

Uncertain Supply Chain Management

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The contribution of balanced scorecard perspectives for improving supply chain performance: A PLS-SEM approach

Imad Ait Lhassan^{a*}, Mohamed Azdod^a, Mustapha Razzouki^b, Mounsef Bouayad^c and Aziz Babounia^c

^aMulti-disciplinary faculty - Larache, Abdelmalek Essaadi University, Morocco

^bFaculty of Economics and Management - Beni Mellal, Sultan Moulay Slimane University, Morocco

^cNational School of Business and Management - Kenitra, Ibn Tofail University, Morocco

ABSTRACT

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The main objective of this article is to provide a theoretical and conceptual framework encompassing concepts such as the supply chain, and supply chain performance. Furthermore, it aims to examine empirical research on the relationship between the perspectives of the Balanced Scorecard and supply chain performance. Finally, the article intends to present the findings and engage in discussions. To achieve this, a positivist epistemological approach was adopted, employing a quantitative methodology. A sample of 85 companies from the automotive industry in Morocco was selected for this study. After data collection, the structural equation method was employed using Smart PLS 3 software to test and confirm the hypotheses as well as the research model proposed. In conclusion, the results of this study highlight the positive impact of the four perspectives of the Balanced Scorecard on supply chain performance within automotive industry companies in the northern region of Morocco.

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1. Introduction

In the context of globalization, logistics has become a fundamental issue for companies, especially industrial enterprises, which are now focusing on achieving objectives and improving logistic processes. This shift is particularly evident in Morocco, where the rise of logistics has fostered economic growth and international competitiveness. Strategies and projects have been implemented, increasing attractiveness for foreign investors and reforming sectors such as industry and ports. The emerging automobile industry plays a major role in increasing GDP and the competitiveness of the Moroccan economy. Morocco has thus become the second-largest vehicle producer in Africa after South Africa, with continuous growth. Constantly seeking logistical tools and practices to enhance competitiveness, this sector drives a significant portion of the country's economic activity.

Logistics is perceived as a key function that creates value and optimizes the competitiveness of companies in Morocco. The logistics sector presents significant assets for transportation, integrated services, and infrastructures. Evaluation criteria such as the quality of infrastructure, customs efficiency, ease of arranging shipments, quality of logistics services, traceability of consignments, and punctuality of deliveries are all considered. The performance of the supply chain in the Moroccan automobile industry is of crucial importance due to its economic impact and current relevance. This chain encompasses physical, financial, and information flows, connecting businesses for operations, from sourcing to the delivery of finished

* Corresponding author

E-mail address: iaitlhassan@uae.ac.ma (I. A. Lhassan)

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products. Key aspects of supply chain performance include organization, operations management, flow control, and the search for reliable evaluation tools. The emergence of the supply chain has led to developments in steering and evaluation systems, exemplified by Kaplan and Norton's 'balanced scorecard.' This model emphasizes the importance of financial, customer, internal business processes, learning, and innovation aspects to enhance overall business performance. Despite a lack of research on performance evaluation systems of the supply chain in Morocco, many studies have been conducted by foreign researchers. These studies aim to answer the overarching question: What is the effect of 'balanced scorecard' perspectives on the supply chain performance of automobile industry companies in Morocco? This research has been conducted in two steps, starting with theoretical aspects including explanations of concepts and a literature review, followed by an empirical study using a quantitative questionnaire focusing on automobile industry companies in Morocco.

2. Conceptual Framework

2.1. Supply chain

In the literature, several definitions of the supply chain have been proposed. Formerly, it encompassed all activities related to physical flows, from raw material transformation to the final customer, as well as information flows (Handfield and Nichols, 1999). Currently, it has evolved into a global network (Génin, 2003). This supply chain constitutes a network of organizations or functions dispersed geographically across multiple sites, working together to reduce costs and speed up processes between suppliers and customers. Another definition proposed by Le Moigne (2017) describes the supply chain as a set of organizations (suppliers, factories, distributors, customers, logistics providers, etc.) involved in the manufacturing, delivery, and sale of a product to a customer.

2.2. Supply chain performance

The supply chain performance is defined as its ability to deliver the right product to the right place at the right time, while offering the best price (Zhang and Okoroafo, 2015). Fugate, Mentzer, and Stank (2010) studied the performance of a commercial supply chain from three main perspectives: efficiency, effectiveness, and differentiation, all of which are positively influenced by logistics performance. They argue that this definition encompasses most essential aspects of the supply chain (Zhang and Okoroafo, 2015).

According to Estampe (2014), three fundamental criteria allow for the evaluation of this performance. Firstly, efficiency measures the ratio between achieved results and set objectives, taking into account customer satisfaction levels relative to allocated resources. Secondly, effectiveness evaluates the ratio between efforts expended, resources committed to the operation, and the actual utility generated by the action, all while seeking to achieve objectives at a lower cost. Lastly, effectiveness is linked to the satisfaction of the results achieved.

The supply chain performance is measured by its ability to meet customer needs, ensuring product availability, timely and efficient delivery, and appropriate stock levels. It also transcends organizational functional boundaries, encompassing areas of production, distribution, marketing, sales, research, and development.

Various methods and tools are used to measure this performance, such as the Balanced Scorecard, the SCOR (Supply Chain Operations Reference) model, and other specific approaches tailored to the needs and peculiarities of each company. In our research, we will focus solely on the Balanced Scorecard as a tool for piloting, measuring, and evaluating company performance.

2.3. Balanced Scorecard

The Balanced Scorecard finds its roots in the research of Kaplan and Johnson (1987) on management control system analysis, which led to the development of balanced measurement systems. Traditionally, management control focused primarily on financial metrics such as return on investment. However, with the increasing complexity of products, technological processes, and the unpredictable business environment, there arose a necessity to expand these measures for more comprehensive management of overall business performance.

In response to this need, Schneiderman and his team devised a strategic plan that included a dedicated aspect for enhancing process quality, known as the "Quality Improvement Process QIP." This strategic framework aimed to provide clear guidance for management in formulating the company's strategic objectives. Schneiderman is widely recognized as one of the trailblazers in the development of the Balanced Scorecard, as he incorporated both financial and non-financial indicators across five strategic dimensions: customer service, internal business processes, human resource management, innovation, and information systems.

Schneiderman's groundbreaking work captured the attention of Kaplan, who engaged him in a collaborative study on measuring performance in the evolving landscape of businesses, joined by D. Norton. Their seminal ideas were first presented

in a Harvard Business Review article in 1992. Within this framework, they identified four pivotal perspectives crucial for businesses: financial, customer, internal business processes, and learning/innovation.

2.4. Supply Chain Balanced Scorecard

Theoretical research efforts have delineated various propositions of the supply chain balanced scorecard, an instrument comprising diverse indicators of the supply chain across four distinct perspectives (financial, customer, internal business processes, and learning/innovation). Brewer and Speh (2000) advocate for aligning the objectives of the supply chain with the axes of the balanced scorecard, thereby ensuring the coherence of logistical goals with internal business processes, customer relations, innovation, and learning. All supply chains strive to enhance themselves to create "customer advantages" that translate into "economic benefits." This necessitates continual progress in areas such as product/process innovation, knowledge sharing with employees (partnership management), information flow management, and evaluating their performance against market threats or alternatives, as per the various metrics of the balanced scorecard: internal business processes, customer, financial, and learning/innovation axes.

In managing the performance of the logistics process, a roadmap is imperative to track the outcomes generated and incorporate indicators into the balanced scorecard. Camman and Villeseque (2002) emphasize the significance of indicators to assess adherence to coordination rules and the efficiency of the systems supporting them, such as logistics information systems. Moreover, Brewer and Speh (2000) have developed an analytical framework of the balanced scorecard applied to the supply chain, proposing a process for selecting suitable indicators to evaluate logistics performance while underscoring the need to consider the key processes and interactions of the supply chain.

Furthermore, Pichot et al. (2002) followed the methodology of Brewer and Speh (2000) to create a dashboard for the supply chain, thus aligning objectives with the axes of the balanced scorecard, based on the SCOR model. Similarly, Kleijnen and Smits (2003) examined various supply chain management indicators via the balanced scorecard, integrating the three traditional perspectives (financial, customer, and internal business processes), along with innovation. These diverse approaches underscore the importance of a clear methodology and suitable indicators to effectively steer the supply chain, thereby enabling proactive management of processes, customer relations, innovation, and learning within the enterprise.

3. Literature Review

The application of the Balanced Scorecard in the supply chain has been studied across various industrial sectors, notably in the automotive industry. We have identified seven authors who have explored this application in this sector: Gunasekaran et al. (2001), Yilmaz and Bititci (2006), Bhagwat and Sharma (2007), Hongxia and Zhipeng (2007), Zimmermann and Seuring (2009), Soni and Kodali (2010), Najmi and Makui (2012). Bhagwat and Sharma (2007) developed a balanced dashboard for supply chain management, considering indicators from the four traditional perspectives. They argue that this framework can serve as the foundation for a strategic supply chain management system, yet stress the need for in-depth research to analyze the full set of performance indicators. On the other hand, Zimmermann and Seuring (2009) emphasized that the Balanced Scorecard is increasingly recognized as a tool for implementing corporate strategies, transforming these strategies into performance measures applicable to assessing supply chain performance. In this section of the literature review, we will delve into empirical research studies examining the correlation between the four perspectives of the Balanced Scorecard and supply chain performance.

3.1. Financial perspective and supply chain performance

The financial axis of a company focuses on its long-term objectives, evaluated through various financial indicators. These goals, typically related to profitability, growth, and shareholder value, should align with a vision of sustainability and economic prosperity. According to Min and Mentzer (2004), reducing supply chain costs significantly improves invested capital and cash flow, thereby increasing profit margins. Studies by Gunasekaran et al. (2001) and Bhagwat and Sharma (2007) examine variances from budget, hourly costs per operation, and total cash flow time, all important indicators for assessing financial performance.

Enhanced collaboration between finance, other activities, and the supply chain is essential to facilitate these processes, as emphasized by Min and Mentzer (2004). Efficient supply chain management directly impacts inventory levels, thus influencing sales and return on investment. Camerinelli (2009) underscores the crucial importance of effective inventory management in ensuring customer retention, leading to increased sales. Therefore, adequate supply combined with flexibility, responsiveness, and reliability in deliveries are essential to ensure improved sales flows.

The overarching financial objective aims to enhance the organization's financial capacity and meet the needs of customers and supply chain partners, thus underscoring the importance of customer satisfaction. According to the works of Gunasekaran et al. (2001) and Bhagwat and Sharma (2007), improvement in financial perspectives such as profitability, cash flow, and cost structure contributes to the overall performance of the company's supply chain. Financial superiority translates into various

measures such as increased sales, cash cycle, profitability, return on investment, and revenue growth. Companies that successfully integrate their supply chain enjoy a competitive advantage, as shown by Brewer & Speh (2000), with a 45% reduction in supply chain costs compared to their competitors. According to Lovett and MacDonald (2005), improved service delivery leads to increased revenue growth, highlighting the importance of maintaining high performance to remain competitive and satisfy shareholders. The measurement of cost structure throughout the cash cycle reflects the financial health of the supply chain (Bhagwat & Sharma, 2007), while several studies confirm the positive impact of the financial perspective on supply chain performance, including those of Ashioya (2013), Khatoon and Farooq (2015), Tariq et al. (2014), Maiga and Jacobs (2003), Zahirul and Wendy (2000).

Based on the conclusions of empirical research, we state the following hypothesis:

Hypothesis (H₁). *The “financial” perspective has a positive effect on supply chain performance.*

3.2. Customer perspective and supply chain performance

The customer perspective within the framework of the Balanced Scorecard consists of a set of indicators related to the company's customers, such as satisfaction level, complaint rate, profitability of the customer segment, market share, among others. These indicators are essential for effective management and proper customer tracking. Companies adopting the Balanced Scorecard must express their objectives in terms of time, quality, performance, and service delivery, and then translate them into specific measures. To achieve the goal of product leadership, companies must implement measures such as product quality and flexibility, offering a range of products that meet customer expectations. It is crucial to understand and effectively manage the various demands, desires, and specificities of customers throughout the supply chain.

The perceived value of the product by the customer, as emphasized by the research of Gunasekaran et al. (2001) and Bhagwat and Sharma (2007), is of paramount importance. This highlights the emphasis placed by practitioners on customer satisfaction to increase competitiveness. A strong customer relationship can be established through measures such as timely product delivery, response times to customers, and order execution lead times. Reducing order processing times leads to reduced customer response times, thereby contributing to a more efficient supply chain. Additionally, Hongxia and Zhipeng (2007) stress the importance of after-sales service and responsiveness to complaints to address urgent customer needs and improve supply chain performance. Hejazi (2022) underscores that customer satisfaction is achieved when the entire supply chain commits, integrates, and coordinates to implement innovative practices. Studies such as those by Chin et al. (2014) and Ashioya (2013) highlight the positive effect of customer integration on supply chain performance. These findings are supported by other research works, including those of Abu-Allan (2024), Marete (2015), Khatoon and Farooq (2015), Maiga and Jacobs (2003), as well as James and Hoque (2000), which demonstrate the positive impact of the customer perspective on organizational performance.

Therefore, we propose the following hypothesis:

Hypothesis (H₂). *The “customer” perspective positively impacts supply chain performance.*

3.3. Internal business processes and supply chain performance

The study axis of internal business processes, focused on innovation and production, aims to evaluate the impact of decisions on value creation. This involves the establishment of indicators, such as transformation cycle time, customer query response time, as well as quality and non-conformity indicators. The primary objective of this axis is to analyze, monitor, and improve the internal business processes of the company. These indicators are generally identified from the Balanced Scorecard once financial objectives and customer expectations are defined. Companies thus select key processes that have the most impact on customer satisfaction and establish specific measures to optimize them.

Regarding the perspective of internal business processes, companies focus on areas in which they aim to excel, implementing customized measures (Bhagwat & Sharma, 2007). This approach starts from the receipt of customer orders and ends with product delivery (Kaplan & Norton, 1996). For example, better inventory management can be achieved by assessing inventory costs throughout the supply chain, including purchases, stock levels, order costs, and stock accuracy, thus reducing the risk of stockouts (Zimmermann; Seuring, 2009). Research such as that of Gunasekaran et al. (2001) and Bhagwat et Sharma (2007) define supplier delivery lead time as the time elapsed between order receipt and shipment. Process flexibility is also a crucial aspect, involving the responsiveness of the supply chain to urgent orders and effective anticipation of customer demand.

Improving delivery performance, for instance by reducing the supply chain cycle time to avoid delays, is essential to ensure a positive image with customers. This translates into the use of efficient logistical tools and effective transport management, thereby enhancing results and the overall performance of the company's supply chain (Jalali Naini et al., 2011; Zimmermann and Seuring, 2009; Najmi and Makui, 2012). Information sharing among stakeholders in the supply chain is an important lever to improve overall company performance (Hongxia and Zhipeng, 2007). According to Gunasekaran et al. (2001) and

Bhagwat et Sharma (2007), the supply chain cycle time represents the sum of the longest delays at each stage, indicating the total time required to process an order if all stock levels are at zero.

The analysis of the relationship between the "internal business processes" perspective and supply chain performance, notably by the works of Tibbs and Langat (2016) on an industrial company in Kenya, aligns with the conclusions of other researchers. These studies highlight the positive impact of the "internal business processes" perspective on the overall performance of the organization, such as those conducted by Ashioya (2013), Marete (2015), Khatoon and Farooq (2015), Maiga and Jacobs (2003), Zahirul and Wendy (2000).

Based on the conclusions of empirical research, we propose the following hypothesis:

Hypothesis (H3). *The "internal business processes" perspective has a positive effect on supply chain performance.*

3.4. Innovation and learning perspective and supply chain performance

Innovation, improvement, and learning within a company are key elements that directly influence its value. This ability to offer new products, generate value for customers, and constantly improve operational efficiency enables companies to conquer new markets and increase their profits and revenues. From the perspective of learning and growth, companies continuously work on innovating and developing best practices in supply chain management, resulting in an improvement in their ability to reduce waste and offer increased flexibility (Jalali Naini et al., 2011). Information sharing is identified as a crucial factor in enhancing supply chain performance and fostering a competitive advantage (Li & Zhang, 2006). Thus, technological advancements such as the use of the internet, intranet, databases, electronic data interchange (EDI), enterprise resource planning (ERP) system, and distribution requirements planning (DRP) are tools used by organizations to promote this sharing (Li & Zhang, 2006). Furthermore, the adoption of new technologies is a means by which companies optimize various crucial factors such as time and risk, with a positive impact on the performance of their supply chain (Soni & Kodali, 2010). This transparency in information sharing is highlighted as a key element for effective supply chain management (Fawcett et al., 2008). Particularly, the internet offers companies a faster and more affordable way to exchange information and data, enabling more informed decisions (Bird, 2000). Additionally, innovations and improvements to products add value for customers. Human capital, including the skills and talents of employees, as well as collaboration with partners, plays a crucial role in this process (Najmi & Makui, 2012; Gunasekaran et al., 2001; Bhagwat & Sharma, 2007). It is therefore imperative to implement collaboration practices among employees, performance management systems, compensation, training, and development to enhance the supply chain (Park et al., 2005).

Studies such as that of Lin and Lin (2008) on the adoption of innovative technologies, highlight the positive impact of innovation on supply chain performance. In general, innovation can transform products, services, and processes, leading to cost reduction and overall improvement in efficiency (Le Roy et al., 2004). Research works, such as those of Seo et al. (2014) or Tibbs and Langat (2016), also emphasize the positive effect of innovation and learning on organizational performance. This "learning and innovation" perspective thus appears to play a key role in improving supply chain performance, as confirmed by several previous research studies (Razzouki et al., 2024; Marete, 2015; Khatoon et Farooq, 2015; Maiga et Jacobs, 2003; James et Hoque, 2000).

Therefore, we propose the following hypothesis:

Hypothesis (H4). *The "learning and innovation" perspective has a positive effect on supply chain performance.*

In conclusion, the conceptual framework of this study was applied to evaluate the impact of the Balanced Scorecard (BSC) on the supply chain performance of industrial companies. Four hypotheses, based on the financial, customer, internal business processes, and learning and growth perspectives of the BSC, were examined. All were anticipated to have a significant relationship with supply chain performance. The representation of this conceptual framework is presented in Fig. 1:

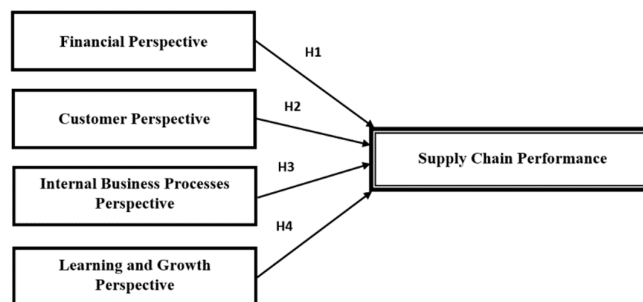


Fig. 1. Conceptual research model

4. Methodology

Our study aims to assess how balanced scorecard perspectives influence supply chain performance within Morocco's automotive industry. Employing structural equation analysis through SMART PLS 3 software, this methodology enabled us to assess the hypotheses formulated in our study and validate our research model. Therefore, a questionnaire was distributed to 340 companies specializing in the automotive industry in Morocco, from which we received 85 correctly completed responses, corresponding to a response rate of 25%.

4.1. Measurement instruments

As previously mentioned in our model, we have four independent constructs: financial perspective (FP), customer perspective (CP), internal business processes perspective (IBPP), and learning and growth perspective (LGP). Additionally, the dependent construct is supply chain performance (SCP).

The measures used in the current study were selected from the existing literature, gathering diverse indicators and items proposed by renowned researchers in the field. The financial perspective (FP), represented by 9 indicators, was enriched by the works of Gunasekaran et al. (2001), Bhagwat and Sharma (2007), and Zimmermann and Seuring (2009). Concerning the customer perspective (CP), our questionnaire includes 8 indicators from the works of Gunasekaran et al. (2001), Bhagwat and Sharma (2007), Zimmermann and Seuring (2009), and Soni and Kodali (2010). For the internal business processes perspective (IBPP), comprising 13 indicators, we drew from the research of Zimmermann and Seuring (2009), Gunasekaran et al. (2001), Bhagwat and Sharma (2007), Yilmaz and Bititci (2006), and Najmi and Makui (2012). Regarding the learning and innovation perspective (LGP), with its 6 indicators, we consulted the works of Gunasekaran et al. (2001), Bhagwat and Sharma (2007), Zimmermann and Seuring (2009), Jalali Naini et al. (2011), Najmi and Makui (2012), and Soni and Kodali (2010). Finally, for the supply chain performance, composed of 6 items, we considered the research of Tibbs and Langat (2016), Ambe (2014), Estampe (2014), Jhawar et al. (2014), Vanichinchai and Igel (2009), as well as Gunasekaran et al. (2004) and Pichot et al. (2002). Also, we employed a Likert scale ranging from 1 to 5. Here, 1 represented “Strongly Disagree” and 5 indicated “Strongly Agree”. This scale was utilized across the dimensions, with the specific items sourced from reputable literature.

4.2. Sample characteristics

At the level of the characteristics of the companies in our sample, we aim to present the legal status, size, and business sector of the automotive industry in Morocco.

The analysis of Table 1 shows that 68% of the companies in the automotive industry are located in Tangier (Tangier Free Zone and Tangier Automotive City), 13% in Kenitra (Kenitra Export Free Zone), and 12% in Casablanca (Casablanca Industrial Zone). Additionally, we observe that 67% of the companies in the automotive industry in Morocco were established under the legal status of “limited liability company”, and 32% as “public limited company”. The table also indicates that 59% of the companies in the automotive industry in Morocco are large enterprises with a workforce of 500 employees or more, 28% are small and medium-sized enterprises, and 13% are small enterprises. Regarding the breakdown of companies by activity, we distinguish that 35% of the companies in the automotive industry in Morocco are engaged in manufacturing vehicle interior components and seats, 45% are specialized in cable manufacturing, 9% are involved in plastic injection, and 6% are specialized in stamping/metalwork.

Table 1
The characteristics of the sample companies

		Frequency	Percentage
City	Tangier	58	68%
	Tetouan	1	1%
	Kenitra	11	13%
	Rabat	2	2%
	Meknes	2	2%
Legal Form	Casablanca	11	12%
	Public Limited Company	27	32%
	Limited Liability Company	57	67%
	General Partnership	1	1%
	[0 - 50]	2	2%
Number of Employees	[50 - 100]	9	11%
	[100 - 500]	24	28%
	500 and more	50	59%
	Activity	Constructor	3
Manufacturer		38	45%
Vehicle Interior and Seats		30	35%
Plastic Injection		8	9%
Metal Stamping		5	6%
Assembly		1	1%

At the level of the respondents' characteristics, we present their positions held and their experiences. Table 2 shows the distribution of respondents among companies in the automotive industry in Morocco. We notice that in our sample, 73% of the respondents are logistics managers, while 27% are logistics directors. Additionally, we observe that 46% of the respondents working in companies in the automotive industry in Morocco have more than 10 years of experience, 33% have experience in the field of logistics between 5 and 10 years, 12% have experience between 3 and 5 years, and 9% have experience of less than 3 years.

Table 2

The characteristics of the respondents in the sample

		Frequency	Percentage
Job position	Logistics Director	23	27%
	Logistics Manager	62	73%
Years of Experience	Between 1 - 3 years	8	9%
	Between 3 - 5 years	10	12%
	Between 5 - 10 years	28	33%
	More than 10 years	39	46%

5. Results

The objective of this section is to present the results of the structural equation analysis from our empirical study of the scales of the various constructs that constitute our research model.

5.1. Validity of the research model through structural equation analysis

The validity of the measurement model is assessed based on four elements: Cronbach's alpha (≥ 0.7), rho_A (≥ 0.7), composite reliability (≥ 0.7), and AVE (≥ 0.5), adhering to established standards (Hair et al., 2014; Tenenhaus et al., 2004). According to Table 3, all variables meet the accepted criteria for Cronbach's alpha, rho_A, composite reliability, and AVE. Additionally, discriminant validity is evaluated using the Fornell and Larcker criterion, showing that the diagonal values are higher than any values below the diagonal, as depicted in Table 3.

Table 3

Results of reliability, convergent and discriminant validity

Constructs	Alpha	rho A	CR	AVE	LGP	CP	FP	IBPP	SCP
LGP	0.923	0.929	0.940	0.724	0.851				
CP	0.886	0.891	0.908	0.526	0.591	0.726			
FP	0.893	0.898	0.913	0.539	0.403	0.471	0.734		
IBPP	0.941	0.947	0.949	0.588	0.716	0.587	0.543	0.767	
SCP	0.859	0.874	0.895	0.589	0.622	0.546	0.443	0.411	0.767

Similarly, the discriminant validity of the outer models is confirmed through the cross-loading criteria. As shown in Table 4, the highest correlation coefficients occur where each variable intersects with the others, thus confirming the scale's discriminant validity. Additionally, the outer model's discriminant validity is evaluated using the cross-loading criterion, indicating that the item loadings surpass all cross-loadings, as depicted in Table 4.

Table 4

Discriminant validity based on the cross-loading criteria

Items	FP	CP	IBPP	LGP	SCP
FP1	0.776				
FP2	0.766				
FP3	0.757				
FP4	0.747				
FP5	0.742				
FP6	0.739				
FP7	0.733				
FP8	0.681				
FP9	0.656				
CP1		0.810			
CP2		0.802			
CP3		0.790			
CP4		0.729			
CP5		0.721			
CP6		0.695			
CP7		0.633			
CP8		0.624			

Table 4
Discriminant validity based on the cross-loading criteria (Continued)

Items	FP	CP	IBPP	LGP	SCP
IBPP1			0.856		
IBPP1			0.849		
IBPP2			0.841		
IBPP3			0.812		
IBPP4			0.808		
IBPP5			0.751		
IBPP6			0.749		
IBPP7			0.737		
IBPP8			0.724		
IBPP9			0.720		
IBPP10			0.716		
IBPP11			0.694		
IBPP12			0.680		
LGP1				0.913	
LGP2				0.883	
LGP3				0.858	
LGP4				0.842	
LGP5				0.824	
LGP6				0.779	
SCP1					0.856
SCP2					0.810
SCP3					0.803
SCP4					0.789
SCP5					0.678
SCP6					0.648

5.2. Predictive validity of the model

At the structural model level, we assessed the coefficient of determination R² and Q². According to Chin (1998), R² values above 0.67 are considered high, those between 0.33 and 0.67 are moderate, values between 0.19 and 0.33 are low, and R² values below 0.19 are unacceptable. For our model, the R² value is 0.490. The Q² effect size result is 0.263, which suggests both a positive predictive relevance of the model and a moderate Q² effect size since it is greater than 0.15. In conclusion, we have observed that our R² and Q² values are moderate and indicate a moderate model fit (Table 5).

Table 5
Results of R² and Q²

Construct	R ²	Q ²	Result
Supply Chain Performance	0.490	0.263	Moderate

Finally, the calculated GoF value is 0.539. Following the criterion set by Wetzels et al. (2009), our model's GoF value, surpassing 0.36, is deemed satisfactory. Therefore, we can conclude that the GoF model of this study is high enough and sufficiently significant to consider adequate PLS model validity.

5.3. Hypothesis results

The primary empirical findings of the research across all data (Figure 2 and Table 6) indicate that the financial perspective has a significant positive effect on supply chain performance (T = 2.334; p < 0.05), while the customer perspective also shows a significant positive effect on supply chain performance (T = 2.860; p < 0.01). Similarly, the learning and innovation perspective demonstrates a significant positive effect on supply chain performance (T=1.971; p < 0.05). Additionally, we observed that the internal business processes perspective has a positive effect on supply chain performance (T = 4.057; p < 0.01). Thus, all four variables have been validated in the Moroccan context.

Table 6
Validity of hypotheses

Hypotheses	O	M	STDEV	T-value	P-value	Result
H1 FP → SCP	0.242	0.237	0.104	2.334	0.026	Accepted*
H2 CP → SCP	0.352	0.366	0.123	2.860	0.004	Accepted**
H3 IBPP → SCP	-0.321	-0.257	0.163	1.971	0.049	Accepted*
H4 LGP → SCP	0.630	0.574	0.155	4.057	0.000	Accepted**

*Significant at P<0.05 and T>1.96

**Significant at P<0.01 and T>2.58

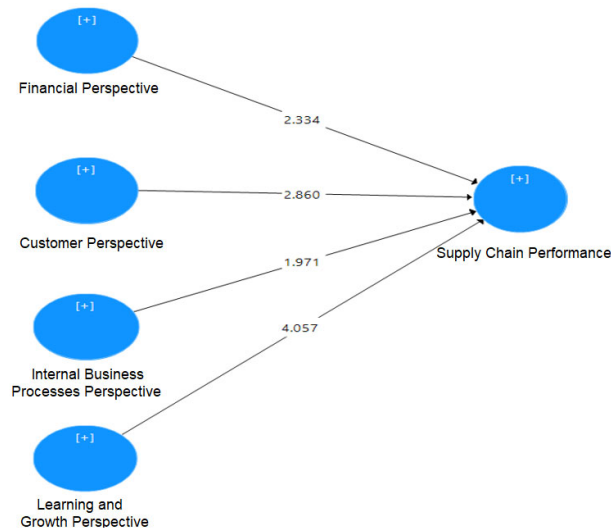


Fig. 2. Hypotheses testing results (Bootstrap)

6. Discussion

This empirical investigation aimed to explore the influence of various perspectives of the balanced scorecard on supply chain performance within industrial enterprises in the Moroccan context. In summary, this outcome validates four hypotheses. Firstly, Hypothesis 1 demonstrates that the financial perspective has a significant positive impact on supply chain performance in the automotive industry in Morocco. This finding aligns with previous theoretical and empirical research (Khatoun et Farooq, 2015; Tariq et al., 2014; Ashioya, 2013; Maiga et Jacobs, 2003; James et Hoque, 2000), emphasizing the significant effect of the "financial" perspective on supply chain performance.

Secondly, Hypothesis 2 reveals that the customer perspective also positively influences supply chain performance in Moroccan automotive companies. This result is consistent with previous theoretical and empirical studies (T.Ai-Chin et al., 2014; Marete, 2015; Khatoun et Farooq, 2015; Ashioya, 2013; Maiga et Jacobs, 2003; James et Hoque, 2000), highlighting the significant impact of the "customer" perspective on supply chain performance.

Furthermore, Hypothesis 3 indicates that the internal business processes perspective has a positive effect on supply chain performance in Moroccan automotive enterprises. This result corroborates previous theoretical and empirical findings (Tibbs et Langat, 2016; Marete, 2015; Khatoun et Farooq, 2015; Ashioya, 2013; Maiga et Jacobs, 2003; James et Hoque, 2000), confirming the importance of the "internal business processes" perspective in enhancing supply chain performance.

Lastly, Hypothesis 4 demonstrates that the learning and innovation perspective positively affects supply chain performance in Moroccan automotive companies. This outcome is consistent with previous theoretical and empirical research (Seo et al., 2014; Tibbs et Langat, 2016; Marete, 2015; Khatoun et Farooq, 2015; Ashioya, 2013; Maiga et Jacobs, 2003; James et Hoque, 2000), underscoring the significant influence of the "learning and innovation" perspective on supply chain performance.

7. Conclusion

In conclusion of our study on the impact of balanced scorecard perspectives on supply chain performance in the automotive industry, our aim was to provide a precise explanatory framework of these perspectives and their influence on performance. After defining key concepts and research elements such as supply chain performance and the balanced scorecard, we established a conceptual framework guiding our hypothetico-deductive approach to the theoretical model. This approach allowed us to direct our empirical study conducted with 85 companies in the automotive sector in Morocco, through a questionnaire distributed via various means such as postal mail, electronic means, face-to-face interviews, or websites. The use of SmartPLS 3 software was crucial in validating our hypotheses, confirming or rejecting our initial assumptions by comparing them with previous works. Thus, we present in conclusion our final research model, supported by empirical data. In summary, our work highlights the limitations of our study, as well as avenues for future research.

8. Limitations and Future Research Directions

The limitations of our research, as mentioned above, clearly guide the perspectives for extending our study. Firstly, our sample size, comprising an average of 85 companies from the automotive industry in Morocco out of a large number of existing companies, is not sufficient due to the unavailability of logistics directors and managers to participate, as well as the challenges in obtaining information. Additionally, the substantial number of items in our survey limited participants' ability to respond

within the allotted time frame, typically between 15 and 20 minutes. Lastly, the items selected in the scope of our study, focused on the industrial sector, particularly the automotive industry, are not generalizable to other sectors such as services or commerce.

This article explores the research perspectives opened up by studying the balanced scorecard perspectives on the supply chain performance of companies in the automotive industry in Morocco. By outlining the limitations of our research, we identify avenues for future work. Firstly, we suggest exploring a qualitative method, such as a case study, to complement our empirical approach based on a questionnaire sent to Moroccan companies in the sector. Secondly, applying our model to other sectors such as aerospace, textiles, and agribusiness would allow for instructive comparisons. Thirdly, enriching our model by integrating the contingency factors of balanced scorecard perspectives of the supply chain, as mentioned in the literature, within the context of industrial companies in Morocco, represents a promising avenue. Lastly, adding perspectives such as the environmental aspect and information technologies in our research model could offer a comprehensive outlook. These future avenues, presented in the conclusion of this article, show that this study represents a first step in a broader and ever-evolving research process.

References

- Abu-Allan, A. (2024). The impact of balanced scorecard mediation in the relationship of perceived environmental uncertainty, business strategy, and organizational performance. *Uncertain Supply Chain Management*, 12(2), 737-750. <https://doi.org/737-750>. 10.5267/j.uscm.2024.1.012
- Ashioya, I. B. (2013). The balanced scorecard and supply chain performance: a case of Kenya Nut Company. Master of Business Administration (MBA) School Of Business, University Of Nairobi. Retrieved from <http://erepository.uonbi.ac.ke:8080/xmlui/handle/123456789/59501>
- Bhagwat, R., & Sharma, M. K. (2007). Performance measurement of supply chain management: a balanced scorecard approach. *Computers & Industrial Engineering*, 53(1), 43–62. <https://doi.org/10.1016/j.cie.2007.04.001>
- Brewer, P.C., & Speh, T.W. (2000) Using the Balanced Scorecard to Measure Supply Chain Performance. *Journal of Business Logistic*, 21, 75-93.
- Camerinelli, E. (2009). Supply Chain Finance. *Journal of Payments Strategy & Systems*, 3, 114-128.
- Camman, C., & Villeseque, F. (2002). Pilotage stratégique de la chaîne logistique et système d'évaluation de la performance. Quatrième RIRL, CRET-LOG, Marseille.
- Chin, T. A., Tat, H. H., & Sulaiman, Z. (2015). Green supply chain management, environmental collaboration and sustainability performance. *Procedia Cirp*, 26, 695-699. 10.1016/j.procir.2014.07.035.
- Chin, W. W. (1998). The Partial Least Squares Approach to Structural Equation Modeling. *Modern Methods for Business Research*, 2, 295-336.
- Estampe, D. (2014). Performance Evaluation Model for Value Creation. In book: *Supply Chain Performance and Evaluation Models*. <https://doi.org/10.1002/9781119005421.ch4>.
- Fawcett, S., Magnan, G., & McCarter, M. (2008). Benefits, barriers, and bridges to effective supply chain management. *Supply Chain Management: An International Journal*, 13, 35-48. <https://doi.org/10.1108/13598540810850300>
- Fugate, B. S., Mentzer, J. T., & Stank, T. P. (2010). Logistics performance: efficiency, effectiveness, and differentiation. *Journal of business logistics*, 31(1), 43-62. <https://doi.org/10.1002/j.2158-1592.2010.tb00127.x>.
- Génin, P. (2003). Planification tactique robuste avec usage d'un APS : Proposition d'un mode de gestion par plan de référence. Thèse de Doctorat, École des Mines de Paris, France.
- Gunasekaran, A., Patel, C., & McGaughey, R. E. (2004). A framework for supply chain performance measurement. *International Journal of Production Economics*, 87(3), 333–347. <https://doi.org/10.1016/j.ijpe.2003.08.003>
- Hair Jr., J. F., et al. (2014). Partial Least Squares Structural Equation Modeling (PLS-SEM): An Emerging Tool in Business Research. *European Business Review*, 26, 106-121. <https://doi.org/10.1108/EBR-10-2013-0128>
- Handfield, R. B., & Nichols Jr., E. L. (1999). Introduction to Supply Chain Management. Englewood Cliffs, NJ: Prentice Hall.
- Hejazi, M. (2022). The association between organizational performance and supply chain management practices. *Uncertain Supply Chain Management*, 10(4), 1219-1232. <https://doi.org/10.5267/j.uscm.2022.8.006>
- Hongxia, J., & Zhipeng, C. (2007). Performance Appraisal on Supply Chain Based on Value Engineering and Multistage Fuzzy Comprehensive Evaluation. In: Proceeding of International conference in Wireless Communications, Networking and Mobile, Shanghai, 21–25. <https://doi.org/10.1109/WICOM.2007.1160>
- Jalali Naini, S. G., Aliahmadi, A. R., & Jafari-Eskandari, M. (2011). Designing a mixed performance measurement system for environmental supply chain management using evolutionary game theory and balanced scorecard: A case study of an auto industry supply chain. *Resources, Conservation & Recycling*, 55(6), 593-603. <https://doi.org/10.1016/j.resconrec.2010.10.008>
- James, W., & Hoque, Z. (2000). Linking Balanced Scorecard Measures to Size and Market Factors: Impact on Organizational Performance. *Journal of Management Accounting Research*, 12, 1-24. <https://doi.org/10.2308/jmar.2000.12.1.1>.
- Kaplan, R. S., & Johnson, H. (1987). Relevance Lost: The Rise and Fall of Management Accounting. Harvard Business School Press.
- Kaplan, R. S., & Norton, D. P. (1996). Strategic Learning: The Balanced Scorecard. *Strategy & Leadership*, 24, 18-24. <https://doi.org/10.1108/eb054566>

- Khatoon, S., & Farooq, A. (2015). Balanced Scorecard as a Tool to Influence Organizational Performance: Evidences from Indian Companies. *Prestige e-Journal of Management and Research*, 2(1), 2-10.
- Kleijnen, J. P. C., & Smits, M. T. (2003). Performance metrics in supply chain management. *Journal of the Operational Research Society*, 54(5), 507-514.
- Le Roy, F., Robert, M., & Giuliani, P. (2015). Exploring the link between technical and management innovation: The moderating effects of firm size and type of innovation. *International Journal of Entrepreneurship and Small Business*, 25, 171. <https://doi.org/10.1504/IJESB.2015.069284>
- Lin, H. F., & Lin, S. M. (2008). Determinants of E-Business Diffusion: A Test of the Technology Diffusion Perspective. *Technovation*, 28, 135-145. <https://doi.org/10.1016/j.technovation.2007.10.003>
- Lovett, M. J., & MacDonald, J. B. (2005). How does financial performance affect marketing? Studying the marketing-finance relationship from a dynamic perspective. *Journal of the Academy of Marketing Science*, 33, 476-485.
- Maiga, A., & Jacobs, F. A. (2003). Balanced scorecard, activity-based costing and company performance: An empirical analysis. *Journal of Managerial Issues*, 15, 283-301.
- Marete, J. K. (2015). Influence of balanced scorecard on organizational performance in institutions of higher learning: A case study of University of Nairobi and Centre for Mathematics. *Science and Technology Education in Africa. European Journal of Business and Management*, 7(20), 106-116.
- Min, S., & Ph.D, J. (2004). Developing and Measuring Supply Chain Management Concepts. *Journal of Business Logistics*, 25, 63-99. <https://doi.org/10.1002/j.2158-1592.2004.tb00170.x>
- Najmi, A., & Makui, A. (2012). A conceptual model for measuring supply chain's performance. *Production Planning & Control*, 23(9), 694-706. <https://doi.org/10.1080/09537287.2011.586004>
- Park, H. B., Yokota, A., Gill, H. S., El Rassi, G., & McFarland, E. G. (2005). Diagnostic accuracy of clinical tests for the different degrees of subacromial impingement syndrome. *The Journal of Bone and Joint Surgery, American Volume*, 87(7), 1446-1455. <https://doi.org/10.2106/JBJS.D.02335>
- Pichot, L., Baptiste, P., & Neubert, G. (2004). Pilotage de la Supply Chain : Application de la segmentation à la définition des politiques de gestion Produit. *Revue Française de Gestion Industrielle*, 23, 99-111. <https://doi.org/10.53102/2004.23.02.521>
- Razzouki, M., El Adnani, M. J., Touhami, F., Azdod, M., & Darkaoui, A. (2024). Internal control system, innovation and performance of Moroccan public organizations: structural equation modeling based on the PLS approach. *Multidisciplinary Science Journal*, 6(8), 2024174. <https://doi.org/10.31893/multiscience.2024174>
- Rémy Le Moigne (2017). Supply chain management: Achat, Production, Logistique, Transport, Vente, 2nd ed., DUNOD.
- Schneiderman, A. M. (1999). Analog Devices: 1986-1991, The First Balanced Scorecard. Arthur M. Schneiderman.[Viitattu 10.10. 2013]
- Seo, Y. J., Dinwoodie, J., & Kwak, D. W. (2014). The impact of innovativeness on supply chain performance: Is supply chain integration a missing link?. *Supply Chain Management*, 19(5/6), 733-746. <https://doi.org/10.1108/SCM-02-2014-0058>
- Soni, G., & Kodali, R. (2010). Internal benchmarking for assessment of supply chain performance. *International Journal of Benchmarking*, 17(1), 44-76. <https://doi.org/10.1108/14635771011022316>
- Tariq, M., Ahmed, A., Rafi, S., & Ahmed, S. (2014). Investigating the Impact of Balanced Scorecard on Performance of Business: A study based on the Banking Sector of Pakistan. *IBT Journal of Business Studies (Formerly Journal of Social & Management Sciences)*, 10, 125-136. <https://doi.org/10.46745/ilma.jbs.2014.10.01.09>
- Tenenhaus, M., Amato, S., & Vinzi, V. E. (2004). A Global Goodness-of-Fit Index for PLS Structural Equation Modelling. *Proceedings of the XLII SIS Scientific Meeting*, 1, 739-742.
- Tibbs, C. Y., & Langat, L. K. (2016). Internal business processes, learning perspective of balance scorecard and organisational performance. *International Journal of Economics, Commerce and Management*, 4(11), 458-474.
- Yilmaz, Y., & Bititci, U. (2006). Performance measurement in the value chain: manufacturing v. tourism. *International Journal of Productivity and Performance Management*, 55(5), 371-389. <http://dx.doi.org/10.1108/17410400610671417>
- Zhang, H., & Okoroafo, S.C. (2015). Third-Party Logistics (3PL) and Supply Chain Performance in the Chinese Market: A Conceptual Framework. *Engineering Management Research*, 4, 38. <https://doi.org/10.5539/emr.v4n1p38>
- Zimmermann, K., & Seuring, S. (2009). Two case studies on developing, implementing and evaluating a balanced scorecard in distribution channel dyads. *International Journal of Logistics Research and Applications*, 12(1), 63-81. <https://doi.org/10.1080/13675560802141697>



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