

## Value creation through demand and supply chains: evidences from Spanish companies

*Creación de valor a través de la demanda y cadenas de suministro: evidencias de empresas españolas*

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**Abstract:** The global context in which companies operate nowadays is extremely complex. This fact pushes organizations to a continuous search of the best strategy that will enable them to stand out in the market. Supply Chain Management, in its dual concept of coordinated demand and supply chains, represents an excellent opportunity to enhance the competitive advantage of companies. In relation to the demand chain, it can help to improve the knowledge of the customers and their needs, to develop their capacities for innovation and response, as well as to differentiate their products. With respect to the supply chain, it will focus the attention on increasing the flexibility in production capacity and delivery of products and services with less use of resources. For this reason, this study proposes to analyze the relationship between value creation and business results in some Spanish companies through supply chain processes. In order to do so, it describes a transactional non-experimental research employing the Technological Innovation Panel Database (PITEC).

**Keywords:** Competitive advantage, Supply Chain, Value, Effectiveness, Efficiency

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## 1. Introduction

In the current global market, companies seeking to remain competitive must adopt business strategies that support them. In order to be successful, these strategies must be aimed at value creation, so that they can be able to respond effectively to the requirements of different customers, without setting aside the objective of reducing costs, thus being efficient.

Demand Supply Chain Management (DSCM) aims to gain competitive advantage by providing superior value

at lower cost, therefore increasing revenues (effectiveness) and controlling costs (efficiency), by means of the coordinated management of both supply and demand processes (Hilletofth, 2011).

In this research, the relationship between value creation and business results of some Spanish companies is analyzed by focusing on the processes of the supply chain using the Technological Innovation Panel Database (PITEC).

## 2. Literature review

DSCM is a relatively new concept, however, it has only recently been introduced as an effective way to gain competitive advantage by coordinating the processes of the supply chain (supply, production, distribution and returns) and those of the demand chain (market intelligence, innovation and marketing). This management seeks to overcome both the intra-organizational and the inter-organizational barriers to include processes performed by suppliers and customers (Bustinza et al., 2013; Hilletofth and Ericsson, 2007; Jüttner et al., 2007; Walters and Rainbird, 2004). Thus, it can be defined as the strategic coordination of the demand and supply chains within a particular company and extending its scope to other related companies in order to provide superior value to the customer at the lowest possible cost (Hilletofth et al., 2009; Jüttner et al., 2007; Walters, 2008). The coordination of these chains is based on the underlying principle that they are equally important (Jacobs, 2006; Jüttner et al., 2007; Rainbird, 2004), although the conditions of the organization itself (characteristics of the product, the demand and the business model) will assign more importance to one or another chain. Research on supply chain management discipline has tended to encourage supply focused vision (push vs pull; lean vs agile). Nowadays demand chain perspective has shifted that vision to an environment where lean and agile “leagile” or other production strategies such as postponement, modularization, servitization are combined (Christopher and Ryals, 2014). The ultimate test of DSCM excellence is a profit level that allows the particular company and the demand-supply chain as a whole to prosper in the long run (Gligor, 2014; Hilletofth et al., 2009).

In order to achieve this goal, companies must be organized around understanding how customer value is created and delivered, and how this demand and supply processes can be coordinated (Esper et al., 2010; Jüttner et al., 2007; Walters and Rainbird, 2004). It is very important that value creation is considered in both the demand and supply chains, since competitiveness is not solely gained by desirable products, but also concerns how products are manufactured and delivered (Hilletofth and Ericsson, 2007; Walters, 2008). The road towards superior customer value lies in the ability of the firm to differentiate itself from competition with regard to product and supply chain solutions (Esper et al., 2010; Hilletofth and Ericsson, 2007; Jüttner et al., 2007). Two of the most important opportunities for product and supply chain differentiation are innovation and responsiveness (Canever et al., 2008; De Treville et al., 2004; Hilmola et al., 2015; Selen and Soliman, 2002).

The main benefits of the DSCM as understood by most researchers are: enhanced competitiveness and better demand and supply chain performance. Competitiveness may be achieved by simultaneous focus on value creation, differentiation, innovation, responsiveness, and cost efficiency in the demand and supply processes in a coordinated manner (Canever et al., 2008; Charlebois, 2008; Walters and Rainbird, 2004). This, in turn, leads to improved profitability due to increased revenues and reduced costs (Esper et al., 2010; Hilletofth et al., 2009; Jüttner et al., 2007). Higher demand chain performance is achieved by increased innovation, responsiveness and cost efficiency in the development of new products, improved range and life cycle management, higher brand loyalty, more effective marketing efforts, and reduced costs in the demand chain (Rainbird, 2004; Walters, 2008). Supply chain performance is increased through higher responsiveness, product differentiation, cost-efficient product delivery, flexible operating structure, reduced inventories, fewer stock outs, less obsolete products, improved customer service, and reduced costs in the supply chain (Childerhouse et al., 2002; De Treville et al., 2004; Langabeer and Rose, 2002).

## 3. Research model and hypothesis

The goal of this study is to show that there is a relationship between value creation and business performance through the processes of the supply chain. This analysis has been carried out for some Spanish companies.

As noted in the previous section, the creation of customer value comes from two simultaneous and equally important aspects, i.e. the product chain, related to the characteristics of the product, and the supply chain, focused on the efficiency with which the product and its delivery is accomplished. Two hypotheses have been stated, covering the relationship between both product and supply chains with business performance (Hypothesis H<sub>1</sub> and H<sub>2</sub>):

- H<sub>1</sub>: Demand creation or product chain (effectiveness) is positively and significantly related to business performance.
- H<sub>2</sub>: Demand satisfaction or supply chain (efficiency) is positively and significantly related to business performance.

The research model is illustrated in Figure 1.

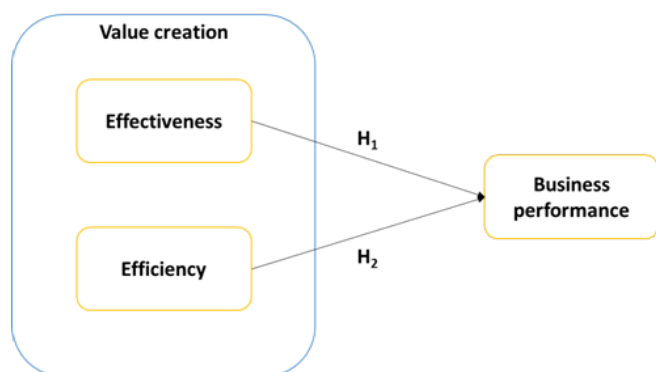


Figure 1. Research model.

These concepts may have different interpretation, so that they should be defined (Table 1).

Table 1. Definition of the main variables involved in the research model.

Concept	Definition and contextualization in the model
Value Creation	"Value creation is linked to the efficiency and effectiveness, and, metaphorically, can be defined as quality divided by price" (Chase, Aquilano, Jacobs, 2009). In this paper value creation is determined through the double supply chain processes, i.e., coordinated processes of the demand and supply chains.
Effectiveness	"Doing the right thing in order to create the maximum possible value for the organization" (Chase, Aquilano, Jacobs, 2009). In this research it refers to the ability of organizations to understand, manage and create demand through processes and business activities related to the customer, such as market intelligence (identifying the characteristics of the market, creating value profiles, establishing value propositions according to customer expectations), generate differentiation to develop options and product management, and marketing (managing the relationship with the customer).

Efficiency	"It means doing something at the lowest possible cost", "in general terms the goal of an efficient process is to produce a good or to provide a service using the least possible amount of inputs" (Chase, Aquilano, Jacobs, 2009). In this research it would be the result of the development of all business processes and activities that companies carry out to deliver the product to the customer, trying to consume the least amount of resources. Cost is the key factor, with an orientation in the short term to product, focused on efficiency, in the immediate resources and capacity restrictions, usually dominated by manufacturing personnel and logistics, historically focused on planning processes and control production.
Business Performance	Speaking of business results is to refer to the measurement of management organization performances. For Eliyahu Goldratt and his Theory of Constraints (1997), business results are measured by financial results: net profits, return on investment, liquidity and operating results (production, inventory and operating expenses). In this research we have tried to go beyond financial results considering economic, social and environmental criteria.

This approach to value creation connects the firm product and process architecture, while both can be focused on satisfying customer particular needs.

#### 4. Methodology

This research is based on the database of the Technological Innovation Panel (PITEC). PITEC is designed as a panel survey and this database has been created by the Spanish National Statistics Institute (INE) and the Spanish Foundation for Science and Technology (FECYT). The data used for this research comes from the survey of 2012. The total sample for that year was formed by 9.709 companies. Several selection criteria were applied: Country (corporate headquarters must be in Spain), Industry sector (only manufacturing companies were considered, according to CNAE2009 codes from 1 to 33) and Available data for the analysed variables (all items should be available). According to them, the final sample comprises 1,064 companies.

As described in the previous section, the model is based on three latent variables: effectiveness, efficiency and business performance. So it is necessary to firstly identify the appropriate indicators that could be measured and secondly justify the association between these indicators and their corresponding latent variables (Table 2). In this way, we proceeded to perform a factor analysis and principal component analysis. The type of indicators used to determine the value of the latent variable was the purpose (target) for which the company determines the importance of technological innovation. There were about 16 targets, coded OBJECT1 to OBJECT16. These indicators are measured following a 4 Likert points scale. Each value means an opinion about how important that objective is for the company when it is involved in a process of technological innovation: 1: High Importance; 2: Medium importance, 3: Low importance; and 4: Not relevant. In order to make it more understandable the scale was reversed. Although it is originally an ordinal scale, there are studies that support to equate certain specific frequency quantifiers to an interval scale (Osinski and Bruno, 1998). Therefore parametric statistical techniques can be applied.

**Table 2.** List of indicators used by each latent variable

Latent variable	Objectives
Effectiveness	OBJECT1: Increase range of goods or services. OBJECT2: Replace obsolete products or processes. OBJECT3: Enter new markets. OBJECT5: Improve product and service quality.
Efficiency.	OBJECT6: Increase flexibility of production OBJECT7: Increase production capacity. OBJECT8: Reduce labour costs per unit. OBJECT9: Reduce material costs per unit. OBJECT10: Reduce energy costs per unit.
Business performance	OBJECT4: Increase market share. OBJECT11: Reduce environmental impacts. OBJECT12: Improve health or safety of employees. OBJECT13: Fulfill government environmental regulation or standards requirements. OBJECT14: Increase the total employment. OBJECT15: Increase the qualified employment. OBJECT16: Maintain the employment rate

## 5. Descriptive analysis and results

The profile of the Spanish manufacturing companies available in the PITEC database can be described through variables such as size (based on the number of employees) and industry sector.

There are 1,064 Spanish companies with available data for the variables under study. Approximately three out of four (73.2%) are small and medium enterprises. All the industry sectors are represented in the database. However there are some of them with a greater presence: Companies that produce food, beverages and tobacco products which account for the 17% of the sample. The Manufacture of chemicals and chemical products and the Other Manufacture of machinery and equipment industrial activities represent around 11% each. The 8.5% of the companies belongs to the activity code of Manufacturing of fabricated metal products. Finally other industry sector that has specific weight is the Manufacturing of motor vehicles, trailers and semi-trailers industry which means the 7% of the sample.

To ensure the reliability and validity of the constructs a series of analysis were performed. Firstly, the reliability of each construct was tested through Factor and Reliability Analysis. Therefore Kaiser-Meyer-Olkin (KMO) and Cronbach's alpha were calculated for each construct. KMO value results validated the use of factor analysis. Secondly, the Cronbach's alpha values were higher than 0.8 which assured the reliability of the constructs. Finally, convergent and discriminant validity were tested using the Average Variance Extracted (AVE). AVEs values above 0.5 indicate convergent validity. Discriminant validity is present when the variance shared between a construct and any other construct in the model is less than the variance that the construct shares with its indicators (Fornell et al., 1982). If the square roots of the AVEs are greater than the off-diagonal elements in the corresponding rows and columns in the correlations table, a construct is more strongly correlated with its indicators than with the other constructs in the model.

Table 3. Correlation and reliability analysis

Correlation and Discriminant validity				Statistical analysis
Variable	Effectiveness	Efficiency	Business performance	
Effectiveness	(0.808)			KMO: 0.781 Cronbach's alpha: 0.822 AVE: 0.654
Efficiency	0,506**	(0.857)		KMO: 0.841 Cronbach's alpha: 0.910 AVE: 0.735
Business performance	0,656**	0,698**	(0.798)	KMO: 0.904 Cronbach's alpha: 0.904 AVE: 0.637

\*\* $p < 0,01$ . Diagonal in parentheses: square root of AVE; Off-diagonal: correlations between constructs KMO: Kaiser-Meyer-Olkin test. AVE: Average variance extracted.

The approach used for testing the two hypotheses ( $H_1$  and  $H_2$ ) was a multiple linear regression model. The values for the independent variables (effectiveness and efficiency) and also for the dependent variable (business performance) were their respective factor scores. The scores are typified so the scatter plots show a scale from -2 to 2 points (Figure 2).

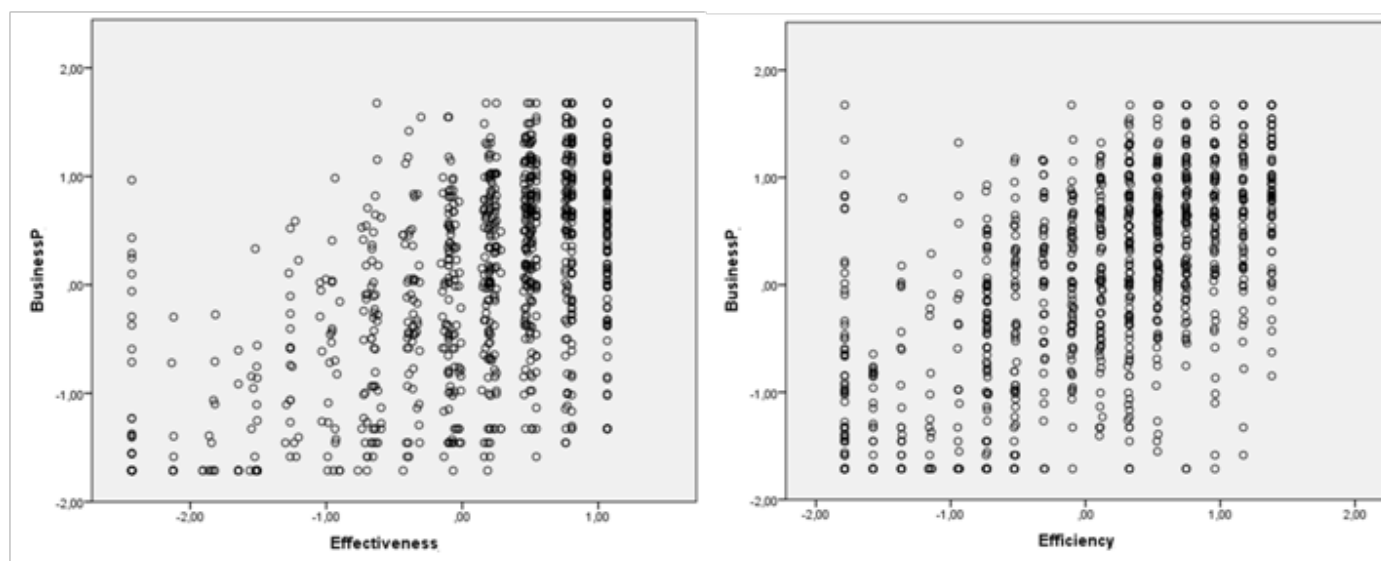


Figure 2. Scatterplots between dependent (Business performance) and independent variables (Efficiency and Effectiveness).

The results of the linear regression analysis are shown in Table 3. It is interesting to highlight the fact that the percentage of variance explained for the business performance is relatively high (61%) and the root mean square of residuals (RMSR) of 0.625. This means that value creation as has been defined can explain in an interesting percentage the variability of the dependent

variable. With these data, the  $H_1$  and  $H_2$  hypotheses are validated. Therefore there is a positive and significant relationship between demand creation (effectiveness) and business performance as well as between demand satisfaction (efficiency) and business performance.

**Table 3.** Results for the multiple regression model

Model	Independent variable	B	Std. Error of B	$\beta$	R2	$\Delta R2$
1	Constant	-1.31E <sup>-16</sup>	0.022		0.487***	-
	Efficiency	0.660	0.021	0.70***		
2	Constant	-1.98E <sup>-16</sup>	0.019		0.610***	0.123***
	Efficiency	0.468	0.022	0.492***		
	Effectiveness	0.419	0.022	0.407***		

\*\*\*  $p < 0.001$ . Dependent variable: Business Performance (BP);  $\beta$  is the standardized coefficient.

## 6. Discussion

The results of this study indicate that there is a strong relationship between processes and business activities related to the customer (demand chain), such as identifying the characteristics of the market and creating differentiation by developing product management or by managing customer relationships. Similarly, the processes and business activities that companies carry out for satisfying customer orders (supply chain) are positively and significantly related with business results. It is also interesting to highlight that the value creation components, effectiveness and efficiency, have similar weight in the model. These results are aligned with other articles that prove the interest of demand and supply chains such as Esper et al. (2010) and Hilmola et al. (2015).

Consequently the efforts of the organizations should be focused on both demand and supply chains in order to maintain or develop new competitive advantages. As supply chain management has traditionally been focused on supply side, companies should also focus on gaining demand side capabilities. In fact, according to Christopher and Ryals (2014), the supply chain becomes the demand chain. Understanding demand allows companies to create or improve their products, their commercial campaigns and their service levels which make them re-think their supply chain processes. Supply chain strategies such as postponement, modularization and servitization should be based on demand side. This means to understand the demand patterns, and to differentiate and make a segmentation according to specific criteria such as sales volume or

customization level. The next step will be to analyse whether the current configuration of the supply chain fits the different customer segments.

## 7. Conclusions

The main contribution of this paper is the application of the Demand Supply Chain Management concept to a real scenario, i.e. Spanish manufacturing companies. This study makes a contribution to the understanding of value creation into the supply chain management knowledge area. Thus, in the supply chain management framework, it has been proved that value creation can be divided into demand creation (effectiveness) and demand satisfaction (efficiency) and all of them have a direct impact on business performance. This double approach is interesting from both conceptual and empirical approaches. From the conceptual point of view, the use of the demand creation and demand satisfaction concepts means to set the customer (demand) as the key of the whole business. From the empirical perspective, this study highlights the importance of considering product and service as an indivisible couple for developing competitive advantages.

The results support the participation of supply chain managers in the top decision making processes. This is an interesting point because supply chain management must not be just restricted to the logistics perspective anymore. It requires updating supply chain managers skills, such as analytical businesses capabilities for product and service processes, leadership and team building. However, there are some limitations that may have affected the results of the research, such as

being restricted by the availability of variables and records of the PITEC database.

As future research it would be interesting to empirically determine whether any feature such as environment uncertainty or the company's sector has influence on the prioritization of the demand creation or the demand satisfaction chain. Similarly, it would be interesting to analyse how the coordination between both chains works with a qualitative technique research such as in depth interviews.

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