

## **THE IMPACT OF PERFORMANCES IN ROMANIAN SUPPLY CHAINS ON ORGANIZATIONAL PERFORMANCES**

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### **ABSTRACT**

The concept of supply chain encompasses all the activities and processes associated with the flows of merchandises, services, information and capital from origin to the end customer. A vast body of supply chain management literature deals with identifying optimum performance measurement system in a supply chain. After presenting the metrics and sub-metrics used to measure the performances in a supply chain using the balanced scorecards methodology, we propose an empirical study based on a supply chain research conducted in 2011 on a representative sample of Romanian firms from various industries. We have conducted a principal component analysis to assess the validity of scales used to collect the data. Then we have conducted OLS analysis of the impact of customers' orientation, operational excellence and innovation/leadership on organizational performances. Results bring evidence of a positive and statistically significant impact of performances in supply chains on organizational performances.

**KEYWORDS:** supply chain management, performances, logistics integration

**JEL CLASSIFICATION:** M10, C35, C54

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### **1. INTRODUCTION**

Supply chain management (SCM) provides the link between production and distribution at organizational level and between supply and demand at supply chain level (Constangioara, 2013). As Felea and Albastroiu (2013) underline, while logistics deals with the flows of material, information, services and capital at organizational level, supply chain management optimizes logistics flows across all members of a logistic chain.

In Romania the literature on SCM is relatively new. Roceanu (2003), Ilies (2006), Balan (2007), Popa (2009) and Mocuta (2009) are among the first to transpose the SCM literature at national level. Besides general theoretical approach of SCM, efforts have been made to identify the characteristics of SCM in different industries (Constangioara, 2013). Prejmerean and Vasilache (2008) focus on the factors influencing the distribution of medicines on the Romanian pharmaceutical market whereas Muhcina and Popovici (2008) analyse the SCM in tourism. Balan analyses the negative effect on organizational performance of the 'bull-whip effect' and Seitan (2008) presents the performance benefits of harmonizing organizational strategy with strategy at supply chain level. A synthesis of SCM literature at national level is presented by Butilca et al. (2011).

The problematic of performance in supply chains is central to SCM literature. Thus, Bowersox et al. (2000) show that performances in a supply chain are determined by integrating key business processes, logistics being one of them. Stank, Keller and Closs (2001) focus on the importance of achieving integration within supply chain. Algren and Kotzab (2011) in their turn focus on achieving integration of supply chain measurement systems (SCMS). They argue that integration in SCMS

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requires measuring all relevant aspects of performance within a supply chain (horizontal integration), linking performances within a supply chain with organizational' strategy (vertical integration) and using both financial and non-financial measures of performance (inter-organizational integration).

After presenting the main approaches to measuring performances in as supply chain context, this paper proposes using OLS estimations to analyse the impact of different facets of performances within Romanian supply chains on organizational performances.

The main hypotheses of the study are:

H<sub>01</sub>: there is no relationship between customers' orientation and organizational performances;

H<sub>02</sub>: there is no relationship between operational excellence and organizational performances;

H<sub>03</sub>: there is no relationship between innovation/leadership and organizational performances.

## 2. SUPPLY CHAIN MEASUREMENT SYSTEMS

We can identify several approaches to measuring performances in supply chains: (a) measuring performances based on scorecards methodology, (b) measuring performances of business processes within a supply chain, (c) measuring performances at strategic, operational and tactical level.

Financial indicators continue to remain the most prevalent measures of organizational performance, despite that using solely financial indicators ignores the multidimensionality of organizational performance (Richard et al., 2009). Kaplan and Norton (1992) have proposed Balanced Scorecards (BSC) as a tool for measuring organizational performance and for implementing the organizational strategy. BSC distinguishes four dimensions of organizational performance: finance, marketing, operations and innovation. For each type of metrics several key control variables (sub-metrics) are defined. By covering four area of organizational performance, BSC's balanced metrics achieves the desired horizontal integration necessary for performances in supply chains (Algren and Kotzab, 2011; Gunasekaran, Patel and McGaughey, 2003; Stank, Keller and Closs, 2001).

By linking performances in supply chain by organizational strategy, BSC achieves vertical integration (Algren and Kotzab, 2011). SCM literature identifies three strategies organization might implement: (a) operational excellence, (b) innovation / product leadership and (c) customer orientation. We see that for each strategy there is a corresponding BSC performance area. Implicitly we see that under this approach operational excellence, innovation/leadership and customer orientation are the contributors to organizational performance.

In order to achieve inter-organizational integration we must measure performances of all processes and activities in a supply chain. Gunasekaran, Patel and McGaughey (2003) identify the following supply chain activities / processes: (a) plan, (b) source, (c) make/assembly, (d) deliver/customer. Santos, Gouveia and Gomes (2007) adopt a more detailed approach of activities within a supply chain, identifying the following activities: (a) sales, (b) customer support, (c) logistics, (d) sourcing, (e) manufacturing, (f) warehousing, (g) storing), (h) delivering, (i) accounting, (j) planning, (k) innovation, (l) social responsibility and (m) human resources. The above mentioned authors in fact combine measuring performances of key activities/processes in a supply chain with BSC as depicted in what follows.

**Table 1. Performance metrics and sub-metrics in a supply chain from a customer perspective**

Perspective	Activities/Processes	Indicators
Customers perspective	Sales/Customers support	Quality - % of non-conformity Forecast accuracy Market share
	Logistics	On time delivery Fill rate Number of products Number of distribution channels Damaged shipments

Source: Adapted from Santos, Gouveia and Gomes (2007), pp. 93-115

Table 1 show the main activities in a supply chain and their corresponding performance indicators from a customers' perspective. We see that SCM literature identifies only two activities in a supply chain that can be analyzed from a customers' perspective: sales / customers' support and logistics. For each activity several key indicators are identifies. Since BSC was developed outside SCM, the challenge is that each company identifies performance metrics and sub-metrics specific to its environment (Kleijnen and Smits, 2003).

**Table 2. Performance metrics and sub-metrics in a supply chain from a financial perspective**

Perspective	Activities/Processes	Indicators
Financial perspective	Sourcing	Costs of materials
	Manufacturing	Non-quality costs Warehousing costs Manufacturing unit costs
	Warehousing	Cost of carrying
	Logistics	Transportation costs Logistic costs
	Accounting	Cash flow Income Return on investments (ROI) Return on sales (ROS)

*Source:* Adapted from Santos, Gouveia and Gomes (2007), pp. 93-115

Table 2 shows the performance metrics and sub-metrics employed in a supply chain from a financial perspective. We can identify here five activities / processes which take place in a supply chain. Although only one is logistics, from a broad perspective there is agreement in SCM literature that sourcing, warehousing and manufacturing support are considered also logistical activities. Of prime importance are the accounting indicators of performance. As underlined by performance literature (Richard et al., 2009), accounting indicators are most prevalent indicators used in econometric estimations of performances as dependent variable. This is holds true for estimations of performances in supply chains (Ho, Au and Newton, 2002).

**Table 3. Performance metrics and sub-metrics in a supply chain from an operational perspective**

Perspective	Activities/Processes	Indicators
Operational perspective	Sourcing	Supplier on-time delivery Inventories Quality of materials Supplier cycle time
	Planning	% of orders delivered according to plan Schedule changes
	Manufacturing	Adherence to schedule % zero defects Manufacturing cycle time Plant utilization
	Delivering / Storing	Finished goods (units) Inventories (units)

*Source:* Adapted from Santos, Gouveia and Gomes (2007), pp. 93-115

Achieving operational excellence is one of the three strategies firms can employ in order to successfully compete in today's volatile business environment (Constangioara, 2013). In the context

of supply chains operational excellence is targeted planning, sourcing, manufacturing support and delivering/storage. In order to achieve operational excellence, real time logistics has to be corroborated with techniques meant to attain economies of scale (Constangioara, 2004).

**Table 4. Performance metrics and sub-metrics in a supply chain from the innovation/learning perspective**

Perspective	Activities/Processes	Indicators
Innovation / Learning perspective	Innovation	% new product development
	Social responsibility	Social programs investments
	Human resources	Absenteeism % Employee training Employee productivity Motivation Employee turnover

*Source:* Adapted from Santos, Gouveia and Gomes (2007), pp. 93-115

The third strategy firms might embrace in a supply chain context is product innovation/leadership (Constangioara, 2013). Here SCM literature proposes two activities we need to develop performance metrics for – social responsibility and human resources. As Richards et al (2009) points out, accounting for social responsibility as well as for the interests of other stakeholders, increases the multidimensionality of organizational performance. Managing business risks, realizing efficiencies and creating sustainable products are considered the business drivers of supply chain sustainability (Constangioara, 2013).

### 3. ANALYSIS OF PERFORMANCES IN NATIONAL SUPPLY CHAINS

#### 3.1. Data

In 2011 we have conducted a comprehensive supply chain survey using an initial 100 sample of Romanian firms from various industries. Survey has targeted high-level management of the firms in the sample, as recommended by empirical studies in SCM literature (Stank, Keller and Closs, 2001). Respondents were asked to evaluate different aspects of performances of their firms compared to performances of their competitors. A seven items scale was used for responses. From 100 mailed questionnaires only 26 were returned with usable answers. The 26% response rate is similar to response rate reported in supply chain empirical studies (Constangioara, 2013).

In order to assess the validity of scale used to measure SCS, present paper follows the principal component methodology proposed by Hair et al. (1998). According to the above-mentioned authors, a scale reflects unidimensional characteristics if all the principal components are above 0.30. In order to ensure the reliability of the scale the Alpha Cronbach coefficient has to exceed 0.7. (Hair et al., 1998).

The working dataset comprises enterprises representative of the overall structure of Romanian economy. Most enterprises form the working dataset are from the manufacturing sector (11) followed by commerce (5) and other services (10). Final sample size is sufficient for adequate quantitative estimation (Wooldridge, 2009). The distribution of the firms according to their size is presented in table 5.

**Table 5. Distribution of firms according to their size**

Category of firm	Frequency	Frequency (%)
Micro firm	4	0.133
Small firm	20	0.769
Medium size firm	2	0.006

We see in table 5 that most firms in our analysis are small firms (20 out of 26). There are only 4 micro-firms and 2 medium size firms which have been used in the subsequent analysis.

### 3.2. Results

Principal component analysis of the validity of scales employed in the analysis shows that all principal components have scores exceeding the 0.30 threshold. This is evidence that scales reflects unidimensional characteristics. The values of Cronbach alpha are also above 0.80 which is additional evidence that the scales' reliability is satisfactory.

Further we have considered that financial indicators are best proxies for organizational performances, as suggested by Richard et al, (2009). Consequently we have used profit rate for 2010 as the left hand-side variable in an OLS estimation of organizational performances on its factors. Thus we want to determine whether performances in supply chains from a customers' perspective are found to be statistically significant. Results from estimation are presented in table 6.

**Table 6. Impact of supply chain performance from customers' perspective on organizational performance**

Variable	Estimate	p-values
Quality - % of non-conformity	1.19	0.012
Forecast accuracy	1.06	0.091
Market share	1.02	0.002
On time delivery	1.12	0.000
Fill rate	1.21	0.000
Damaged shipments	0.96	0.051

Table 6 shows that from the indicators measuring performances in supply chains from customers' perspective 'On time delivery', 'Fill rate' and 'Market share' are statistically significant at  $p < 0.05$ . Whereas 'Damages shipments' is marginally insignificant at  $p = 0.05$ , the 'Quality - % of non-conformity' and 'Forecast accuracy' are clearly not significant at  $p < 0.05$ .

We have also investigated the relationship between organizational performance and operational excellence in the context of a supply chain. Results are presented in Table 7.

**Table 7. Impact of operational excellence on organizational performance**

Variable	Estimate	p-values
Supplier on-time delivery	0.24	<0.000
Quality of materials	1.02	<0.000
Supplier cycle time	0.12	<0.000
% of orders delivered according to plan	0.25	<0.000
Schedule changes	0.12	<0.000
% zero defects	0.67	0.045
Manufacturing cycle time	0.13	0.012
Plant utilization	1.15	<0.000

Table 7 shows we have found powerful evidence of the positive impact of operational excellence in the context of supply chains on organizational performance. All the variables have the intuitive sign, showing the positive impact of operational excellence on organizational performances. Only one of the variables in Table 7 is not statistically significant ('% ZERO DEFECT' variable). Thus indeed we have found supporting evidence that competitiveness could be achieved by implementing a strategy of operational excellence.

**Table 8. Impact of innovation/leadership on organizational performance**

Variable	Estimate	p-values
Social programs investments	1.07	0.23
Absenteeism	0.12	0.001
% Employee training	0.89	0.002
Employee productivity	1.05	0.019
Motivation	1.62	0.000

Table 8 shows that ‘Social programs investments’ and ‘Employee productivity’ are not statistically significant. To the opposite, we see that companies which prevent absenteeism, offer training programs for their employees and motivate them are more likely to have superior overall performances.

#### 4. CONCLUSIONS

This paper underlines that besides traditional logistics activities, SCM circumscribes activities such as marketing, product developing and customer service. Specific to SCM is a paradigm shift from the traditional profit maximizing problem at firm level to maximizing profits across supply chains through cooperation among supply chain participants. After presenting a brief SCM literature review we have analyzed the coordinates of an integrated supply chain measurement system. In particular we have presented the metrics and sub-metric employed in SCM literature for measuring performances in a supply chain context.

The empirical analysis is based on a supply chain research based on questionnaire conducted in 2011. The working dataset comprises enterprises representative of the overall structure of Romanian economy. Our analysis has focused on estimating the impact of customer’s orientation, operational strategy and innovation/leadership on organizational performances. We can reject all three null hypotheses and thus we have documented that customers’ orientation, operational strategy, innovation and leadership do have a positive and statistical significant impact on organizational performances.

Analysis of the impact of customers’ orientation on organizational performance reveals results that are in concordance with empirical findings in Management, documenting that market share is relevant for organizational performances, as PIMS models has shown previously. Results also are in accordance with findings reported by empirical studies in SCM literature which underline that logistical performances, measured by ‘Fill Rate’ and ‘On Time Delivery’ are also significant in OLS estimations of organizational performances (Stank, Keller and Closs, 2001).

Analysis of the impact of operational excellence on organizational performance reveals that competitiveness could be achieved by implementing a strategy of operational excellence.

Analysis of the impact of innovation and leadership on organizational performance reveals that at national level accounting for multiple dimensions of performance does not have a positive statistical significant impact on organizational performance. Moreover we have found that employee productivity is not statistically relevant for organizational performance – one possible explanation is that organizational performances are determined primarily by the technology employed which subsequently determine in its turn the productivity of the employee.

As a limit of this research we mention that controlling for more factors is always beneficial to the analysis and consequently we propose that in the future we control for factors such as industry, firms’ size and business context.

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