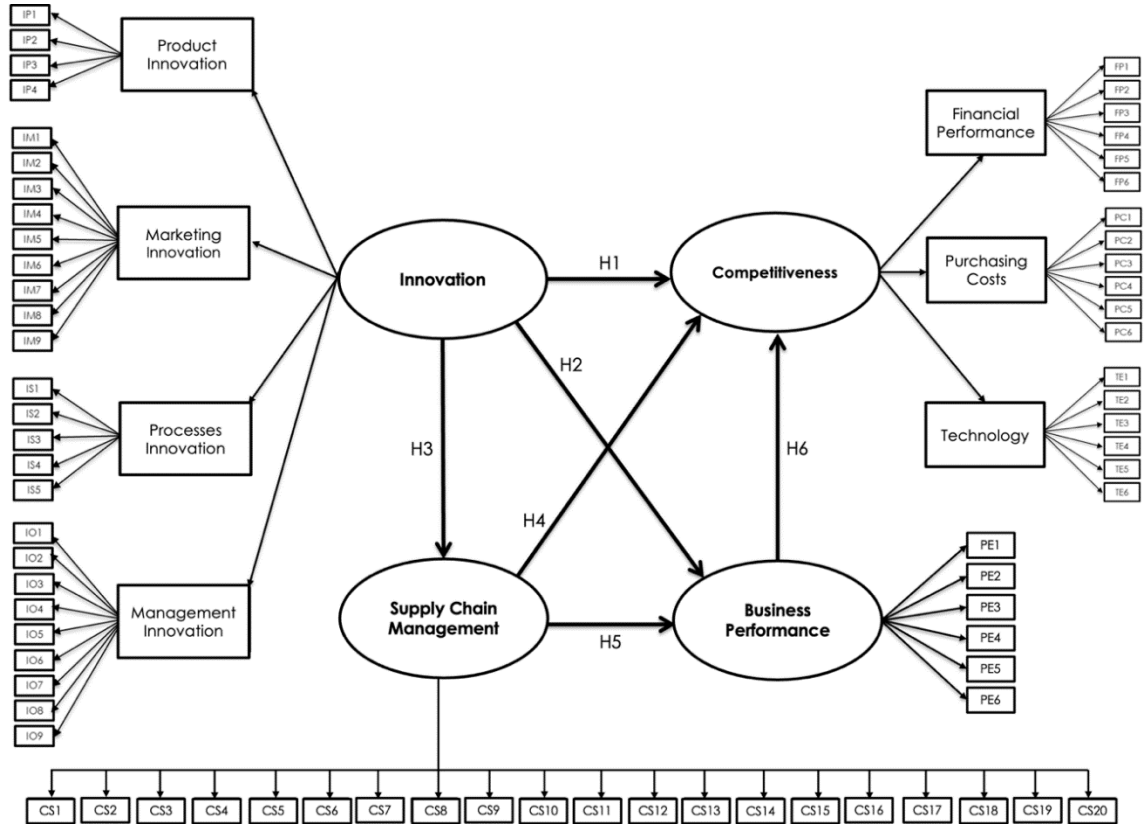
Source: Own elaboration

3. Main Results

In the first place, as part of the research methodology used in this paper, to test the model of the impact of supply chain management and business innovation on the competitiveness and performance of the manufacturing companies located in the State of Aguascalientes in Mexico, the questionnaire method design was chosen. In specific, this questionnaire was applied to company managers and the responses were subsequently recorded in IBM SPSS Statistics to analyze them. Hence, it's important to point out that the questionnaire facilitated the development of latent variables for the use of factor analysis.

It is convenient to point out that the type of research conducted was explanatory because it focuses on explaining the relationship between two or more variables (supply chain management, business innovation, competitiveness, and business performance); causal, because empirical evidence was obtained of the relationship between supply chain management, business innovation, business performance and competitiveness; and transversal, since the study was carried out in a single moment through the application of a survey.

In this empirical research, the method used to obtain data is a very traditional quantitative method known as the survey or questionnaire method, with the aim to determine insights about a group of company managers of SMEs manufacturing companies. In this context, Arribas (2004) states that the questionnaire is an instrument used to collect information, designed to quantify, and universalize information and standardize the interview procedure. In fact, its purpose is to achieve the comparability of information. A questionnaire is a research instrument that presents a series of queries for the purpose of gathering information from respondents. Lema (2017) consider that the questionnaire is one of the most used data collections techniques because it helps to study specific situations and even make future predictions based on the reaction of a specific population segment.

Within this framework, the subjects of this study are the SMEs manufacturing companies of the State of Aguascalientes in Mexico. The National Statistical Directory of Economic Units (DENUE) provided by the National Institute of Statistics and Geography (INEGI) of Mexico was used to obtain the directory of companies in the manufacturing segment, a database from which 230 manufacturing companies were selected to begin the application of the questionnaires. The sampling method that was used was non-probabilistic, which is characterized by being based on the experience of the researcher. According to Alaminos and Castejón (2006), it is a sampling characterized by the intentionality of the investigator, who tries to locate cases that can provide a maximum of information. Additionally, within the non-probabilistic sample, the convenience procedure was used, which is also called accidental or fortuitous.

Convenient to highlight that in this method the investigator simply selects the cases that are most available. In convenience sampling, the researcher makes the decision on who to interview (Alaminos and Castejón, 2006). Correspondingly, regarding the determination of the sample, it is essential to note that the sample size was

determined considering that the information will be analyzed later using the Structural Equation Models technique, hereinafter SEM by its acronym in English: Structural Equation Modeling.

In this context, is convenient to highlight that the authors Ruiz, Pardo, and San Martín (2010) consider that in SEM techniques it is advisable to have large samples, which means to particularly have a sample size greater than 100 or 200 cases. It is usual to demand sample sizes greater than 100 subjects and, specifically, sizes greater than 200 subjects are a better guarantee. First thing to remember when using this technique and methodology is that: "the larger the number of variables, the larger the sample size should also be (a rate higher than 10 subjects per observed variable is recommended)" (Ruiz, et al. 2010: 44). Therefore, for the purposes of the current research and since the data would be analyzed later using the Structural Equation Models technique, it was determined to establish a sample size of at least 200 cases of companies belonging to the State of Aguascalientes in Mexico.

Regarding the measurement of the variables used in this study, the measurements of various constructs are established: innovation, supply chain management, competitiveness, and business performance. Furthermore, the approach was made using previously developed scales implementing adaptations of them. Considering this context, it is important to note that to verify the validity of the instrument, pilot tests were conducted.

For the assessment of the reliability and validity of the three measurement scales, a Confirmatory Factor Analysis (CFA) was applied, using the maximum likelihood estimation (MLE) with the support of the EQS 6 (Bentler, 2005; Brown, 2006; Byrne, 2006). Additionally, for the measurement of reliability, Cronbach's Alpha, and Composite Reliability Index (CRI) were used (Bagozzi & Yi, 1988), and according to the results obtained in the CFA all the values of the three scales they are higher than 0.7 for both indices, which provides evidence of the reliability of the scales and justifies their internal reliability (Nunnally & Bernstein, 1994; Hair et al., 1998). Furthermore, as evidence of convergent validity, the CFA results indicate that all items of related factors are significant ($p < 0.01$) and the size of all standardized factor loads is greater than 0.60 (Bagozzi & Yi, 1988).

The results of the application of the CFA are presented in Table 14 and suggest that the measurement model provides a good fit of the statistical data (S-B X2 = 2,879.6378; df = 1,916; p = 0.000; NFI=0.694; NNFI = 0.863; CFI = 0.870; RMSEA = 0.048). Additionally, Table 13 shows a high internal consistency of the constructs, in each case Cronbach's Alpha exceeds the value of 0.70 recommended by Nunnally and Bernstein (1994). In this context, must be remembered that Fornell & Larcker (1981) consider that the composite reliability represents the variance extracted between the group of observed variables and the fundamental construct, so that a CRI greater than 0.60 is considered desirable (Bagozzi & Yi, 1988), and in this study this value it is widely exceeded. The index of the Extracted Variance Index (EVI) was calculated for each of the constructs, resulting in an EVI greater than 0.50 (Fornell & Larcker, 1981), and in this study 0.50 is exceeded in all factors.

Table 14: Internal consistency and convergent validity of the theoretical model

Construct	Dimension	Item	Cronbach's Alpha		Factorial Loading L_{ij}	Robust t Value	CRI	EVI
			Scale	Dimension				
Innovation	Product Innovation	IP1	0.945	0.803	0.689***	1.000*	0.804	0.507
		IP2			0.740***	8.55		
		IP3			0.691***	7.13		
		IP4			0.727***	7.80		
				Mean	**0.712**			
	Marketing Innovation	IM1		0.916	0.740***	1.000*	0.917	0.553
		IM2			0.835***	14.95		
		IM3			0.728***	11.50		
		IM4			0.723***	10.66		
		IM5			0.695***	11.80		
		IM6			0.789***	12.02		
		IM7			0.818***	12.89		
		IM8			0.673***	10.73		
		IM9			0.669***	10.22		
				Mean	**0.741**			
	Process Innovation	IS1		0.882	0.681***	1.000*	0.883	0.603
		IS2			0.810***	11.49		
		IS3			0.770***	11.27		
		IS4			0.844***	10.51		
		IS5			0.769***	8.93		
				Mean	**0.775**			
	Management Innovation	IO1		0.900	0.760***	1.000*	0.903	0.508
		IO2			0.747***	12.09		
		IO3			0.718***	10.00		
		IO4			0.727***	12.30		
		IO5			0.699***	9.81		
		IO6			0.661***	10.43		
		IO7			0.656***	9.83		
		IO8			0.705***	10.54		
		IO9			0.736***	11.50		
				Mean	**0.712**			
SCM	SCM	CS1	0.920	0.920	0.690***	1.000*	0.926	0.501
		CS2			0.749***	9.42		
		CS3			0.778***	8.21		
		CS4			0.774***	6.16		
		CS5			0.832***	7.47		
		CS6			0.738***	6.53		
		CS9			0.721***	8.53		
		CS10			0.688***	6.23		

		CS11			0.609***	5.73		
		CS14			0.594***	6.33		
		CS15			0.616***	8.56		
		CS16			0.654***	5.50		
		CS17			0.638***	7.47		
				Mean	**0.699**			
Competitiveness	Financial Performance	FP1	0.896	0.896	0.863***	1.000*	0.911	0.636
		FP2			0.865***	19.05		
		FP3			0.922***	21.02		
		FP4			0.854***	17.55		
		FP5			0.649***	11.05		
		FP6			0.567***	9.31		
				Mean	**0.787**			
	Purchasing Costs	PC1		0.875	0.790***	1.000*	0.876	0.543
		PC2			0.824***	19.03		
		PC3			0.724***	10.98		
		PC4			0.763***	11.97		
		PC5			0.681***	11.50		
		PC6			0.622***	8.55		
				Mean	**0.734**			
	Technology	TE1		0.918	0.796***	1.000*	0.920	0.657
		TE2			0.789***	14.31		
		TE3			0.870***	18.11		
		TE4			0.736***	11.96		
		TE5			0.804***	15.04		
		TE6			0.859***	19.05		
				Mean	**0.809**			
Business Performance	Business Performance	PE1	0.883	0.883	0.830***	1.000*	0.883	0.562
		PE2			0.859***	20.53		
		PE3			0.746***	13.80		
		PE4			0.596***	8.18		
		PE5			0.642***	10.61		
		PE6			0.789***	14.54		
				Mean	**0.744**			

$S\text{-}BX^2$ = 2879.6378/df=1916 = **1.503**; p< 0.00000; NFI= 0.694; NNFI= 0.863; CFI= 0.870; RMSEA= 0.048;

* = Parameters constrained to that value in the identification process

*** = p < 0.001

Source: Own elaboration based on the results of reliability tests.

For the validity analyses, convergent and discriminant validity analyzes were included. In the first instance, regarding the analysis of convergent validity, every one of the factor loadings of the items of the adjusted theoretical research model were evaluated. According to Bagozzi and Yi (1988), the factor loadings of the items must be greater than 0.60. Therefore, by carrying out an analysis of the factor loading of each item, it can be observed that all the factor loadings comply with the parameter established by Bagozzi and Yi (1988) and, consequently, it is possible to point out that there is internal consistency between each item of the dimensions analyzed.

Table 15: Discriminant validity of the adjusted theoretical research model

Item	1	2	3	4	5	6	7	8	9
Supply Chain Management	**0.501**	0.067, 0.295	0.063, 0.259	0.076, 0.316	0.114, 0.334	0.049, 0.265	**-0.007**, 0.145	0.085, 0.321	0.064, 0.280
Product Innovation	0.033	**0.507**	0.465. 0.865	0.303, 0.707	0.344, 0.680	0.122, 0.442	0.044, 0.312	0.394, 0.786	0.146, 0.434
Marketing Innovation	0.026	0.442	**0.553**	0.275, 0.615	0.386, 0.714	0.098, 0.406	**-0.057**, 0.247	0.387, 0.779	0.143, 0.419
Process Innovation	0.038	0.255	0.198	**0.603**	0.380, 0.816	0.205, 0.533	0.028, 0.316	0.467, 0.871	0.197, 0.497
Management Innovation	0.050	0.262	0.303	0.358	**0.508**	0.182, 0.478	0.041, 0.297	0.434, 0.766	0.211, 0.471
Financial Performance	0.025	0.080	0.064	0.136	0.109	**0.636**	0.155, 0.435	0.255, 0.587	0.404, 0.716
Purchasing costs	0.005	0.032	0.009	0.030	0.029	0.087	**0.543**	0.045, 0.385	0.168, 0.420
Technology	0.041	0.348	0.340	0.448	0.360	0.177	0.046	**0.657**	0.343, 0.619
Busines Performance	0.030	0.084	0.079	0.120	0.116	0.314	0.086	0.231	**0.562**
The diagonal represents the **Extracted Variance Index (EVI)**, whereas above the diagonal the variance is presented (squared correlation). Below diagonal, the estimated correlation of factors is presented with 95% confidence interval.									

Source: Own elaboration

In particular, the discriminant validity of the theoretical model of innovation, supply chain management, competitiveness and business performance were measured by means of two tests, which are presented in Table 15. First, the confidence interval test is presented (Anderson and Gerbing, 1988), which establishes that with a 95% confidence interval, none of the individual elements of the latent factors of the correlation matrix has the value of 1. Second, the extracted variance test is presented (Fornell and Larcker, 1981), which states that the variance extracted from each pair of constructs is lower than its corresponding EVI. Therefore, according to the results obtained from the application of both tests, it is possible to conclude that both tests demonstrate sufficient evidence of the existence of discriminant validity.

3.1   Results of the SEM

To respond to the six hypotheses raised in this empirical study, a structural equation modeling (SEM) was applied with the support of the EQS 6.2 software (Bentler, 2005; Byrne, 2006; Brown, 2006), analyzing the nomological validity of the theoretical model of innovation, supply chain management, competitiveness and business performance through the Chi-square test, through which the results obtained between the theoretical model and the measurement model were compared, obtaining non-significant results which allows an explanation of the relationships observed between latent constructs (Anderson & Gerbing, 1988). Table 16 shows in greater detail the results obtained from the application of the SEM.

Table 16. Results of the System of Structural Equations of the General Model of Innovation, Supply Chain Management, Competitiveness and Business Performance

Hypothesis	Structural Relationship	Standardized Coefficient	r^2
H₁: Innovation has a positive effect in competitiveness.	Innovation → Competitiveness	0.884***	12.413
H₂: Innovation has a positive effect on business performance.	Innovation → Business Performance	0.261***	11.899
H₃: Innovation has a positive effect on supply chain management.	Innovation → SCM	0.714***	8.721
H₄: Supply chain management has a positive effect on competitiveness.	SCM → Competitiveness	0.412***	10.871
H₅: Supply chain management has a positive effect on business performance.	SCM → Business Performance	0.448***	10.357
H₆: Business Performance has a positive effect on competitiveness.	Business Performance → Competitiveness	0.864***	14.048

S-BX^2 = 2446.1503/df= 1892 = **1.511**; p< 0.000; NFI=0.740; NNFI= 0.920; CFI=0.925; RMSEA= 0.037;
*** = p < 0.001
Source: Own elaboration based on statistical results

Results contained in Table 16 are NNFI= 0.920 and CFI=0.925, therefore, because these values are greater than 0.9, it is considered that the theoretical model has a good fit (Jöreskog and Sörbom, 1986; Byrne, 1989; Papke -Shields, Malhotra, and Grover, 2002). Similarly, the value RMSEA= 0.037 is less than 0.08, therefore it is considered acceptable (Jöreskog and Sörbom, 1986, Hair et al., 1998). In this context, the analysis of the acceptance of the hypotheses raised in this research is detailed in the next paragraphs.

3.1.1   Hypothesis Innovation and Competitiveness
The first study hypothesis is formulated as follows:

H_1: Innovation has a positive effect on competitiveness.

Table 15 present the results obtained with reference to this hypothesis, where β = 0.884, p value of 0.001, values that demonstrate that innovation has positive and significant effects on the competitiveness of companies in the manufacturing industry in the State of Aguascalientes in Mexico. Thus, the first study hypothesis is accepted.
These research findings support the theoretical research exposed by Urbancová and Vrabcová (2023); Vrabcová and Urbancová (2021); Bigliardi et al. (2020); Wang, Lin, and Li (2019); Gupta et al. (2016); and Rossi and Raimondi (2007). In addition, agree with the empirical results obtained in several studies performed by Zhang, Wang, and Wang (2023); Urbancová and Vrabcová (2023); Wang, et al. (2022); Khyareh and Rostami (2022); Hermundsdottir & Aspelund (2021); Franco (2020); and Cho, et al. (2008).

3.1.2   Hypothesis Innovation and Business Performance
The second study hypothesis is stated as follows:

H_2: Innovation has a positive effect on business performance.

Table 15 display the results obtained concerning this hypothesis, where the influence of innovation on business performance is established, with results of β = 0.261, p value of 0.001, so it is possible to accept this hypothesis given that the statistical results prove that innovation positively and significantly affects the business performance of companies belonging to the manufacturing industry of the State of Aguascalientes in Mexico.
These research findings agree with the theoretical research exposed by Ponta, et al. (2021); Prokop, Striteska & Stejskal (2021); Moretti and Biancardi (2020); Bigliardi et al. (2020); Piroska y Kálmán (2013); Lichtenthaler (2009); Arora and Fosfuri (2003); and Kazuyuki (2016). Furthermore, correspond with the empirical results obtained in several studies performed by Zhang and Jiang (2024); Zhou, et al. (2023); Becker (2023); Narayan and Hungund (2022); Prokop, et al. (2021); Le, Nguyen and Hoang (2020); Rajapathirana and Yan Hui (2018); Xu, Ribeiro-Soriano, and Gonzalez-Garcia (2015); and Jimenez and Valle (2011).

3.1.3   Hypothesis Innovation and Supply Chain Management

The third study hypothesis is formulated as follows:

H₃: Innovation has a positive effect on supply chain management.

The results to test this hypothesis are presented in Table 15, where it is possible to observe that $\beta = 0.714$, p value of 0.001, which indicates that innovation has positive and significant effects on the supply chain management of companies of the manufacturing industry of the State of Aguascalientes in Mexico.
These research findings support the theoretical research exposed by de Souza, et al. (2023);
Hunold and Shekhar (2022); Seyhan, et al. (2021); Morcillo-Bellido, et al. (2021); and Hao, Chen, and Yang (2020). In addition, agree with the empirical results obtained in several studies performed by Sukati, et al. (2023); Mehregan et al. (2023); Joshi et al. (2023); Hunold and Shekhar (2022); and Zhang et al. (2022).

3.1.4   Hypothesis Supply Chain Management and Competitiveness

The fourth study hypothesis addresses the following relationship:

H₄: Supply chain management has a positive effect on competitiveness.

Table 15 specifies the results concerning this hypothesis where the influence of the supply chain management variable on competitiveness is established, resulting in $\beta = 0.412$, p value of 0.001, therefore, it is possible to accept the hypothesis, because with these statistical results it is proven that supply chain management positively and significantly affects the competitiveness of companies of the manufacturing industry in the State of Aguascalientes in Mexico.
These research findings support the theoretical research exposed by Monnagaaratwe and Motatsa (2021); Gurtu and Johny (2021); Mitrović and Mitrović (2021); Mukhtar and Azhar (2020); and Lahkani, et al. (2020). Additionally, agree with the empirical results obtained in several studies performed by Sujatha and Maheswari (2023); Khoza, et al. 2022); Rehman et al. (2020); and Li, et al. (2020).

3.1.5   Hypothesis Supply Chain Management and Business Performance

The fifth study hypothesis addresses the following relationship:

H₅: Supply chain management has a positive effect on business performance.

The results to test this hypothesis are shown in Table 15, where it is possible to observe that at $\beta = 0.448$, p value of 0.001. Therefore, these statistical results confirm the influence of the supply chain management variable on business performance. Thus, it is possible to accept this hypothesis and it is confirmed that

supply chain management has positive and significant effects on the business performance of companies in the manufacturing industry located in the State of Aguascalientes in Mexico.

These research findings support the theoretical research exposed by Yurtay, et al. (2023); Ahsan, et al. (2023); Luo and Xie (2021); and Orr and Jadhav (2018). In addition, most compelling evidence agree with the empirical results obtained in several studies performed by Mukhsin (2023); Bach, et al. (2023); Ruzo-Sanmartín, et al. (2023); García-Alcaraz, et al. (2022); Siagian, et al. (2021); Reklitis, et al. (2021); and Jamaluddin and Saibani (2021).

3.1.6   Hypothesis Business Performance and Competitiveness

Finally, the sixth hypothesis addresses the following relationship:

*H₆: Business performance has a positive effect on competitiveness.*

Table 15 presents the results obtained concerning this hypothesis, where the influence of the business performance variable on competitiveness is confirmed, resulting in $\beta = 0.864$, p value of 0.001. Thus, it is possible to accept the hypothesis, since the statistical results obtained confirm that business performance has positive and significant effects on the competitiveness of companies in the manufacturing industry of the State of Aguascalientes in Mexico.

These research findings support the theoretical research exposed by Martincevic (2022); Chen, et al. (2021); Leisner, et al. (2020); and Lee, et al. (2019). Furthermore, agree with the empirical results obtained in several studies performed by German, et al. (2023); Djalic, et al. (2021); Danurdara, et al. (2021); Bibi, et al. (2020); Bakator, et al. (2019); and Thongrawd, et al. (2019).

3.2   SEM Conclusion

In conclusion, the six hypotheses raised in the theoretical research model are significant or have positive effects, which demonstrates that innovation and supply chain management have positive effects on the competitiveness and performance of companies in the manufacturing industry located in the State of Aguascalientes in Mexico. Figure 2 shows the Theoretical Model graphically along with the standardized coefficients obtained on the statistical analyses.

Figure 2: Model of Innovation, Supply Chain Management, Competitiveness and Business Performance
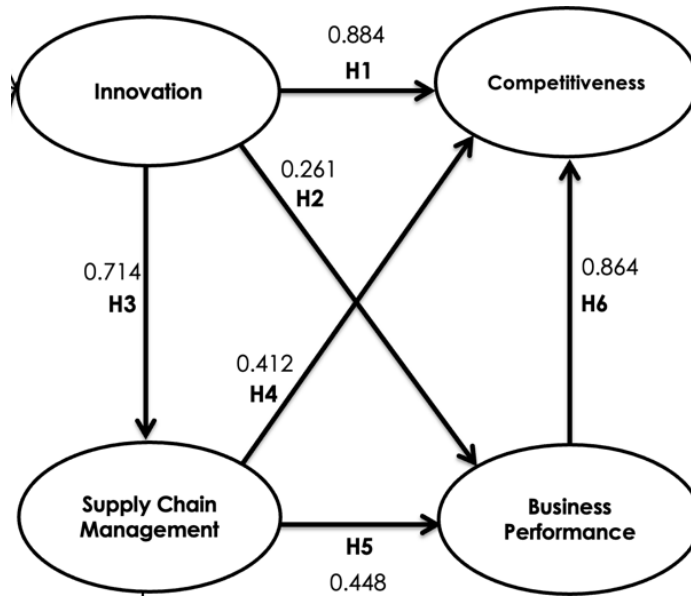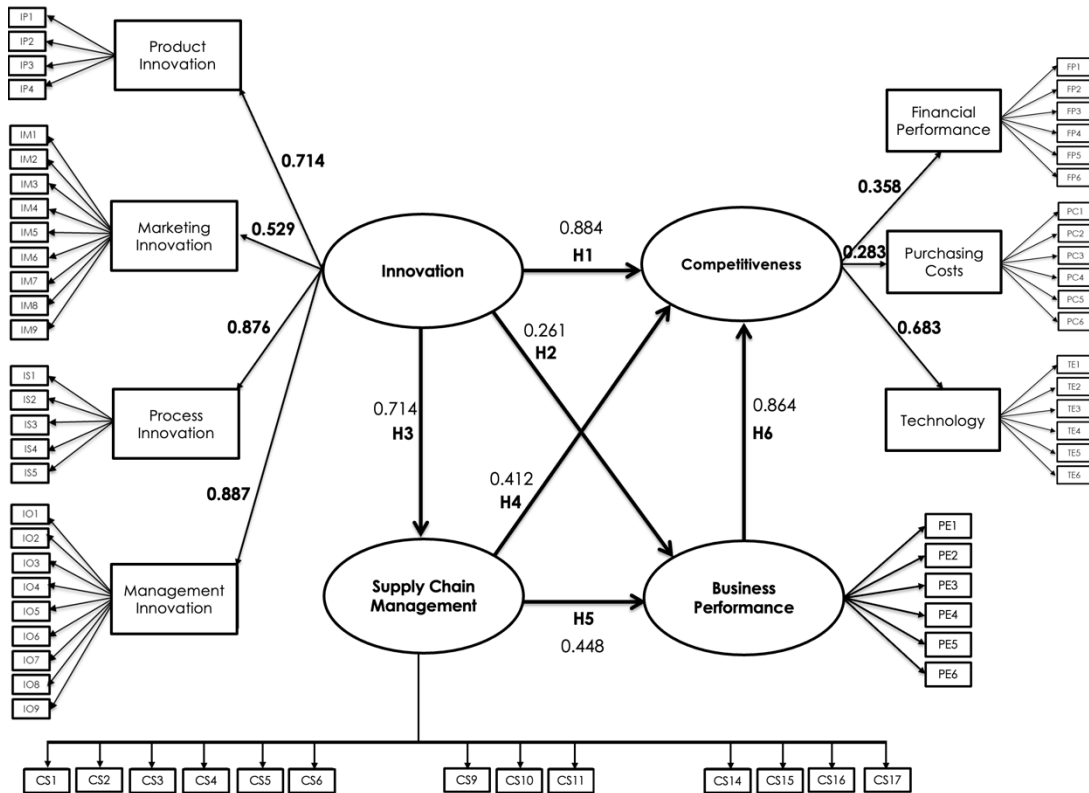

Source: Own elaboration based on statistical results.

It should be noted that within the innovation construct, the dimension that contributes the most is that referring to innovation in management with $\beta = 0.887$. Secondly, the process innovation dimension with $\beta = 0.876$. Thirdly, the product innovation dimension with $\beta = 0.714$. Finally, the dimension that contributes the least to the innovation construct is that referring to marketing innovation with $\beta = 0.529$. Thus, it is concluded that the dimension that most explains the innovation construct is that referring to innovation in management.

Now, regarding the competitiveness construct, the dimension that most contributes and explains said construct is technology with $\beta = 0.683$. Secondly, the financial performance dimension with $\beta = 0.358$. Ultimately, the dimension that least explains the competitiveness construct is that referring to purchasing costs with $\beta = 0.283$. The above described can be seen graphically in Figure 3, shown below.

Figure 3: Results of the System of Structural Equations of the General Model of Innovation, Supply Chain Management, Competitiveness and Business Performance

Source: Own elaboration based on statistical results.

4. Conclusion

In general terms, in a highly competitive context influenced by the globalization, companies that do not implement innovation practices are destined to collapse or even disappear. In specific, it can be concluded that the present empirical study conducted in manufacturing companies located in the State of Aguascalientes in Mexico confirms that innovation practices and supply chain management have positive effects in the overall business competitiveness and performance. Therefore, it is highly recommended that companies implement innovation practices when manufacturing their products, modernize their industrialized processes, and implement novel practices in their marketing and management processes. In addition, research findings confirm that financial performance, purchasing costs and technology are vital variables to boost company competitiveness. In this context, it is important to highlight that in the following paragraphs, business and government implications are addressed, as part of the main conclusions of the present study.

4.1   Business implications

Regarding the six hypotheses raised in the theoretical research model, these are significant or have positive effects, which demonstrates that innovation and supply chain management have positive effects on the competitiveness and performance of companies in the manufacturing industry of the State of Aguascalientes in Mexico. Thus, with respect to the business implications, some recommendations based on the results of the analyzes of the theoretical model of this doctoral research are listed below:

- It is vital to make executives aware of implementing innovation practices in products (changes or improvements in existing products or commercialization of new products), marketing, processes (changes or improvements in production processes or acquisition of new capital goods) and management (changes or improvements in direction and management or purchasing and supplies) in their organization. This is because innovation is an essential factor for the company to remain competitive in today's market.
- Executives are encouraged to focus on improving their supply chain management practices in an innovative way, whether by reducing response times across the supply chain, creating a higher level of trust throughout the supply chain, increasing your company's just-in-time capabilities, and establishing more frequent contact with supply chain members. All this to improve the company's performance and increase its competitiveness.
- It would be a good strategy to implement strategies to enhance close collaboration between universities and research centers with manufacturing companies located in the State of Aguascalientes in Mexico. This is essential to foster trust & to be able to work together to carry out research in strategic areas or topics to improve the competitiveness of the region in the long-term.

4.2   Government implications

Considering the research findings of the present study, which confirms the relevance of innovation and supply chain management practices in the manufacturing industry of the State of Aguascalientes in Mexico, as well as the growing search of companies to be more competitive in their environment and improve its business performance, some recommendations for the government sector are listed below.

- It is recommended that the government encourages the creation of public policies that in turn become actions that promote innovation. This, since a close relationship between innovation and competitiveness has been recognized in the literature and empirically confirmed in the present research.
- It is suggested that the *SEDECYT: Secretaría de Desarrollo Económico, Ciencia y Tecnología* (Secretariat of Economic Development of the State of Aguascalientes in Mexico) increase the number of programs focused on innovation and technological development, since although some programs already exist, the majority are focused on the software industry and technology

development. Therefore, it is recommended that efforts are directed to develop innovation programs in products, services, processes, and management systems specifically for the manufacturing industry of the State of Aguascalientes in Mexico, given its relevance in the local and national GDP of Mexico.

- It is proposed that efforts and resources be channeled into training projects for personnel who work for the companies that are part of the manufacturing industry in the State of Aguascalientes in Mexico, in such a way that they develop their skills in terms of supply chain management practices. In this way, human capital will contribute to reducing supply chain problems, such as reducing response times throughout the supply chain, creating a higher level of trust throughout the supply chain, and increasing company's capabilities just in time, among others.

- It is highly recommended that the government encourages close collaboration between universities and research centers with manufacturing companies. It would be a good initiative to incorporate scientists into companies so that the most recent research findings in innovation and supply chain management can be used as tools to improve the competitiveness and performance of companies in the short and long-term. To cover the salary of scientists who work in collaboration with companies, it would be a good initiative for the government to consider a budget for this, so that the economic aspect to cover this cost does not have to be covered completely by the company and thus businessmen are more open to this initiative.

Finally, it is important to highlight that each of the initiatives mentioned above are suggestions for the government and their goal is to improve the competitiveness of the manufacturing companies located in the State of Aguascalientes in Mexico. This is relevant, since improving the competitiveness of companies will also result in improving competitiveness not only in the State of Aguascalientes, but in the whole country.

5. Limitations

Although the result of this study can prove the research hypotheses, this study has limitations. First, the findings are limited to companies located in the manufacturing industry of the State of Aguascalientes in Mexico. Therefore, it is recommended that the findings of this study be examined in other contexts. Second, the data collected with the sampling method and the small number of the sample mean that the results cannot be generalized. In other words, it can be improved by the random sampling method with a larger number of samples.

On the other hand, there were great limitations specifically regarding field work. The first limitation was having the financial resources necessary to carry out surveys. The second limitation concerns the willingness of managers and general directors to answer the survey. In most cases it was very difficult to obtain appointments to apply the questionaries, since in general the companies did not express an interest in academic research activities. Even when access to an appointment was finally

achieved, on several occasions they canceled the meetings at the last minute and asked to reschedule the appointment for another date.

In this context, the executives expressed distrust when answering the questionnaire, as they argued that the information requested was confidential, specifically, that related to annual sales income. However, after explaining to them that the information collected would be treated statistically in a general way and not in particular, they agreed to answer the entire survey.

Likewise, another limitation that can be considered is that applying the instrument only to top management (general directors or managers) only represents the opinion of one person in the company, therefore, the information collected may be subjective. It would be appropriate for future studies to apply the survey to both employees and clients of the organization, to be able to obtain information from another point of view and even be able to compare data with the information collected from the instruments applied to the general directors and managers.

References

[1]   Adner, R. & Kapoor, R. (2010). Value creation in innovation ecosystems: how the structure of technological interdependence affects firm performance in new technology generations. *Strategic Management Journal 31*(3):306–333.

[2]   Ahsan, T., Mirza, S. S., Gull, A. A., & Majeed, M. A. (2023). How to deal with customer and supplier concentration to attain sustainable financial growth? The role of business strategy. *Business Strategy and the Environment*, *32*(7), 4600-4619. https://doi-org.ugto.idm.oclc.org/10.1002/bse.3383

[3]   Alaminos, A., & Castejón, J. (2006). Elaboración, análisis e interpretación de encuestas, cuestionarios y escalas de opinión. Alicante, España: Editorial Marfil, S.A.

[4]   Albats, E., Podmetina, D., & Vanhaverbeke, W. (2023). Open innovation in SMEs: A process view towards business model innovation. *Journal of Small Business Management*, *61*(6), 2519-2560.
      https://doi.org/10.1080/00472778.2021.1913595

[5]   Anderson, J., & Gerbing, D. (1988). Structural equation modeling in practice: a review and recommended two-step approach. *Psychological Bulletin, 13,* 411-423.

[6]   Arora, A. & Fosfuri, A. (2003). Licensing the market for technology. *Journal of Economic Behavior & Organization*. 2003; 52(2): 277-295.

[7]   Arribas, M. (2004). Diseño y validación de cuestionarios. *5*(17), 23-29.
      From Matronas Profesión: http://ebevidencia.com/wp content/uploads/2014/07/validacion_cuestionarios.pdf

[8]   Bach, M. P., Klincar, A., Aleksic, A., Jelavic, S. R., & Zeqiri, J. (2023). Supply Chain Management Maturity and Business Performance: The Balanced Scorecard Perspective. *Applied Sciences-Basel*, *13*(4), Article 2065. https://doi-org.ugto.idm.oclc.org/10.3390/app13042065

[9] Bagozzi, R., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science, 16*(1), 74-94.

[10] Bakator, M., Dordevic, D., & Cockalo, D. (2019). Modelling the Influence of Product Development on Business Performance and Competitiveness in Manufacturing Enterprises. *Tehnicki Vjesnik-Technical Gazette*, *26*(6), 1628-1634. https://doi-org.ugto.idm.oclc.org/10.17559/tv-20181102185923

[11] Banbury, C.M. & Mitchell, W. (1995). The effect of introducing important incremental innovations on market share and business survival. *Strategic Management Journal, Summer Special Issue 16*: 161-182.

[12] Becker, B. (2023). Green Innovation Strategies, Innovation Success, and Firm Performance-Evidence from a Panel of Spanish Firms. *Sustainability, 15*(2), Article 1656. https://doi.org/10.3390/su15021656

[13] Bentler, P. (2005). EQS 6 structural equations program manual. Encino, USA: Multivariate Software.

[14] Bibi, S., Khan, A., Qian, H. D., Garavelli, A. C., Natalicchio, A., & Capolupo, P. (2020). Innovative Climate, a Determinant of Competitiveness and Business Performance in Chinese Law Firms: The Role of Firm Size and Age. *Sustainability*, *12*(12), Article 4948. https://doi-org.ugto.idm.oclc.org/10.3390/su12124948

[15] Bigdeli M, Jacobs B, Tomson G, Laing R, Ghaffar A, Dujardin B, et al. (2013). Access to medicines from a health system perspective. *Health Policy Plan*. 2013;*28*(7):692–704.

[16] Bigliardi, B., Ferraro, G., Filippelli, S., & Galati, F. (2020). The influence of open innovation on firm performance. *International Journal of Engineering Business Management, 12,* Article 1847979020969545. https://doi.org/10.1177/1847979020969545

[17] Brown, T. (2006). Confirmatory factor analysis for applied research. New York, USA: The Guilford Press.

[18] Byrne, B. (1989). A primer of LISREL: basic applications and programming for confirmatory factor analysis analytic models. New York, USA: Springer.

[19] Byrne, B. (2006). Structural equation modeling with EQS, basic concepts, applications, and programming (2 ed.). London, UK: LEA Publishers.

[20] Chen, J. L., Wei, Z. H., Liu, J. L., & Zheng, X. S. (2021). Technology Sharing and Competitiveness in a Stackelberg Model. *Journal of Competitiveness*, *13*(3), 5-20. https://doi-org.ugto.idm.oclc.org/10.7441/joc.2021.03.01

[21] Cho Y. J., Leem C. S., & Shin K. T. (2008). The relationships among manufacturing innovation, competitiveness, and business performance in the manufacturing industries of Korea. *International Journal of Advanced Manufacturing Technology, 38,* 840-850.

[22] Choi, K., Narasimhan, R., & Kim, S. W. (2012). Postponement strategy for international transfer of products in a global supply chain: A system dynamics examination. *Journal of Operations Management*, *30*(3), 167-179. https://doi. org/10.1016/j.jom.2012.01.003

[23] Danurdara, A. B., Darmawan, H. & Kalsum, E. U. (2021). The Role of Digital Innovation and Its Impact on Competitiveness and Performance: The Case of Business Hotel in Indonesia. *Quality-Access to Success*, *22*(184), 179-185. https://doi-org.ugto.idm.oclc.org/10.47750/qas/22.184.23

[24] de Souza, T. A., Pinto, G. A., Antunes, L. G. R., & Grützmann, A. (2023). SIPOC-OI: a proposal for open innovation in supply chains. *Innovation & Management Review, 20*(1), 76-93. https://doi.org/10.1108/inmr-12-2020-0182

[25] Djalic, N., Nikolic, M., Bakator, M. & Erceg, Z. (2021). Modeling the Influence of Information Systems on Sustainable Business Performance and Competitiveness. *Sustainability*, *13*(17), Article 9619. https://doi-org.ugto.idm.oclc.org/10.3390/su13179619

[26] Duong, N. H. & Ha, Q. (2021). The links between supply chain risk management practices, supply chain integration and supply chain performance in Southern Vietnam: A moderation effect of supply chain social sustainability. *Cogent Business & Management*, *8*(1), Article 1999556. https://doi-org.ugto.idm.oclc.org/10.1080/23311975.2021.1999556

[27] Eisenhardt, K.M. & Tabrizi, B.N. (1995). Accelerating adaptive processes: product innovation in the global computer industry. *Administrative Science Quarterly 40*(1):84-110.

[28] Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, 18*, 39-50.

[29] Franco, M. (2020). Entrepreneurship, Competitiveness, and Innovation. Sustainability, 12(16), Article 6576. https://doi.org/10.3390/su12166576

[30] García-Alcaraz, J. L. G., Díaz-Reza, R. D., Jiménez-Macías, E. J., Vidal, R. P. I., Flor-Montalvo, F. J. F., & Sánchez-Toledo Ledesma, A. S. T. (2022). Effect of the Sustainable Supply Chain on Business Performance- The Maquiladora Experience. *Ieee Access*, *10*, 40829-40842. https://doi-org.ugto.idm.oclc.org/10.1109/access.2022.3166193

[31] Geng, L. S., Shi, X. F., Zu, L. R., Chai, M. Q., & Xing, J. G. (2021). Importance Calculation of Customer Requirements for Incremental Product Innovation. *Frontiers in Psychology, 12,* Article 633472. https://doi.org/10.3389/fpsyg.2021.633472

[32] German, J. D., Redi, A., Ong, A. K. S., & Liwanag, J. L. (2023). The impact of green innovation initiatives on competitiveness and financial performance of the land transport industry. *Heliyon*, *9*(8), Article e19130. https://doi-org.ugto.idm.oclc.org/10.1016/j.heliyon.2023.e19130

[33] Gupta, S., Malhotra, N. K., Czinkota, M., & Foroudi, P. (2016). Marketing innovation: A consequence of competitiveness. *Journal of Business Research, 69*(12), 5671-5681. https://doi.org/10.1016/j.jbusres.2016.02.042

[34] Gurtu, A., & Johny, J. (2021). Supply Chain Risk Management: Literature Review. *Risks*, *9*(1), Article 16. https://doi-org.ugto.idm.oclc.org/10.3390/risks9010016

[35] Hair, J., Anderson, R., Tatham, R., & Black, W. (1998). *Multivariate data analysis with readings*. New York, USA: Prentice-Hall.

[36] Hao, Y. F., Chen, W., & Yang, H. (2020). Collaborative Innovation with Dynamic Incentive Contracts in a Supply Chain. *Mathematical Problems in Engineering, 2020*, Article 6538653. https://doi.org/10.1155/2020/6538653

[37] Hermundsdottir, F., & Aspelund, A. (2021). Sustainability innovations and firm competitiveness: A review. *Journal of Cleaner Production, 280*, Article 124715. https://doi.org/10.1016/j.jclepro.2020.124715

[38] Hunold, M., & Shekhar, S. (2022). Supply Chain Innovations and Partial Ownership. *Review of Industrial Organization, 60*(1), 109-145. https://doi.org/10.1007/s11151-021-09836-9

[39] Jamaluddin, F., & Saibani, N. (2021). Systematic Literature Review of Supply Chain Relationship Approaches amongst Business-to-Business Partners. *Sustainability*, *13*(21), Article 11935. https://doi-org.ugto.idm.oclc.org/10.3390/su132111935

[40] Jimenez-Jimenez, D., & Sanz-Valle, R. (2011). Innovation, organizational learning, and performance. *Journal of Business Research, 64*(4), 408-417. https://doi.org/10.1016/j.jbusres.2010.09.010

[41] Jöreskog, K., & Sörbom, D. (1986). LISREL VI: analysis of linear structural relationships by maximum likelihood, instrumental variables, and square methods. Moorsville, USA: Scientific Software.

[42] Joshi, S., Sharma, M., Ekren, B. Y., Kazancoglu, Y., Luthra, S., & Prasad, M. (2023). Assessing Supply Chain Innovations for Building Resilient Food Supply Chains: An Emerging Economy Perspective. *Sustainability*, *15*(6), Article 4924. https://doi.org/10.3390/su15064924

[43] Katila, R. & Chen, E.L. (2008). Effects of search timing on innovation: the value of not being in sync with rivals. *Administrative Science Quarterly 53*(4): 593–625.

[44] Kazuyuki M. (2016). Innovation and entrepreneurship: a first look at the linkage data of Japanese patent and enterprise census. *Seoul Journal of Economics* 2016; *29*(1): 69-94.

[45] Khoza, S., Mafini, C., & Okoumba, W. V. L. (2022). Lean practices and supply-chain competitiveness in the steel industry in Gauteng, South Africa. *South African Journal of Economic and Management Sciences*, *25*(1), Article a4617. https://doi-org.ugto.idm.oclc.org/10.4102/sajems.v25i1.4617

[46] Khyareh, M. M., & Rostami, N. (2022). Macroeconomic Conditions, Innovation and Competitiveness. *Journal of the Knowledge Economy, 13*(2), 1321-1340. https://doi.org/10.1007/s13132-021-00752-7

[47] Kot, S., Haque, A. U., & Baloch, A. (2020). Supply Chain Management in Smes: Global Perspective. *Montenegrin Journal of Economics*, *16*(1), 87-104. https://doi-org.ugto.idm.oclc.org/10.14254/1800-5845/2020.16-1.6

[48] Kus, A. (2020). The Importance of Innovation in the Development of Polish Business Gazelles. *Central European Management Journal, 28*(1), 32-51. https://doi.org/10.7206/cemj.2658-0845.14

[49] Lahkani, M. J., Wang, S. Y., Urbanski, M., & Egorova, M. (2020). Sustainable B2B E-Commerce and Blockchain-Based Supply Chain Finance. *Sustainability*, *12*(10), Article 3968. https://doi-org.ugto.idm.oclc.org/10.3390/su12103968

[50] Le, H. M., Nguyen, T. T., & Hoang, T. C. (2020). Organizational culture, management accounting information, innovation capability and firm performance. *Cogent Business & Management, 7*(1), Article 1857594. https://doi.org/10.1080/23311975.2020.1857594

[51] Lee, H., Ahmed, U., Zhussupova, B., & Khalid, N. (2019). Impact of innovation capability and competitiveness on entrepreneurial orientation regarding to the entrepreneurial education in business performance among south Korean firms. *Polish Journal of Management Studies*, *20*(2), 358-367. https://doi-org.ugto.idm.oclc.org/10.17512/pjms.2019.20.2.30

[52] Leiblein, M.J. & Madsen, T.L. (2009). Unbundling competitive heterogeneity: incentive structures and capability influences technological innovation. *Strategic Management Journal 30*(7): 711-735.

[53] Leiponen, A. & Helfat, C.E. (2010). Innovation objectives, knowledge sources, and the benefits of breadth. *Strategic Management Journal 31*(2): 224-236

[54] Leisner, P., Larson, C., Nielsen, L. P., Muller, S., Hansal, W., Puippe, J. C., & Zielonka, A. (2020). Global competitiveness of European surface technology. Part 1: competitiveness and the relationship between European manufacturing and surface finishing sectors. *Transactions of the Institute of Metal Finishing*, *98*(6), 279-287. https://doi-org.ugto.idm.oclc.org/10.1080/00202967.2020.1835255

[55] Lema, S. (2017). *Cómo elaborar una encuesta o cuestionario de investigación de mercados*. https://www.gestion.org/marketing/investigacion-mercados/31823/como-elaborar-una-encuesta-o-cuestionario-de-investigacion-de-mercados/

[56] Li, T. C., Qiao, L., & Ding, Y. Y. (2020). Factors Influencing the Cooperative Relationship between Enterprises in the Supply Chain of China's Marine Engineering Equipment Manufacturing Industry- A study based on GRNN-DEMATEL method. *Applied Mathematics and Nonlinear Sciences*, *5*(1), 121-138. https://doi-org.ugto.idm.oclc.org/10.2478/amns.2020.1.00012

[57] Lichtenthaler U. (2009). Outbound open innovation and its effect on firm performance: examining environmental influences. *R&D Management*; *39*(4): 317-330.

[58] López, D. & Oliver, M. (2023). Integrating Innovation into Business Strategy: Perspectives from Innovation Managers. *Sustainability*, *15*(8), Article 6503. https://doi.org/10.3390/su15086503

[59] Luo, T., & Xie, R. H. (2021). Supply Chain Power and Corporate Environmental Responsibility: Mediation Effects Based on Business Performance. *International Journal of Environmental Research and Public Health*, *18*(17), Article 9264.
https://doi-org.ugto.idm.oclc.org/10.3390/ijerph18179264

[60] Martincevic, I. (2022). The correlation between digital technology and digital competitiveness. *International Journal for Quality Research*, *16*(2), 541-558. https://doi-org.ugto.idm.oclc.org/10.24874/ijqr16.02-13

[61] Mehregan, E., Sanaei, S., Manna, M., Bozorgkhou, H., & Heidari, S. (2023). The Role of SCM practices in Competitive Advantage and Firm Performance: A Mediating Role of Supply Chain Innovation and TQM. *Tehnicki Glasnik-Technical Journal, 17*(4), 516-523. https://doi.org/10.31803/tg-20221223200658

[62] Mentzer, John T., James S. Keebler, Nancy W. Nix, Carlo D. Smith, and Zach G. Zacharia. (2001). Defining Supply Chain Management. *Journal of Business Logistics 22:* 1-25.

[63] Mitrović, V., & Mitrović, J. (2021). Defining the notions of management of supply chains, value chains and clusters in agriculture. *Casopis Za Ekonomiju I Trzisne Komunikacije*, *11*(2), 479-496.
https://doi-org.ugto.idm.oclc.org/10.7251/emc2102479m

[64] Monnagaaratwe, K. F., & Motatsa, K. W. (2021). Enhancing business competitiveness of medium-sized food produce retailers through supply chain management. *Journal of Transport and Supply Chain Management*, *15*, Article a639. https://doi-org.ugto.idm.oclc.org/10.4102/jtscm.v15i0.639

[65] Morcillo-Bellido, J., Isasi-Sanchez, L., Garcia-Gutierrez, I., & Duran-Heras, A. (2021). Model Based Analysis of Innovation in Sustainable Supply Chains. *Sustainability, 13*(9), Article 4868. https://doi.org/10.3390/su13094868

[66] Moretti, F., & Biancardi, D. (2020). Inbound open innovation and firm performance. *Journal of Innovation & Knowledge*, *5*(1), 1-19.
https://doi.org/10.1016/j.jik.2018.03.001

[67] Mukhsin, M. (2023). Supply Chain Performance as a Mediating Factor in the Effect of Supply Agility on Company Performance. *Quality-Access to Success*, *24*(193), 306-313.
https://doi-org.ugto.idm.oclc.org/10.47750/qas/24.193.34

[68] Mukhtar, U., & Azhar, T. M. (2020). Inter-functional Coordination to Co-create Value Within Integrated Value Chains for Competitive Supply Chain. *Operations and Supply Chain Management-an International Journal*, *13*(1), 11-22.
https://doi-org.ugto.idm.oclc.org/10.31387/oscm0400249

[69] Narayan, A., & Hungund, S. (2022). Enhancing Firm Performance Through Adoption of Innovation: An Empirical Evidence from Indian Biotechnological Firms. *Journal of the Knowledge Economy, 13*(3), 2431-2456.
https://doi.org/10.1007/s13132-021-00821-x

[70] Nunnally, J., & Bernstein, I. (1994). Psychometric theory (3 ed.). New York, USA: McGraw-Hill.

[71] Papke-Shields, K., Malhotra, M., & Grover, V. (2002). Strategic manufacturing planning systems and their linkage to planning system success. *Decision Science, 13*(1), 1-30.

[72] Piroska, H., & Kálmán, K. (2013). Innovation-based performance evaluation foundations. *Információs Társadalom*, *13*(2).

[73] Ponta, L., Puliga, G., & Manzini, R. (2021). A measure of innovation performance: the Innovation Patent Index. *Management Decision, 59*(13), 73-98. https://doi.org/10.1108/md-05-2020-0545

[74] Prokop, V., Striteska, M. K., & Stejskal, J. (2021). Fostering Czech firms' innovation performance through efficient cooperation. *Oeconomia Copernicana, 12*(3), 671-700. https://doi.org/10.24136/oc.2021.022

[75] Rajapathirana, R. P. J., & Hui, Y. (2018). Relationship between innovation capability, innovation type, and firm performance. *Journal of Innovation & Knowledge, 3*(1), 44-55. https://doi.org/10.1016/j.jik.2017.06.002

[76] Rehman, A. U., Al-Zabidi, A., AlKahtani, M., Umer, U., & Usmani, Y. S. (2020). Assessment of Supply Chain Agility to Foster Sustainability: Fuzzy-DSS for a Saudi Manufacturing Organization. *Processes*, *8*(5), Article 577. https://doi-org.ugto.idm.oclc.org/10.3390/pr8050577

[77] Reklitis, P., Sakas, D. P., Trivellas, P., & Tsoulfas, G. T. (2021). Performance Implications of Aligning Supply Chain Practices with Competitive Advantage: Empirical Evidence from the Agri-Food Sector. *Sustainability*, *13*(16), Article 8734. https://doi-org.ugto.idm.oclc.org/10.3390/su13168734

[78] Roberts, P.W. (1999). Product innovation, product-market competition, and persistent profitability in the U.S. pharmaceutical industry. *Strategic Management Journal 20*(7): 655–670.

[79] Rossi, L., & Raimondi, A. (2007). Investments, innovation, and competitiveness [Article]. *Economia Politica, 24*(2), 163-174.

[80] Ruiz, M., Pardo, A., & San Martin, R. (2010). Modelos de ecuaciones estructurales. *Papeles del Psicólogo, 31*(1), 34-45.

[81] Ruzo-Sanmartín, E., Abousamra, A. A., Otero-Neira, C., & Svensson, G. (2023). The direct and indirect effects of internal enablers on internal integration and business performance. *Journal of Business Economics and Management*, *24*(4), 633-652.
https://doi-org.ugto.idm.oclc.org/10.3846/jbem.2023.20115

[82] S. Orr and A. Jadhav. (2018). Creating a sustainable supply chain: The strategic foundation. *Journal of Business Strategy 39*(6), 29-35.10.1108/JBS-11-2017-0157

[83] Schroeder, D.M. (1990). A dynamic perspective on the impact of process innovation upon competitive strategies. *Strategic Management Journal 11*(1):25-41.

[84] Seyhan, M., Cigdem, S., Yildiz, B., & Meidute-Kavaliauskiene, I. (2021). Supply chain - innovation: past, present, and future. *Independent Journal of Management & Production, 12*(8), 2094-2116.
https://doi.org/10.14807/ijmp.v12i8.1490

[85] Shan, W., Walker, G. & Kogut, B. (1994). Interfirm cooperation and startup innovation in the biotechnology industry. *Strategic Management Journal 15*(5): 387–394.

[86] Siagian, H., Tarigan, Z. J. H., & Jie, F. (2021). Supply Chain Integration Enables Resilience, Flexibility, and Innovation to Improve Business Performance in COVID-19 Era. *Sustainability*, *13*(9), Article 4669. https://doi-org.ugto.idm.oclc.org/10.3390/su13094669

[87] Sujatha, R., & Maheswari, B. U. (2023). Green Supply Chain Management Practices as a Determinant of Organisational Competitiveness: An Empirical Study Among Hotels in India. *Asian Journal of Business and Accounting*, *16*(1), 193-218. https://doi-org.ugto.idm.oclc.org/10.22452/ajba.vol16no1.7

[88] Sukati, I., Awain, A., & Ismaeel, R. I. (2023). The Role of Supply Chain Innovation for New Normal on the Relationship between SCM Practices and SMEs Performance. *International Journal of Information Systems and Supply Chain Management*, *16*(1), Article 321950. https://doi.org/10.4018/ijisscm.321950

[89] Tajeddini, K., Martin, E., & Altinay, L. (2020). The importance of human-related factors on service innovation and performance. *International Journal of Hospitality Management, 85,* Article 102431. https://doi.org/10.1016/j.ijhm.2019.102431

[90] Thongrawd, C., Bootpo, W., Thipha, S., & Jermsittiparsert, K. (2019). Exploring the nexus of green information technology capital, environmental corporate social responsibility, environmental performance, and the business competitiveness of Thai sports industry firms. *Journal of Human Sport and Exercise*, *14*, S2127-S2141. https://doi-org.ugto.idm.oclc.org/10.14198/jhse.2019.14.Proc5.33

[91] Urbancová, H., & Vrabcová, P. (2023). Sustainability-oriented Innovation: Crucial Sources to Achieve Competitiveness. *Ekonomicky Casopis, 71*(1), 46-64. https://doi.org/10.31577/ekoncas.2023.01.03

[92] Valdez-Bocanegra, H. G. (2023). Effects of Supply Chain Management on Competitiveness and Performance: Empirical Evidence in Mexico. *Advances in Management & Applied Economics, 14*(1): 113-140.

[93] Valdez-Bocanegra, Maldonado-Guzmán, and Valdez González (2020). Effects of Innovation on Competitiveness and Performance: Empirical Evidence in the State of Guanajuato in Mexico. *Advances in Management & Applied Economics, 10*(3): 45-68.

[94] Veckalne, R., & Tambovceva, T. (2023). The importance of gender equality in promoting entrepreneurship and innovation. *Marketing and Management of Innovations, 14*(1), 158-168. https://doi.org/10.21272/mmi.2023.1-14

[95] Vrabcová, P., Urbancová, H. & Petříček, M. (2021). Knowledge and Its Transfer-Key Prerequisite for Long-term Competitive Advantage and Sustainable Business. *Knowledge Management Research & Practice*, pp. 1-11. Available at: https://doi.org/10.1080/14778238.2021.2015262

[96] Wang, N., Zhang, S. J., & Wang, W. (2022). Impact of Environmental Innovation Strategy on Green Competitiveness: Evidence from China [Article]. *International Journal of Environmental Research and Public Health, 19*(10), 17, Article 5879. https://doi.org/10.3390/ijerph19105879

[97] Wang, P., Lin, X. Y., & Li, S. S. (2019). Evaluation of government-supported provincial innovation competitiveness-Evidence from China. *Growth and Change, 50*(2), 587-608. https://doi.org/10.1111/grow.12293

[98] Wu, Ing-Long, Cheng-Hung Chuang, and Chien-Hua Hsu. (2014). Information sharing and collaborative behaviors in enabling supply chain performance: A social exchange perspective. *International Journal of Production Economics 148:* 122–32.

[99] Xu, Y. J., Ribeiro-Soriano, D. E., & Gonzalez-Garcia, J. (2015). Crowdsourcing, innovation, and firm performance. *Management Decision*, *53*(6), 1158-1169. https://doi.org/10.1108/md-06-2014-0408

[100]   Yurtay, Y., Yurtay, N., Demirci, H., Zaimoglu, E. A., & Göksu, A. (2023). Improvement and Implementation of Sustainable Key Performance Indicators in Supply Chain Management: The Case of a Furniture Firm. *Ieee Access*, *11*, 41913-41927.
https://doi-org.ugto.idm.oclc.org/10.1109/access.2023.3271138

[101]   Zhang, B. C., Zhao, S. K., Fan, X. Y., Wang, S., & Shao, D. (2022). Green supply chain integration, supply chain agility and green innovation performance: Evidence from Chinese manufacturing enterprises. *Frontiers in Environmental Science, 10,* Article 1045414.
https://doi.org/10.3389/fenvs.2022.1045414

[102]   Zhang, J. H., & Jiang, J. A. (2024). Investment deregulation and innovation performance of Chinese private firms. *Journal of Financial Stability, 70*, Article 101207. https://doi.org/10.1016/j.jfs.2023.101207

[103]   Zhang, M. P., Wang, Z. J., & Wang, X. (2023). Configuration of Conditions Leading to High National Innovation Competitiveness: A Fuzzy Set Qualitative Comparative Analysis Approach. *Sustainability, 15*(18), Article 13698. https://doi.org/10.3390/su151813698

[104]   Zhou KZ, Wu F. 2010. Technological capability, strategic flexibility, and product innovation. *Strategic Management Journal 31*(5): 547–561.

[105]   Zhou, S. K., Rashid, M. H. U., Zobair, S. A. M., Sobhani, F. A., & Siddik, A. (2023). Does ESG Impact Firms' Sustainability Performance? The Mediating Effect of Innovation Performance. *Sustainability, 15*(6), Article 5586. https://doi.org/10.3390/su15065586