

## Supply chain integration practices and its impact on financial and operational performance of the Tunisian industrial sector

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### CHRONICLE

#### Article history:

Received April 2, 2023  
Received in revised format July 8 2023  
Accepted August 19 2023  
Available online August 19 2023

#### Keywords:

*Supply chain integration practices*  
*Financial performance*  
*Operational performance*  
*Tunisian industrial compaines*  
*Multiple regression*

### ABSTRACT

Supply chain integration is a key factor in improving business performance. Despite this growing interest, little research has highlighted this issue that will determine the survival of many companies. The purpose of this study was to examine the relationship between the supply chain integration practices (SCMP) and the financial and operational performance of Tunisian manufacturing companies. To achieve this, a questionnaire was used as a research tool for data collection. Multiple regression analysis using SPSS26 software was used to answer study questions and examine study hypotheses. According to research, SCMP includes customer relationship management (CRM), supplier relationship management (SRM), buyer-supplier collaboration (BSC), joint knowledge creation (JCK), level of information sharing (IS), goal congruence (GC), risk management (RM), internet usage (IU), quality management (QM), except information quality (IQ), collaborative planning, forecasting and replenishment practices (CPFR), and just-in-time (JIT), are all significantly related to the financial and operational performance of the companies surveyed. Some recommendations are proposed to help managers better manage knowledge throughout the supply chain.

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## 1. Introduction

In today's competitive environment, companies can hardly rely on skills alone to gain a competitive edge. For this reason, many stakeholders believe that reducing new product development time and reducing inventory management costs, thereby ensuring the existence of products that more closely and quickly meet customer needs, will help the supply chain to grow faster. We believe that it is becoming an important factor in improving corporate performance and others (Christopher, 1998). As global markets become more competitive, many companies are increasingly relying on efficient supply chain practices (Bicocchi et al., 2019). The success of supply chain management depends on the organization working together and working together effectively. As companies become more specialized and globalized, managing the entire supply network to optimize overall performance becomes increasingly important. The practice of supply chain integration is seen as a powerful weapon for gaining competitive advantage. This is confirmed by Adebayo (2018), who estimates that supply chain management practices contribute 50% of his contribution to company profitability and performance. Overall, many studies have shown a clear interest in examining the impact of supply chain integration practices on financial and operational performance (Al-Shqairat et al., 2020; Zulfqar et al., 2020; Sharma & Modgil, 2020; Modgil 2019; Phan et al., 2019). The purpose of this study is to examine the relationship between supply chain integration practices and financial and operational performance in the context of Tunisian industrial enterprises.

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This article therefore aims to answer the following questions:

- How can the practices of supply chain integration impact the financial performance of Tunisian industrial company?
- How can the practices of supply chain integration impact the operational performance of Tunisian industrial company?

In summary, this article is divided into various points. The following points describe the theoretical background, followed by the development of hypotheses and the presentation of conceptual models. Therefore, the third point relates to methodology and the fourth to discussion of results to establish conclusions and managerial recommendations.

## 2. Theoretical background

### 2.1 Supply Chain Integration Practices

Most of the supply chain literature views supply chain integration practices as collaborative efforts to link supply chain functions and networks in terms of process, information, and physical flows (Frohlich and Westbrook 2001). Koh et al., (2007) stated that supply chain management practices are a set of practices that integrate all levels of the supply chain, including suppliers, manufacturers, distributors, and customers, to improve operational and financial performance. In fact, supply chain management practices can be defined in many ways. Min and Mentzer (2004) defined supply chain management practices as practices that include an agreed vision and goals, information sharing, risk and reward sharing, cooperation, integration of process, long-term relationships and agreed supply chain leadership. In contrast, Li and al. (2005) defined supply chain management practices as the set of activities that organizations undertake to promote effective supply chain management. Zhou and Benton (2007) categorized supply chain management practices into the following aspects: information sharing, supply chain planning, just-in-time (JIT) production, and delivery practices in supply chain management. Chong et al., (2011) show that supply chain management practices are categorized into strategic supplier partnerships, customer relationships, information sharing, information technology, training, and operations internally. An empirical study by Sundram et al., (2016) categorized seven critical supply chain management practices., namely strategic supplier partnership, customer relationship, information sharing, information quality, reporting, agreed vision and goals, and sharing of risks and rewards. Al-shboul et al. (2017) developed seven dimensions including strategic supplier partnership, information sharing, information quality, customer relationship management, lean internal practices, reporting and total quality management. Al-shboul et al. (2018) present seven dimensions of supply chain management practices. The dimensions cover the upstream (collaboration with suppliers) and downstream (customer relationship management) sides of the supply chain, the flow of information within and through a supply chain (use of the internet), the internal supply chain process (flexibility with partners, Lean production), internal integration and quality management. Kumar and Kushwaha (2018) provided empirical information on the relationship between various supply chain management practices (customer relationship management, information technology, information quality) and the operational performance of Indian pricing stores. The study shows that only three of his aspects of supply chain management practices are significantly and positively related to operational performance. Saragih et al. (2020) examined and explained the relationship between operational performance and ten supply chain management practices, including information sharing and site visits, supplier relationship, inventory management, product development, agility, quality implementation, integration of logistics, transport and purchasing activities with the manufacturing process. The results of Saragih et al. (2020) showed that sustainable operational performance can be achieved through supply chain management. Welby et al., (2021) present four dimensions of supply chain management practices such as buyer-supplier collaboration, total quality management, adoption of information technologies and integration of Supply Chain. Table 1 shows how the literature review provides the theoretical foundation for our study.

**Table 1**

Literature on practices adopted in supply chain integration

Supply chain integration practices	Min and Mentzer (2004)	Li et al., (2005)	Zhou and Benton (2007)	Chong et al., (2011)	Cao et al., (2011)	Sundram et al., (2016)	Al-Shboul et al., (2017)	Al-Shboul et al. (2018)	Khalil et al., (2019)	Saragih et al., (2020)	Welby et al., (2021)
Customer relationship management		✓		✓		✓	✓	✓	✓		
Supplier relationship management		✓		✓		✓	✓	✓	✓	✓	
Buyer-supplier collaboration											✓
Joint Knowledge Creation					✓						
Information Quality		✓				✓	✓		✓		
Goal congruence	✓				✓	✓					
Risk management	✓					✓					
CPFR											
JIT			✓								
Internet use								✓			
Lean production		✓						✓	✓		
Quality management							✓	✓			✓

## 2.2 Financial performance

A company's financial performance is described as the extent to which a company achieves its financial goals (Anant Deshpande 2012). Financial targets propagate accounting variables to measure the performance of industrial companies such as return on investment (Yang & Su 2009). Return on investment is a key measure of profitability (Karaduman et al., 2010), return on investment (ROI), market share, return on sales, ROI growth, sales growth, market share growth and cost reduction. Five metrics were identified to operationalize performance: sales growth, return on investment, return on assets, market share, and profit margin on sales (Vickery et al., 1999; Li et al. al., 2006).

## 2.3. Operational performance dimensions

This article presents operational performance as an aggregate construct that describes the firm's delivery performance, cost performance, quality performance, and production flexibility (Ward & Duray, 2000). Delivery performance is the ability to reduce lead times and development cycles for new products. Cost performance indicates a company's ability to produce at low cost, while quality performance indicates its ability to produce to specification and without defects. Production flexibility is the ability to accommodate product design changes and production variations (Munir et al., 2020).

## 3. Hypotheses development

### 3.1. Relationship between supply chain integration practices and financial performance

Most researchers argue that supply chain management practices increase a company's market share and return on investment, increasing its overall competitiveness (Li et al., 2006; Mzoughi et al., 2008). For example, strategic partnerships with suppliers have been reported to generate company-specific in terms of financial performance (Karimi & Rafiee 2014). It has also been shown that customer relationship practices lead to significant improvements in organizational performance (Oshodin & Omoregbe 2021). To improve their processes, increase their profits and their organizational performance, quality management practices are widely and successfully applied with success by industrial companies. In general, many studies highlight the positive impact of quality management practices on financial performance (Prajogo & Sohal 2003 and Aliotk 2012). Some researchers have begun to examine the relationship between risk management practices and organizational performance (Chen et al., 2019; Florio & Leoni 2017). These studies primarily focused on the link between risk management and financial performance. Khan Majid et al. (2016), Florio and Leoni (2017) examine stock market excess return, return on assets, cost reduction, return on equity, earnings volatility, profitability, and cost efficiency. Financial variables were used to assess company performance. Therefore, it can be concluded that supply chain integration practices have a positive impact on financial performance. Hence, the following hypothesis:

**H<sub>1</sub>:** *Supply chain integration practices improve financial performance.*

### 3.2. Relationship between supply chain integration practices and financial performance

Many researchers around the world are conducting research to develop effective ways to improve operational performance (OP). Supply chain management practices are seen as a foundation for improving operational performance. The relationship between supply chain management practices and operational performance has received much attention in the literature (Hong & Jeong, 2018). The research conducted by Abdallah et al., (2016) on industrial companies in Turkey shows influence of supply chain practices on the operational performance of the company where the company can improve the performance of its employees to obtain good results in their operational performance. Previous research has shown that different elements of supply chain management, such as strategic partnerships with suppliers, impact different aspects of operational performance. For example, strategic partnerships with suppliers can improve supplier performance, reduce time to market (Ragatz et al., 1997), and improve responsiveness and customer satisfaction (Power et al., 2001). A study by Yim et al. (2004) points out that implementing customer relationship management activities can achieve the goals of improving customer satisfaction and loyalty and improving operational performance. The quality of information contributes positively to customer satisfaction (Spekman et al., 1998) and to the quality of the partnership (Walton 1996). Information quality contributes positively to customer satisfaction (Spekman et al., 1998) and partnership quality (Walton 1996). Drug et al., (2012) also provide strong evidence that implementing lean production improves inventory management operational performance. Goal congruence has been studied in many industries and found to play an important role in improving operational performance (Cao & Zhang, 2011; Narayanan et al., 2015). Deming (1986) found that quality is the main determinant of success in a competitive environment. Therefore, quality management practices generally have a strong and positive relationship with operational performance (Brah et al., 2002). Therefore, it can be concluded that supply chain integration practices have a positive impact on operational performance. So, the following hypothesis:

**H<sub>2</sub>:** *Supply chain integration practices improve operational performance.*

#### 4. Conceptual Framework

Our research's conceptual model, shown in Figure 1, allows us to understand the various links between supply chain integration practices, financial performance, and operational performance. The research model has two groups of variables. Supply chain integration practices form the first group and constitute the independent variable. Financial performance and operational performance constitute the second group and represent the dependent variable.

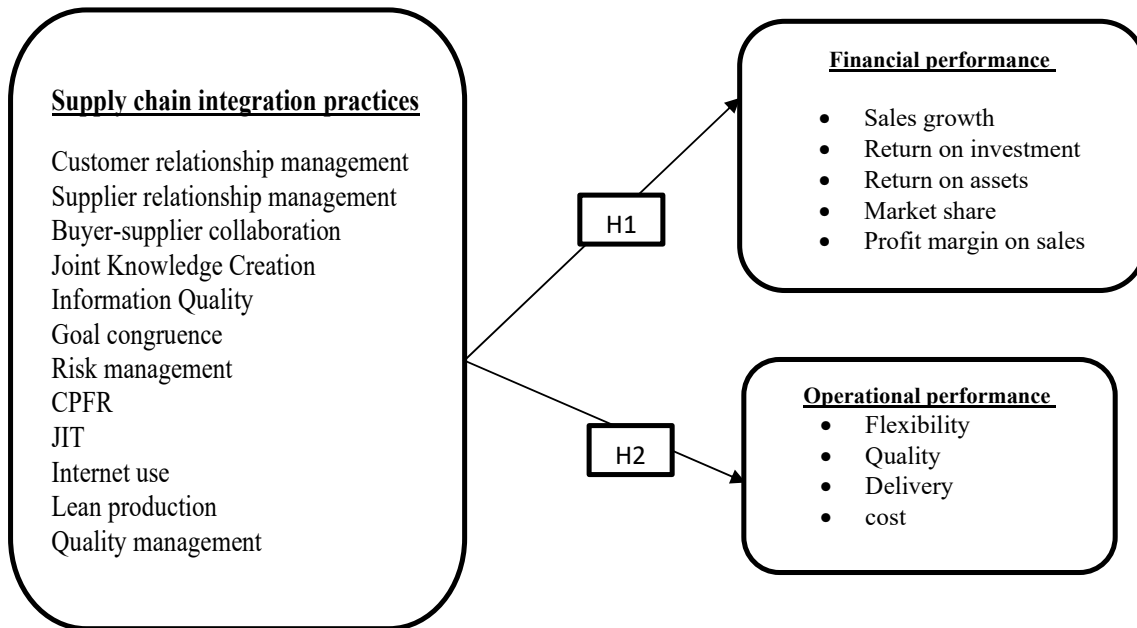


Fig. 1. Research Model Framework

#### 5. Research methodology

This part deals with the selection and description of our studied sample, the construction of the questionnaire and the method of analysis.

##### 5.1. Sample selection

To test our hypotheses and achieve our objectives, we conducted a survey of a representative sample of Tunisian industrial companies. The selected companies belong to nine economic sectors, namely the electronics industry, mechanical engineering, the chemical industry, the food industry, the ceramic building materials industry, the textile industry, the wood industry, the leather industry, and other sectors (Table 3).

**Table 3**  
Profile of respondents

	Frequency	Percent (%)
Industry		
Food industry	28	22.6
Textile and clothing industry	9	7.3
Ceramic and glass building materials Industries	6	4.8
Mechanical and metallurgical industries	27	21.8
Electrical, electronics and home appliance industries	9	7.3
Chemical industry	29	23.4
Wood, cork and furniture industry	7	5.6
Leather and shoe industry	6	4.8
Various industries	3	2.4

The list of companies surveyed comes mainly from APII (Agency for the Promotion of Industry and Innovation). The survey was conducted between September 2018 and February 2019. We distributed the questionnaire to business leaders. It was disseminated via the internet, electronic message to the target population, telephone and face-to-face interview. The main disadvantage of email questionnaires is that sometimes respondents don't bother to answer them and can simply ignore the questionnaire, so we resorted to the telephone to schedule an appointment with the executive. We distributed 300 questionnaires, and we had a return of 165 questionnaires, a return rate of 55%. For reasons related to the lack of information, 124 questionnaires that we consider usable. For our study, we used a non-probability sampling method. This method consists of selecting the most accessible and available individuals.

### 5.2 Measuring scale

The Likert scale is used to measure the items included in the questionnaire. The items relating to the 12 explanatory variables which measure supply chain integration practices and the items relating to the 2 variables to be explained which measure the financial and operational performance of companies are measured by a 5-point scale ranging from 1 "No totally agree" to 5 "Totally agree" with a midpoint 3 anchored as "Neutral" makes it possible to apprehend the case of absence of feeling in relation to a proposition.

### 5.3 Analytical methods

The data obtained was processed using the software IBM SPSS Statistics version 26. The main statistics used in the study include principal component analysis and regression analysis. Principal component analysis is based on two main phases: Dimensionality analysis of the scale and internal consistency analysis. To examine the reliability of the scale and analysis the internal coherence of the elements using Cronbach's alpha. According to Katiar & al. (2018), the reliability coefficient of Cronbach's alpha is usually between 0 and 1. Based on their rule of thumb, a Cronbach's alpha >of 0.7 is acceptable. In addition, the researcher conducted regression analysis to test the relationship between supply chain integration practices, financial performance and operational performance.

## 6. Results and discussion

### 6.1 Principal component analysis

**Table 5**  
Dimensionality and reliability analysis

Variables	N° of items	Variance explained	Cronbach's alpha
Customer relationship management	9	60.655%	0.903
Supplier relationship management	8	56.627%	0.888
Buyer-supplier collaboration	3	65.254%	0.725
Conjoint knowledge creation	4	70.054%	0.856
Information quality	5	62.429%	0.844
Goal congruence	4	78.022%	0.905
Risk management	4	74.113%	0.876
CPFR	4	82.909%	0.929
JIT	3	86.526%	0.919
Internet Used	4	74.019%	0.873
Lean production	3	70.132%	0.777
Management quality	6	59.209%	0.851
Financial performance	5	65.247%	0.848
Operational performance	4	77.815%	0.899

The results of this analysis show that the scales used are unidimensional. The results show that all reliability values are greater than 0.7. The high value of Cronbach's alpha for all variables in the study shows that the responses are reliable and consistent. This first phase of validation of the measurement scales allows us to move on to the hypothesis testing phase.

### 6.2 Hypothesis tests

To test the hypotheses, two-staged multiple regression was used. In the first stage, financial performance was entered as a dependent variable with Customer relationship management, Supplier relationship management, Buyer-supplier collaboration, Joint Knowledge Creation, Information Quality, Goal congruence, CPFR, Just-in-time, Internet use, Lean production and Quality management were entered as independent In the second stage, Customer relationship management , Supplier relationship management , Buyer-supplier collaboration , Joint Knowledge Creation , Information Quality , Goal congruence , CPFR , Just-in-time , Internet use, Lean production and Quality management were the independent variables, while operational performance was the dependent variable.

The regression equation for the first model was formulated as follows:

$$FP = \beta_0 + \beta_1 CRM + \beta_2 SRM + \beta_3 BSC + \beta_4 CK + \beta_5 IQ + \beta_6 CG + \beta_7 RM + \beta_8 CPFR + \beta_9 JIT + \beta_{10} IU + \beta_{11} LP + \beta_{12} MQ + \varepsilon_i \quad (1)$$

In Eq. (1)

$\beta_0$  is the constant.

$\beta_1, \dots, \beta_{12}$  are the coefficients of the independent variables.

$FP$  is the dependent variable.

The results of the first regression model are shown in Table 5. The results indicate that Customer relationship management (Beta=0.156, t=2.922, p=0.004), supplier relationship management (Beta=0.166, t=3.103, p=0.002), buyer-supplier collaboration (Beta=0.118, t=2.164, p=0.033), co-creation of knowledge (Beta=0.107, t=2.055, p=0.042), goal congruence (Beta=0.183, t=3.481, p=0.001), risk management (Beta=0.168, t=3.042, p=0.003), internet usage (Beta=0.185, t=3.457, p=0.001), lean production (Beta=0.112, t=2.007, p=0.047), management quality (Beta=0.488, t=7.686, p=0.004) positively influence financial performance. The results show that all individual parameters have a significant impact on financial performance except for information quality, CPFR and JIT. Table 4 reveals that the twelve supply chain integration practices ( $R^2 = 0.716$ ) can explain 71.6% of the total variance in financial performance. This result suggests that the remaining 29.4% is attributable to other factors that influence financial performance in industrial companies but were not included in this study. The results below support Hypothesis 1 that supply chain integration practices have a positive impact on financial performance.

**Table 4**  
Model 1 - Regression Results to test Hypothesis 1

Parameters	S.E.	B	T
(Constant)	0.058		-2.006
Customer relationship management	0.009	0.156	2.922***
Supplier relationship management	0.004	0.166	3.103***
Buyer-supplier collaboration	0.014	0.118	2.164**
Conjoint knowledge creation	0.009	0.107	2.055**
Information quality	0.014	0.049	0.843
Goal congruence	0.013	0.183	3.481***
Risk management	0.007	0.168	3.042***
CPFR	0.012	0.075	1.371
JIT	0.006	0.02	0.4
Internet Used	0.008	0.185	3.457***
Lean production	0.014	0.112	2.007**
Management quality	0.061	0.488	7.686***

Notes: Dependent Variable: financial performance; F-value = 23.372. Significant F =0.000;  $R^2 = 0.716$ .

\*\*\* p <0.01, \*\* p < 0.05, \* p < 0.1

The regression equation for the second model was formulated as follows:

$$OP = \beta_0 + \beta_1 CRM + \beta_2 SRM + \beta_3 BSC + \beta_4 CK + \beta_5 IQ + \beta_6 CG + \beta_7 RM + \beta_8 CPFR + \beta_9 JIT + \beta_{10} IU + \beta_{11} LP + \beta_{12} MQ + \varepsilon_i \quad (2)$$

In Eq. (2):

$\beta_0$  is the constant.

$\beta_1, \dots, \beta_{12}$  are the coefficients of the independent variables.

$OP$  is the dependent variable.

**Table 5**  
Model 2 - Regression Results to test Hypothesis 2

Parameters	S.E.	B	T
(Constant)	0.048		-0.935
Customer relationship management	0.007	0.139	2.947***
Supplier relationship management	0.003	0.122	2.542**
Buyer-supplier collaboration	0.017	0.1	2.003**
Conjoint Knowledge Creation	0.009	0.145	3.054***
Information quality	0.012	0.016	0.285
Goal congruence	0.011	0.102	2.160**
Risk management	0.006	0.11	2.315**
CPFR	0.013	0.049	1.031
JIT	0.004	0.073	1.611
Internet Used	0.01	0.132	2.886***
Lean production	0.017	0.115	2.209**
Management quality	0.05	0.591	10.575***

Notes: Dependent Variable: operational performance; F-value = 32.236. Significant F =0.000;  $R^2 = 0.777$ .

\*\*\* p <0.01, \*\* p < 0.05, \* p < 0.1

Evaluation of the data for Hypothesis 2 indicate that Customer relationship management (Beta=0.139,  $t=2.947$ ,  $p=0.004$ ), supplier relationship management (Beta=0.122,  $t=2.542$ ,  $p=0.012$ ), buyer-supplier collaboration (Beta=0.100,  $t=2.003$ ,  $p=0.048$ ), conjoint knowledge creation (Beta=0.145,  $t=3.054$ ,  $p=0.003$ ), goal congruence (Beta=0.102,  $t=2.160$ ,  $p=0.033$ ), risk management (Beta=0.110,  $t=2.315$ ,  $p=0.022$ ), internet usage (Beta=0.132,  $t=2.886$ ,  $p=0.005$ ), lean production (Beta=0.115,  $t=2.209$ ,  $p=0.029$ ), management quality (Beta=0.591,  $t=10.575$ ,  $p=0.000$ ) positively influence financial performance. The results show that all individual parameters have a significant impact on financial performance except for information quality, CPFR and JIT. As shown in Table 5, the twelve supply chain integration practices ( $R^2 = 0.777$ ) contributed nearly 77.7% of the variance in operational performance.

## 7. Conclusions

The results of our study provide researchers and companies with theoretical and managerial implications.

### 7.1 Theoretical implications

The primary contribution of this study is the development of a research model to empirically examine the relationships between supply chain integration practices, financial performance, and operational performance. Our results suggest that when supply chain integration practices are employed, improved financial performance and operational performance can be achieved. The results indicate that implementing risk management can help reduce potential losses through risk prevention and control, and thus improve financial and operational performance. The results show that the practices of customer relationship management, supplier relationship management, buyer-supplier collaboration, co-creation of knowledge, congruence of objectives, risk management, use of the internet, Lean production and quality management are very important and crucial for a company as they have affected the success of Supply chain management and hence the financial and operational performance of the company. This finding is consistent with previous studies (e.g. Karimi and Rafiee 2014; Mustefa 2014; Altiok 2012; Linus et al., 2020; Al-shboul et al., 2018; Mondini et al., 2014; Ushantha et al., 2017, Yan & Dooley, 2013; Kauppi et al., 2016; Ontario et al., 2010; Chavez et al., 2013).

As evidenced by this study, the quality of information sharing has a positive but not statistically significant influence on the financial and operational performance of companies. This finding corroborates with Alahmad (2021) and contrasts with the work of Mustefa (2014); Zhou and Benton (2007), whose results showed that the quality of information has a positive and significant influence on performance.

The implementation of new production methods such as JIT production and CPFR can lead to a substantial improvement in the efficiency and productivity of the company. However, the introduction of these new production approaches has not always been successful at the level of the companies in the sample. Panahifar et al., (2015) point out in their work that although many companies in developed countries have benefited from CPFR and JAT applications, its implementation in developing countries has been slow.

### 7.2 Managerial implications

This study indicates various managerial implications in the Tunisian context. The analysis indicates that the practices of supply chain integration have a positive relationship with the financial and operational performance of companies, i.e., these practices help to improve financial and operational performance in manufacturing industries. Therefore, it is necessary for industrial companies to intentionally develop different supply chain integration practices to improve financial and operational performance.

This study is very important in the aspect of supply chain management, and it has provided very useful information to help managers understand this relationship and improve their level of performance. However, some improvements could be made, and therefore some recommendations for managers are given below.

- Competition today is between supply chains rather than between organizations. As a result, adopting supply chain management practices is necessary to survive and thrive in a highly competitive environment.
- The relationship between information quality and financial and operational performance is positive, but not significant. Therefore, managers are recommended to improve the performance of their organization by developing and increasing the quality of information sharing. The role of quality is an essential element to managing a smooth supply chain, and therefore the first recommendation is to develop and organize a platform where information could be easily shared in the supply chain. Also, the second recommendation is to develop trust between the various supply chain partners so that the receiving party can easily become credible and reliable on the information due to the presence of high trust between them.
- Quality management has the greatest impact on financial and operational performance. Based on these results, managers should manage quality effectively, so that the competitive advantage of the supply chain can be increased and drive the financial and operational performance of the company.
- The results of the study show that the actual use of JIT practices in Tunisian industrial companies was low. It is recommended that managers increase the implementation of JIT practices to reduce inventory, eliminate waste, achieve the right cost, right quality, customer satisfaction, which leads to full utilization of operational and financial performance.

## 8. Limitations and future directions

The present study has some limitations that future studies should strive to overcome. Firstly, the concept of integration is a very broad and complex concept that cannot be grasped by a single study. Future research may consider other integration practices. Secondly, the study is limited to industrial firms and therefore the model may not work in other sectors of the economy. Future research could therefore focus on replicating this model in the service sector and other sectors of the economy. Another limit is linked to the organizational characteristics of the company.

Indeed, the presence of supply chain integration practices can be influenced by variables related to the context of the company, such as the sector of activity, the size of the company or the position of the company in the market. Supply Chain. These factors were not taken into consideration in our research, and yet they may have an important explanatory role.

To conclude, several other future paths can be proposed, we recall before ending that the work we have presented deals with a problem and concepts that are not yet broadened in the academic community. However, this is indeed a hot topic for manufacturers, and the benchmarks developed for the evaluation of financial and operational performance in the context of supply chain integration.

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