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The impact of customers' demands for lower logistics costs in the automotive industry supply chain on companies' business processes

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Abstract

Companies that operate in the international automotive industry face various cost-related demands, including demands for lower logistics costs. For the purpose of assessing the situation in the field of logistics, a survey was carried out on a sample of Slovenian manufacturing companies that are part of the international supplier chain. The goal of the study is to determine whether the various demands of customers for lower logistics costs have an impact on the business processes of Slovenian companies. The results of the statistical analysis highlight the importance of cooperation between departments within companies when customers demand lower logistics costs and emphasize the importance of introducing innovations in the optimization of these costs. The case study also represents a current reference for other sectors of the economy on the topic of logistics process management and on strengthening relations in international supply chains.

Introduction

Due to the complexity of operations and international competition, logistics play a crucial role in the management of the company's supply chain. The main role of logistics in the supply chain is to act as a connecting element between individual entities, activities and functions, with a view to ensuring the smooth flow of materials and information. Any change in the logistics supply to the customer also affects logistics costs, which are often dependent on the complexity of the customer's demands, as well as impacting the organization of the supply chain. Suppliers are thus confronted with the significant challenge of meeting customers' needs and desires, while simultaneously managing logistics costs in a rational manner (Skerlic & Muha, 2012).

Logistics costs are created in various business areas and are classified by most studies as a percentage of the revenue from the sale of goods. There are at least six individual cost components, namely transport, warehousing, inventory carrying, logistics administration, packaging and indirect costs of logistics (Zeng & Rossetti, 2003; Fugate, Mentzer & Stank, 2010; Engblom et al., 2012). There are major differences in logistics costs among companies in different industries, however; several scientific studies (Ojala et al., 2007; Engblom et al., 2012; Hansen, Hovi & Veisten, 2014; Rantasila & Ojala, 2015) state that their share of the company's sales revenue is at least six percent. This percentage varies widely among the studies and ranges from 6% to 25%, but all agree that the share of logistics costs is the lowest in automotive companies.

The field of logistics management in the automotive industry has evolved over time to such a level that it has become a reference for other industry sectors in terms of managing logistics processes and costs. Being part of such an industry has many advantages, but also entails a lot of responsibility,

because the demands for lower costs are passed down the supply chain from the end-customers (Skerlic & Muha, 2016). This puts enormous pressure on suppliers to achieve a certain degree of cost-effectiveness. However, Singh, Smith and Sohal (Singh, Smith & Sohal, 2005) state that many suppliers have reached a level where significant cost reductions can no longer be achieved by improving productivity and quality. The specificity of customers' demands in the automotive industry is also confirmed by scientific literature, which points out the growing friction in the relationship between car manufacturers and suppliers, especially in terms of the demands for a significant reduction in all costs. Logistics, in particular, is an area where companies are looking for constant cost reduction options (Stock & Lambert, 2001; Beskovnik & Twrdy, 2010).

For this purpose, an analysis of the possible frictions between car manufacturers and suppliers related to logistics costs was carried out on a sample of thirty Slovenian manufacturing companies that are part of the international supply chain. Therefore, the goal of the study is to determine whether the various demands of customers for lower logistics costs have an impact on the business processes of Slovenian companies. The presented study builds on the existing theoretical and practical knowledge, since the last major study on this topic was conducted in 2014. The study highlights future guidelines for the management of logistics processes between participants in the supply chain of the automotive industry, which represents an important contribution for manufacturing companies in Slovenia and its wider region. The article is structured as follows: the second chapter introduces past and current demands of car manufacturers in terms of cost reduction, as well as their impact on long-term relationships in the automotive industry. The third chapter is dedicated to the research methods used and the fourth chapter examines the results of the study. The final chapter consists of the discussion and provides guidelines for further research.

Literature review

The automotive industry has certain features that are specific to it, with regard to strengthening its own supply chain. A modern car can contain 15,000 separate parts, supplied by around 200 to 400 different first-level suppliers, who, in turn, have their own suppliers (Stäblein & Aoki, 2015). Initiatives aimed at improving the efficiency of the supply chain are, therefore, geared towards systematically strengthening and managing relationships with suppliers, as the company's success is evidently dependent upon the performance and efficiency of its suppliers (Marksberry, 2012). This segment includes the forwarding of various demands to suppliers, but also the transfer of knowledge from the world's largest car manufacturers.

The global automotive sector is in a constant state of development. Intense competition puts a lot of pressure on companies, which is why companies must excel in various business areas, including costs, design, functionality, manufacturing and quality (Park & Simpson, 2005). The automotive industry, characterized by relationships dominated by customers, has been undergoing a process of supplier consolidation since the 1990s. This means that the number of suppliers is decreasing, but at the same time the volume of operations with each supplier increases (Lilliecreutz, 1998). However, Akpinar and Zettinig (Akpinar & Zettinig, 2008a) point out that suppliers in the automotive industry face some of the most aggressive purchasing departments in terms of cost reduction. In addition to cost reduction demands, Singh, Smith and Sohal (Singh, Smith & Sohal, 2005) point out that, first and foremost, first-level suppliers in the automotive industry are subject to strategic requirements, which directly relate to strengthening innovation, achieving high production capacities, conforming to environmental and environmental standards, achieving high safety standards, proximity to production facilities, integration of 3PL logistics providers, greater integration into after-sales activities and efficient computerization of business processes.

Akpinar and Zettinig (Akpinar & Zettinig, 2008b) emphasized that the automotive industry is undergoing structural changes due to increasing pressures to generate economies of scale and scope and to develop new technologies, especially in regard to resource and fuel efficiency, and due to increasingly sophisticated customer demands that favour ever more differentiated products. The need for continual cost reductions is thus seen as a competitive necessity throughout the world (Womack, Jones & Roos, 1990). In Australia, the study participants indicated that the four manufacturers require annual cost reductions for components of between 2.5 to 5.0% from their suppliers. This requirement is almost non-negotiable, with one manufacturer indicating that there was no such thing as 'cost-ups' in this industry; suppliers are under extreme pressure to achieve the required level of 'cost-downs'. However, many suppliers in the study claimed that it

was no longer possible to achieve significant further reductions in costs through productivity improvement initiatives. Also, many organizations indicated that they are beginning to see negligible returns from continued quality improvements (Singh et al., 2005).

Possible sources of friction in the relationship between automotive manufacturers and suppliers were confirmed by the latest major study, which was carried out by Roland Berger (Berger, 2014). The study examines current and future efforts by automotive manufacturers (VW, BMW, Daimler, PSA and Renault-Nissan) to reduce costs. Volkswagen intends to reduce costs by 7 billion Euros, of which 5 billion Euros will come from their own Volkswagen brand. Fixed costs are to be reduced by 33%, sales costs by 25% and development and research costs by 25%. In addition to the above, they intend to develop fewer vehicle models and fewer additional products. BMW's goal is to cut costs by hundreds of millions of Euros annually by 2020 and reduce the research and development (R&D) budget. Daimler plans to shift global production in order to reduce operating costs by 5–6% annually (in addition to already-existing savings programs). The company's goals include increased standardization, job shifts and reduced vertical integration and investment. The PSA Group's plans (Peugeot, Citroën, Opel, Vauxhall, Faurecia) feature lower production costs at 1,100.00 Euros per vehicle and a comprehensive range of measures, including reducing the number of models, upgrading automotive manufacturing plants, increasing the market share in emerging markets, reducing the number of jobs and lowering labour costs. Renault-Nissan aim to achieve savings of 7.5% on account of their alliance and collaboration efforts (at least 5.8 billion USD).

Therefore, a conclusion can be drawn that more aggressive ways of exploiting the negotiating power of automotive manufacturers towards their suppliers will have a detrimental effect on the quality of relations between automotive manufacturers and suppliers, which will also affect the logistical processes of Slovenian companies that are suppliers to the international automotive industry.

Research methodology

An analysis of the impact of customers' demands for the reduction of logistics costs in the supply chain of the automotive industry on the business processes of supply companies is part of a wider survey conducted in cooperation with the Automotive Cluster of Slovenia. For the purpose of the survey, an online questionnaire was set up, which was forwarded to the companies' logistics personnel. The respondents were representatives of the middle and senior management of the companies. Before they were forwarded the online questionnaire, the companies were invited, first in writing and later by telephone, to take part in the survey. The survey was carried out on a sample of thirty Slovenian companies that are part of the international supplier chain in the automotive industry. In total, 29 companies answered questions related to the subject of the analysis.

Ordinal variables, where respondents ranked the answers, are presented as median, minimum and maximum values and numeric variables are presented as average, median and standard deviation. Linear regression analysis was used to test whether customer demands for cost reduction in the supply chain of automotive companies influence the companies' business processes.

Customer demands for cost reduction were measured on a 5-point Likert scale comprising five items, and a composite score (average) of these five items was computed. The measurement of customer demands showed good validity, as assessed by factor analysis (all items loaded on a single factor with weights > 0.37) and high reliability (Cronbach $\alpha = 0.82$). The composite variable was used as an independent variable in the regression model. Business processes were measured by five 5-point Likert-type items, all loading considerably on a single factor as assessed by factor analysis and showing high reliability (Cronbach $\alpha = 0.81$). A composite score as an average of the five items was computed and used as a dependent variable in the regression model.

Spearman's correlation coefficient was used to test the correlation between customer demands for cost reduction and business processes in the companies. Measurements showed appropriate validity and reliability (Cronbach $\alpha = 0.82$). Statistical analysis was performed in IBM SPSS 22.0.

Results

The sample of companies included in the survey comprised 2 companies with 11 to 50 employees (6.7%), 13 companies with 51 to 250 employees (43.3%) and 15 companies with more than 250 employees (50%). Table 1 shows an assessment of customers' demands in the automotive industry in terms of logistics costs reduction. The most intense demands are the constant demands to reduce logistics costs in general, followed by demands for quality logistics services. The demands to reduce logistics

Table 1. An assessment of customers' demands in the automotive industry in terms of cost reduction

	Min	Max	AM	Me	SD	*n*
Our company faces constant demands to reduce logistics costs	3	5	4.7	5.0	0.6	29
Demands for quality logistics services increase logistics costs	1	5	3.5	4.0	1.0	29
The demands for lower logistics costs cause disruptions in our internal processes	1	5	3.4	4.0	0.9	29
The demands for lower logistics costs lead to a reduction in logistics costs to our suppliers	1	5	3.4	4.0	1.1	29
New customers are acquired solely based on the guarantee of lower logistics costs	1	5	2.7	3.0	1.0	29

Min = minimum value; max = maximum value; AM = arithmetic mean; Me = median; SD = standard deviation; *n* = number of respondents

Table 2. Assessment of the companies' business processes

	Min	Max	AM	Me	SD	*n*
We regularly measure customer satisfaction with the timeliness of our deliveries	3	5	4.6	5.0	0.6	29
Our company is strongly oriented towards the development of innovations	3	5	4.2	4.0	0.7	29
Our company provides a guarantee of high quality for logistic processes	3	5	3.9	4.0	0.7	29
There is strong cooperation between departments in the company	2	5	3.9	4.0	0.7	29
We regularly measure customer satisfaction with our services	2	5	3.8	4.0	0.9	29

Min = minimum value; max = maximum value; AM = arithmetic mean; Me = median; SD = standard deviation; *n* = number of respondents

costs cause disruptions in the internal processes and lower logistical costs to suppliers. The assessment whether new customers are acquired solely based on the guarantee of lower logistics costs does not represent a significant value.

Table 2 shows the assessments of the business processes in the surveyed companies. The companies regularly measure the level of customer satisfaction with the timeliness of delivery in their business processes. The companies are strongly oriented towards the development of innovation, provide high quality logistic processes and there is also strong cooperation between departments. The companies measure customer satisfaction with the services.

The results of the test to determine whether customers' demands for lower logistic costs in the automotive industry supply chain have an impact on business processes are shown in Table 3. The analysis is conducted with the use of simple linear regression with a composite variable that measures customers' demands for lower logistic costs as the independent and composite variable that measures the assessment of the business within a company as the dependent variable.

Table 3. Predicting the improvement of business processes within a company based on customers' demands for lower logistics costs

	b	*t*	*p*
b_0	3.74	7.05	< 0.001
Demands for lower logistics costs (b_1)	0.09	0.63	0.532

b = regression coefficient; *t* = test statistics; *p* = *p*-value

Linear regression seeks a function of the form:

$$y = b_0 + b_1 \cdot x \quad (1)$$

of which the sum of the squares of the deviations of the observed values will be the smallest. The coefficient b_0 indicates the intersection with the ordinate and the coefficient b_1 describes the slope of the line. This indicates by how much the dependent variable (y) changes, if the dependent variable (x) is increased by one unit. Since the coefficients are calculated based on the sample data, it is necessary to verify whether their value among the population is also statistically significantly different from 0. Table 3 provides the test statistics (t) and the corresponding p-value. The p-value represents the probability that a coefficient different from 0 is a random occurrence. When this probability is small, i.e. <0.05, it is concluded that the difference is not a random occurrence and that the coefficient is also different from 0 among the population. This is especially important for the coefficient b_1, since a coefficient statistically significantly different from 0 indicates that the variables are interconnected and that one can be predicted based on the other.

On the sample data, the value of the improvement of business processes can be predicted using the equation:

$$3.74 + 0.09 \cdot \text{customers' demands for lower logistics costs} \quad (2)$$

An intersection with an abscissa is statistically significant and the coefficient b1 is not statistically

Table 4. The correlation between individual customers' demands for lower logistics costs and the assessment of individual business processes in the company

		We regularly measure customer satisfaction with the timeliness of our deliveries	We regularly measure customer satisfaction with our employees	Our company is strongly oriented towards the development of innovations	Our company provides a guarantee of high quality for logistic processes	There is strong cooperation between departments in the company
Our company faces constant demands to reduce logistics costs	*r*	0.28	0.26	0.13	0.15	0.33
	p	0.139	0.177	0.497	0.430	*0.085*
	n	29	29	29	29	*29*
The requirements for the reduction of logistics costs cause disruptions in our internal processes	*r*	–0.32	–0.08	–0.04	–0.15	–0.10
	p	*0.089*	0.699	0.844	0.440	0.615
	n	29	29	29	29	29
The demands to reduce logistics costs lead to a reduction in logistics costs to our suppliers	*r*	0.01	0.22	0.20	–0.01	0.00
	p	0.944	0.261	0.302	0.957	0.999
	n	29	29	29	29	29
New customers are acquired exclusively due to the guarantee of lower logistics costs	*r*	–0.11	–0.03	0.18	0.10	0.06
	p	0.565	0.864	0.353	0.615	0.766
	n	29	29	29	29	29
Demands for quality logistics services increase logistics costs	*r*	0.03	0.25	0.33	0.23	0.04
	p	0.895	0.197	*0.085*	0.237	0.834
	n	29	29	29	29	29

r = Spearman's correlation coefficient; *p* = *p*-value; *n* = number of respondents

significant. This means that customers' demands for lower logistics costs are not statistically significantly related to the level of business process optimization.

Further on, in Table 4, Spearman's correlation coefficient is used to verify whether there is a correlation between individual customers' demands for lower logistics costs and the assessment of individual business processes in the company. The following formula was used:

$$r_s = \rho_{rgX,rgY} = \frac{\mathrm{cov}(rg_X, rg_Y)}{\sigma_{rgX}, \sigma_{rgY}} \tag{3}$$

where:

ρ – correlation coefficient applied to the rank variables;

$\mathrm{cov}(rg_X, rg_Y)$ – covariance of the rank variables;

σ_{rgX} and σ_{rgY} – standard deviations of the rank variables.

The most significant finding is that even individual customers' demands for lower logistics costs are not correlated with the business processes within the company. However, there are some correlations that are marginally statistically significant. For example, there is a weak positive correlation between constant demands for lower logistics costs and cooperation between departments. There is also a weak positive correlation between the increased costs due to the demands for quality logistics services and the company's focus on innovation. A weak negative correlation was detected between disruptions in internal processes due to demands for lower costs and measuring customer satisfaction with the timeliness of delivery.

Discussion

Slovenian companies that are part of the international automotive industry, which is the world's leading high-tech industry and an important factor in global economic development, are an important source of information that can be used to examine the state of organization of logistics processes and the impact of customers' demands for lower logistics costs on business processes.

The companies that participated in the survey assessed the level of their customers' demands for lower logistics costs as very high, as confirmed by the conclusions drawn from scientific literature. The companies also pointed out that customers' demands for lower logistic costs lead to a reduction in logistics costs to suppliers down the supply chain.

One positive finding for future relations between the participants in the automotive industry is that new customers are not acquired solely because of the guarantee of lower logistics costs. All the companies that participated in the survey also have high-quality logistic processes, as all of them ranked high in this area. The companies are especially aware of the importance of ensuring a high level of quality in the distribution of goods, as they measure customer satisfaction with the timeliness of their delivery.

The main goal of the case study was to determine whether the various demands of customers for lower logistics costs have an impact on the business processes of Slovenian suppliers in the automotive industry. Initial testing did not reveal a significant impact. This proves that Slovenian companies have high-quality business and logistic processes, which is why demands for lower logistics costs do not cause disruptions in these companies.

However, there are some correlations that are marginally statistically significant, as there is a positive correlation between the constant demands for lower logistics costs and cooperation between departments. This correlation, however weak, suggests that functional departments react to customers' demands for lower logic by increasing their level of cooperation. This is crucial for managing logistics processes, since employees from different departments (e.g., sales, production and logistics) all contribute to how the company's distribution logistics are organized. Cooperation between departments can improve communication and influence the effectiveness of logistics process management.

There is also a weak positive correlation between the increased costs due to demands for quality logistics services and the company's focus on innovation. This correlation suggests that the companies in the sample are indeed experiencing increased logistics costs due to the demands for improved logistics services; however, they are taking actions to rationalize costs in logistics through an increased focus on innovation. This has also created actions that are aimed at increasing the potential of the employees and stimulating them to deliver the initiatives (Książek & Ligarski, 2015). It is precisely this focus on innovation that can have the greatest impact on logistics costs, due to the specificity of logistics operations that require finding the best solutions in terms of streamlining logistical activities. The continuous development of information technology (advanced programs and various decision-making tools), work tools (RFID, Barcode, etc.), transport means (powerful and cost-efficient vehicles) and the logistics network (new roads, railways, air and maritime connections and distribution centres) offers a wide array of innovative and modern logistics solutions that can result in lower overall logistics costs for the company.

The presented results are an upgrade of the existing theoretical and practical knowledge of logistics, since the last major study dealing with cost requirements of automotive manufacturers towards their suppliers dates back to 2014. The study highlights future guidelines for management of logistics processes between the participants in the supply chain of the automotive industry, which represents an important contribution for manufacturing companies in Slovenia and its wider region. The limitations of the study stem from the relatively small sample of companies analysed, which makes it difficult to apply its results on a global level.

Conclusions

The study represents one of the first contributions to this topic that analyses the impact of different customers' demands for lower logistics costs on the business processes of companies in the international automotive industry. The results obtained can also be used as a reference for other industry sectors in terms of logistics processes, cost management and strengthening relationships in the supply chain, especially considering the importance of the automotive industry for the global economy. The results also emphasise the importance of cooperation between departments within companies when customers demand lower logistical costs, as well as the importance of focusing on innovation when it comes to the optimization of logistics costs.

The study should be repeated after a certain period of time. More detailed consideration should be given to whether the impact of customers' demands for the reduction of logistics costs on the business processes of companies has changed.

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