
Integration of Logistics Function and Business Performance

Submitted 17/10/20, 1st revision 12/11/20, 2nd revision 07/12/20, accepted 28/12/20

Miklós Pakurár¹, István András Kun², János Felföldi³,
László Vasa⁴, Judit Oláh⁵

Abstract:

Purpose: The degree of integration amongst business functions in enterprises and through the supply chain can greatly affect performance. Integration, with a focus on logistic functions, is investigated to discover the internal and external integration connections at production enterprises so as to measure the association between the level of integration and performance.

Design/Methodology/Approach: Internal factors of the analysis are logistics, procurement, sales, accounting and finance, and HR while external elements are suppliers and external customers. ROS, ROE and ROA were used as the indicators of performance. Based on questionnaire data, rank correlation analysis, factor analysis, regression analysis and structural equation modelling were applied.

Findings: The research shows that the relationship between the level of integration and performance resulted in some cases in a significant correlation, although there were many instances where there was no positive association between integration and performance. The limitations of the research are the relatively small sample size and geographic scope.

Practical Implications: Our research contributes to the scientific understanding of the integration of logistic functions, using four analytical methods. Research shows professionals how important the integration of logistic functions is, which works effectively to improve productivity.

Originality/Value: The novelty of the research is to determine functions that can work efficiently with logistics to improve productivity. At the same time, the relatively small ratio of significantly correlated logistic integration factors with business performance signals to us that the integration-performance relationship makes it difficult to use the results in managerial practice.

Keywords: Business performance, integration, logistic functions, supply chain.

JEL Codes: L22, J24

Paper type: Research study.

¹Institute of Applied Informatics and Logistics, Faculty of Economics and Business University of Debrecen, 4032 Debrecen, Hungary.

²Institute of Management and Organization Sciences, Faculty of Economics and Business University of Debrecen, 4032 Debrecen, Hungary.

³As in 1 above.

⁴Management Campus, Széchenyi István University, 9026 Győr, Hungary.

⁵Corresponding author, WSB University Management Department, Faculty of Applied Sciences, e-mail: juditdrolah@gmail.com;

1. Introduction

The development of the last decades in management that companies do not compete independently, they are members of supply chains and the success of a business depends on the ability to cooperate with the supply chain (SC) members. Products are produced and services are provided by supply chains and the efficiency of a supply chain depends heavily on the relationship between SC partners. Relatively few companies are able to compete effectively without taking into account the direct or indirect external relations (Kozma, 2017).

In supply chains collaboration between functions is important to react quickly to changes in customers' needs. Collaboration between decentralised functional units in a supply chain can solve conflicts between partners (Oláh *et al.*, 2018; Oláh *et al.*, 2017). Without any consensus on functions, units pursue their separate aims, which may hinder the efficient performance of the supply chain (Jung and Jeong, 2005; Kovács and Kot, 2017; Slusarczyk *et al.*, 2016).

Integration of management systems in supply chains, such as warehouse management systems and transportation management systems, leads to a better global visibility of inventory which reduces cost and increases cycle time. Internal integration in business organisations and external integration between supply chain partners should be developed by managers to improve the performance of the organization. Doubt and uncertainty can be reduced in supply chains by increased internal integration, which is an improvement in the information processing capability of organisations. Increased internal integration enables employees to understand value-creating processes better and how business functions are connected together (Zhao *et al.*, 2008).

Szegedi and Illés (2007) concluded that competition is determined by the product's supply chain instead of the product itself: as more products reach the marketplace, service and distribution become more critical to a product's success. In the history of supply chain integration through process management, the process view of SCI was introduced in the 1980's, and since then this concept has been an efficient management method to make companies faster and more flexible. Processes should be smoothly connected, and unnecessary activities eliminated to make a supply chain more efficient.

Lambert *et al.* (2008) found that logistic managers involved in the cross-functional processes of the company were able to do their job more efficiently. The examined cross functional processes were the management of customer relationships, supplier relationships, customer service, demand, order fulfilment, manufacturing flow, product development and commercialization, and returns.

The transformation of information to connect functions and supply chain members and to develop a barrier-free flow of information and a smooth flow of materials is

essential to develop an integrated system. As the life cycle of products has decreased because of fierce competition and the continuously changing demands of customers, obtaining proper information and understanding it become essential (Saenz *et al.*, 2014). The performance of a business depends on its responsiveness to customers and suppliers, which is reflected in the absorptive capacity of the organisation. Cooperation between the SC members, providing each other with information, services mutual support, may improve competitiveness and shorten the cycle-time of the supply chain (Dunay *et al.*, 2018).

Our research aims to analyse the integration of logistic functions with internal functions of enterprises, which are production, procurement, sales, human resources, and accounting and finance, and the integration with external suppliers and buyers. The aim of the research is to find out the importance of internal and external factors that – operating in association with the logistics function - improve the efficiency of management as reflected in the performance of the enterprises.

The structure of the study is as follows, literature review, research methodology, results, discussion, and conclusions and finally the list of references.

2. Literature Review

Integration studies of supply chains started with analyses of relationships between departments of enterprises, and it was found that the cooperation of functions made businesses more adaptive to their environment (Mackelprang *et al.*, 2014; Wong *et al.*, 2011; Narayanan *et al.*, 2011; Tiron-Tudor *et al.*, 2018). Subsequently, overreaching relationships, upstream and downstream, were examined, and it was thought that internal and external integration was equally important for the efficient management of supply chains. According to Gonzalez-Zapatero *et al.* (2017) functional Integration implies information shared and understood with/by the other function, and this information being translated into aligned decisions.

A smooth flow of information through internal business processes and a smooth flow of integration with external supply chain members means that the overall integration of a business organisation works well. At the same time, the elimination of waste and redundant processes is a way of improving process management (Vickery *et al.*, 2003; Cousins and Menguc, 2006). Integrations mean that businesses connect their internal functions and the internal functions with the partner chain member's internal functions through processes, in order to solve problems jointly (Rodrigues *et al.*, 2004; Stank *et al.*, 2001; Bowersox *et al.*, 1999; Finley and Srikanth, 2005; Kliestik *et al.*, 2018, Vasa *et al.*, 2014).

Studies in the field of supply chain integration described SC integration as a one dimensional (Marquez *et al.*, 2004; Lau *et al.*, 2010) or multidimensional phenomenon. Most of the supply chain integration articles have distinguished three elements of the phenomenon: customer integration, supplier integration, and internal

integration. The measurement of SC integration has been evaluated, relating it to performance values, to understand how SCI is reflected in the efficiency of a business (Kim, 2009).

The relationship of SC integration and performance has been investigated by a great number of researchers with various results. The outcomes have differed depending on the determination of performance, as it can be measured in many ways. For example, Wong *et al.* (2011) indicate a direct positive relationship between SC integration and performance; however, others were not able to prove this association and found no correlation between these factors. Dealing with this topic, Koufteros *et al.* (2005) states that integration affects performance positively and indirectly. Opute and Madichie (2017) examined the integration of accounting and marketing functions and found a positive association between the integration of the two factors and the performance of the firm.

The meaning of functional integration is determined by Gonzalez-Zapatero *et al.* (2017). Functional integration exists when the information is transferred efficiently between functions, resulting in advantages for them and for the firm. As companies become bigger, features evolve; these units solve specific tasks and depend on each other. Galbraith (1974) applied Information Processing Theory to explain the evolution and behaviour of functional integration. The company can be considered as an open system with special units (functions).

Internal integration has been studied, either by taking into account the main functions of the business altogether, or only by studying the effect of the association of two-three functions on performance. Lim *et al.* (2006) examined the impact of a better coordinated production-distribution plan on output, and Contreras *et al.* (2013) examined the relationship between the distribution network and performance, both of which showed a positive relationship. Gabler *et al.* (2014) found that sales and logistics integration can be improved by enhancing communication between the two areas, resulting in changes in other processes.

If it is assumed that a better internal integration enhances performance, the question of what drives internal integration seems a logical one for all researchers and managers. Analysis of this problem indicates that the main factors of change in internal integration are structural recovery, the organization's culture, incentives, and communication. Rybakov (2018) argues that process optimization results in better outcomes than functional optimization, which highlights the importance of the integration of functions.

Internal integration is linked to partnerships between enterprise units, while external integration deals with relationships between the company and its partners, suppliers, and customers. The external integration of a firm is often described as the collaboration or cooperation between the firm and the suppliers or customers (Baranyai *et al.*, 2012; Verdonck *et al.*, 2013; Li *et al.*, 2017; Boyce and Mundy

2017). This cooperation may also relate to the competitors; this phenomenon is called then cooptation (Cygler and Sroka, 2017; Cygler *et al.*, 2018; Kliestik *et al.*, 2018; Dabija *et al.*, 2017).

Researchers investigated the relationship between customer integration and business/operational performance; they obtained results with positive Homburg and Stock (2004) or negative Boon-Itt and Yew Wong (2011) relationships. Likewise, supplier integration and business or operational performance publications have come to different conclusions, finding positive Ragatz *et al.* (2002) or negative Azadegan (2011) relationships between the two factors. Measurement of business performance is varied in the logistics literature when integration is discussed. There are operational performance factors such as quality, delivery, cost effectiveness, innovation and service level; and business performance indicators such as profitability, liquidity, ROA, ROI, market share and products sold (Schoenherr and Swink, 2012; Flynn *et al.*, 2010).

According to Ashenbaum and Maltz (2017), integration can be achieved through formal integrative efforts and informal integration efforts. In their study, purchasing managers liked formality, while logistic managers favoured informal integration efforts. Analysis in scientific publications of the relationship between SCI and company performance is based on several organizational theories. Studying the literature, Leuschner *et al.* (2013) differentiates primary theories (the resource-based view, resource-advantage theory, and the relational view) and secondary theories (the knowledge-based view, social exchange theory, transaction cost economics and information processing theory).

Provided SCI has an impact on a company's performance, this research mainly relies on the information processing theory Galbraith (1974) where information passes across corporate boundaries. This information movement results in intensified relationships that create concerted actions and result in better performance and new, marketable products.

SEM has been applied in supply chain management research to test theoretical models to analyse complex relationships combining measurement models and structural models in a statistical test. Our theoretical model is based on papers using SEM to evaluate internal integration factors, external integration factors and performance (Enz and Lambert, 2015; Srinivasan and Swink, 2015).

Five-item Likert scales Ashenbaum and Terpend (2010), Grawe *et al.* (2012), Oflaç *et al.* (2012), Leuschner *et al.* (2012) are popular in SCM research to collect data for SEM. A seven-point Likert scale was applied to measure the opinion of respondents on the relationships between factors, where a rating of 1 meant strongly disagree, 4 indicated a neutral position and 7 meant strongly agree. The sample sizes of SEM in supply chain studies vary greatly, from 57 to 342 in the following papers: Leuschner and Lambert (2016), Gligor (2014), Grawe *et al.* (2015), Ashenbaum and Maltz

(2017). Our sample size is relatively small in comparison with the others, however, the ratio of companies answering questionnaires was high. There are production companies in the region and the logistics managers of firms answered questionnaires. The original intention was to contact logistic managers personally, but due to the managers' lack of time most interviewees were questioned over the phone.

3. Research Methodology

The Hungarian Central Statistical Office database was used to select firms for the research. Budapest-based companies in the processing industry, employing more than 199 people were selected. Budapest, the capital of Hungary, has about 2 million inhabitants, which is approximately one fifth of the country's population, and the density of enterprises is the highest in this area. The data collection was done by telephone and personally. The number of Budapest-based companies was 76, of which 10 companies had to be omitted from the sample because they could not answer all the important questions. Thus, our sample covers $52/76 = 68\%$ of the sampling frame.

The questionnaire was constructed based on the literature, relying heavily on the publication of Boonitt and Paul (2005). The questionnaire consisted of seven scales. Five scales – each of which consisted of seven items – intended to measure the integration of the logistics function with one of the following other functions: production, procurement, sales, human resources, and accounting & finance. The two remaining scales were constructed of eight items each, to estimate the integration between the respondent organisation's logistic function and external suppliers and buyers.

Scale reliability was tested with Cronbach's alpha, and was found to be exceptionally reliable for every case, with the only exception being PD, which, however, is still acceptable (Table 1). The reliability measure could be increased by deleting a single item (the item to be deleted and the reachable Cronbach's alpha is in parentheses) in the case of PD (PD1, 0.747), PC (PC7, 0.925), HR (HR1, 0.919), SU (SU1, 0.857; SU4, 0.857), and CU (CU4, 0.924), but all these available increases are below 0.010, thus we decided not to delete any variable for this reason.

Table 1. Results of scale reliability analysis

Internal integration measures			External integration measures		
Integration and...	between logistics	α	Integration and...	between logistics	α
production (PD)		0.745	suppliers (SU)		0.856
procurement (PC)		0.922	customers (CU)		0.916
sales (SL)		0.924			
human resources (HR)		0.917			
accounting and finance (AF)		0.898			

overall internal	0.932	overall external	0.917
		overall total	0.946

Note: $N = 52$

Source: Authors' own composition.

The only company information involved in the analyses are three measures of performance (these were taken from the public annual accounts of the organizations): the ROS (Return on Sales), the ROE (Return on Equity), and the ROA (Return on Assets). We included these profitability ratios from three years, 2014, 2015, and 2016.

The methods selected to analyse our data are the following. To test if the integration of the logistics function with any other functions investigated is connected to organizational profitability (H11-H17) we employ four analyses. Through the first three analyses ROS, ROE and ROA are computed as three-year averages.

First, rank correlations are calculated between item and scale values (scale values are calculated as the mean value of the items belong to the given scale) and the three profitability ratios. *Second*, exploratory factor analysis is used instead of computing the means of scale items to reveal the latent factors of integration between logistics and other functions, as well as between logistics and internal or external partners. Then, linear correlation and rank correlation analyses test the relationship between integration and profitability. *Third*, linear regression analysis is employed to test the connection between the previously identified factors of logistics' integration (as independent variables) and profitability ratios (as dependent variables) *in the presence of the other factors*. *Fourth*, the structural equation model (SEM) is employed to test not only the direct but also the indirect connections between the constructs of integration and the construct of profitability. Based on the literature discussed above, we constructed a theoretical model for the SEM (Figure 1).

Because the regional, the sectoral, and the staff size effects are controlled as much as possible during the sampling process, and that the profitability variables are ratios compared to other corporate-size aspects (assets, sales, equity) – as well as to the relatively small sample size – our analyses will not involve additional organizational variables.

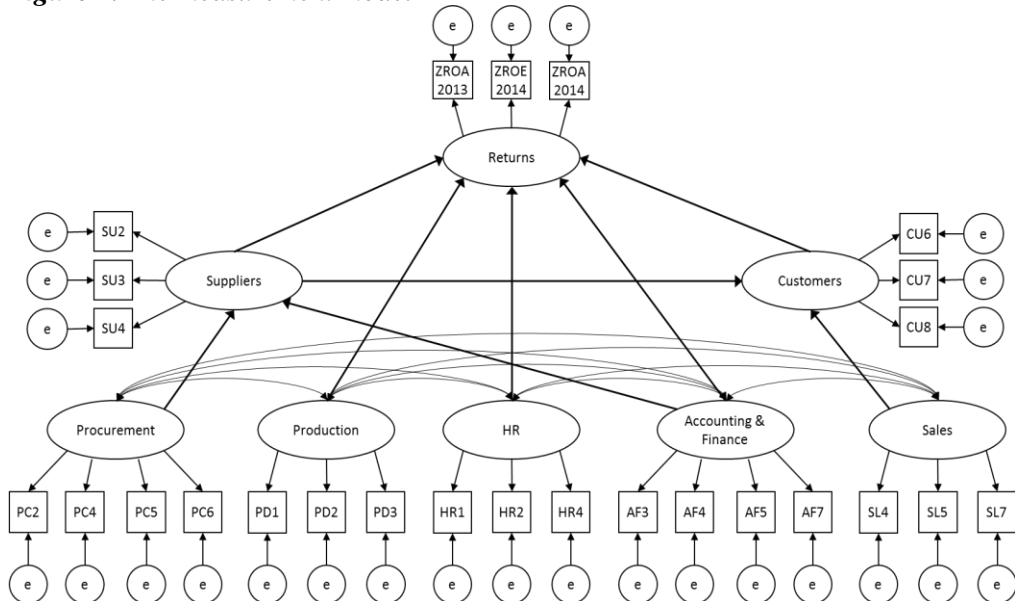
4. Results

4.1 Rank-Correlation Analysis

Before the main test with SEM, some basic measures of connections between dependent and independent variables are performed using bivariate Spearman rank correlation analysis. Rank correlation analysis between variables of integration and profitability shows that there are positive relationships between performance measures and some, but not all, of the questionnaire items. One can note that none of

the items measuring the strength of integration between logistics and sales shows a connection to any of the performance measures. Integration between logistics and production, as well as between logistics and procurement, are rank correlated to performance measures only in two cases each.

Figure 1. The measurement model



Source: Authors' own composition.

On the contrary, the logistics function's integration with HR and with accounting and finance provides a relatively high number of significant correlations (nine items in the case of HR and ten in the case of accounting and finance, i.e., around 43-48% of the possible cases). Integration with external suppliers and consumers have 11 (39%) and 7 (2%) significant rank correlations, respectively, although items about integration with buyers seems to be connected only to the Return on Equity (with only one exception).

Thus, based on these bivariate results, we can guess that profitability seems to be positively connected to integration between the logistics function and HR, accounting and finance, and external suppliers and consumers, while logistics' integration with production, procurement and sales seems to be unrelated (or at least not consequently related) to them. One also must note that integration between logistics and production does show both a significantly positive and a significantly negative rank correlation with the measures of profitability.

Looking from the side of profitability measures, ROE seems to be the most connected to the integration of logistics. There are 19 significant such kinds of relationships, 11 of them appearing when one investigates the integration with

external partners. ROS is related to 12 items about integration (2 about external connections), and ROA has revealed 10 cases of rank correlation (half of them with external partners).

Every significant rank correlation coefficient is weak or moderate in strength (the absolute value is between 0.274 and 0.462).

4.2 Factor Analysis

The factor analysis (principal component method, varimax rotation with Kaiser normalisation) was performed separately on the items measuring internal and external integration. The investigation into internal integration reveals that to get back the five, one must remove some items from the scales.

Table 2. Correlation analysis between factors of integration and profitability ratios

Item	Linear correlation			Spearman's rank correlation		
	ROS	ROE	ROA	ROS	ROE	ROA
PD	-0.312*					
PC				0.258		
SL						
HR	0.303*	0.346*		0.276*	0.311*	
AF	0.334*		0.295*	0.315*		0.274*
SU	0.324*	0.381**	0.343*	0.250	0.260	0.244
CU		0.252			0.311*	

Note: $N = 52$. * significant at the 5% level, ** significant at the 1% level. Coefficients in italic are significant at the 10% level.

Source: Authors' own composition.

Factor analysis of the items about external integration reveals that the scales fit the intentional constructs reasonably well, and there is no need to remove any of the items.

The factors developed as described above show bivariate linear and rank correlations with the three profitability measures, as shown in Table 2. The results support the positive (bivariate) relationship of profitability with the strength of integration between the logistics and the HR, as well as between the logistics and the accounting & finance functions. If logistics is more integrated with the external supplier this also seems to predict higher profitability, although it is only supported by Pearson correlations (Spearman's correlation coefficients are significant only at the 10% level).

4.3 Regression Analysis

Linear regression analyses were performed to test the relationship of the factors introduced above to each of the three dependent variables in the presence of the

other factors (Table 3). In these multivariate models four factors show a significant relationship with at least one profitability measure: PD (negative relationship with ROS), HR (positive, ROS), AF (positive, ROS), and SU (positive, ROE).

Table 3. Correlation analysis between factors of integration and profitability ratios

Independent	Dependent ROS		ROE		ROA	
	B	<i>t</i>	B	<i>t</i>	B	<i>t</i>
Constant	0.053	6.540**	0.131	4.962**	0.061	6.462**
PD	-0.022	-2.467*	-0.006	-0.218	-0.001	-0.136
PC	0.011	1.271	-0.020	-0.675	0.000	-0.026
SL	-0.005	-0.577	-0.042	-1.533	-0.002	-0.173
HR	0.019	2.275*	0.053	1.898	0.012	1.210
AF	0.019	2.030*	-0.028	-0.910	0.013	1.171
SU	0.008	0.814	0.098	3.013**	0.017	1.495
CU	0.001	0.153	0.054	1.807	0.003	0.296
<i>F</i>	3.489**		3.040*		1.365	
adjR ²	0.255		0.219		0.048	

Note: *N* = 52. * significant at the 5% level, ** significant at the 1% level. Coefficients in italic are significant at the 10% level.

Source: Authors' own composition.

According to the findings, the seven factors of the integration of the logistics function together are significantly capable of predicting about 26% of the variance of the 3 year mean of ROS, and about 22% of the variance of the 3 year mean of ROE, but the mean of ROA shows no significant relationship with the linear model of the factors mentioned. If logistics is more integrated with HR, accounting & finance, as well as with the external suppliers, the profitability measures (ROS, ROE) tend to appear along with higher profitability relative to revenues and equity, while a logistics function more integrated with production tends to show up in organisations with lower ROS.

4.3.1 SEM

To meet the strict requirements of structural equation modelling, the dataset should have been reduced to the following variables: PD1, PD2, PD3, PC2, PC4, PC5, PC6, HR1, HR2, HR4, AF3, AF4, AF5, AF7, SL4, SL5, SL7, SU2, SU3, SU4, CU6, CU7, CU8, and the standardised version of ROA2013, ROE2014, ROA2014 (hereafter they are referred to as ZROA2013, ZROE2014, ZROA2014). All the following calculations are implemented on this set of variables.

Building a measurement model based on the survey data

Figure 1 presents the measurement model. Outliers were identified and removed from the database via the calculation of the Mahalanobis distances (at a probability level 0.01). After the removal of one single outlier the sample size decreased to 51.

The only variable that might be suspected of violating the non-multicollinearity assumption is CU6. Its tolerance value is 0.099, while its variance inflation factor (VIF) is 10.074. For the other variables, the second lowest tolerance is 0.127, and the second highest VIF is 7.873 (PC4). The variable set does not seem to violate the homoscedasticity assumption. When comparing dependent to dependent and independent to independent, the sizes of the variances are within an acceptable range. Variances in the questionnaire items in the variable set are between 2.266 and 4.843, and the variances of profitability measures are 1.064 (ZROA2014), 1.135 (ZROA2013) and 1.151 (ZROE2014). The correlation matrix is positively definite (determinant = $4.12(10^{-10})$).

Are there really eight constructs? According to our *a priori* model, we are expecting eight factors (constructs): five about the internal, two about the external integration of logistics, and one about the organisations' financial performance. The factor loadings of the latent variables of integration show the factor loading of the profitability variables.

With the remaining items, construct reliability is tested one more time ($N = 51$). The Cronbach's alpha values show that the construct reliability is not unacceptable (all are above 0.7) for any construct:

- PD (PD1, PD2, PD3): 0.716
- PC (PC2, PC4, PC5, PC6): 0.899
- SL (SL4, SL5, SL7): 0.877
- AF (AF3, AF4, AF5, AF7): 0.851
- HR (HR1, HR2, HR4): 0.87
- SU (SU2, SU3, SU4): 0.706
- CU (CU6, CU7, CU8): 0.895,
- RO (ZROA2013, ZROE2014, ZROA2014): 0.876

The degree of freedom in our model is 276, thus our model is over-identified. Prerequisites on uni-dimensionality are met, where they were applicable (Table 4).

Table 4. Measures of unidimensionality and convergent validity

Construct	df	CMIN	GFI	NFI	CFI	RMSEA	AVE	CR
PD	0	–	–	–	–	–	0.464	0.721
PC	2	1.900	0.980	0.985	1.000	0.000	0.697	0.901
SL	0	–	–	–	–	–	0.710	0.880
AF	2	0.678	0.993	0.992	1.000	0.000	0.596	0.854
HR	0	–	–	–	–	–	0.719	0.883
SU	0	–	–	–	–	–	0.468	0.724
CU	0	–	–	–	–	–	0.759	0.903
RO	0	–	–	–	–	–	0.714	0.881

Note: ** significant at the 1% level. $N = 52$.

Source: Authors' own composition.

Average variance extracted (AVE) and composite reliability (CR) values can be found in Table 4. CR values are always higher than 0.7, but AVE values are slightly below 0.5 in two cases (PD and SU). Still, we accept these, because the CR value is in the acceptable range, and the AVE values are below the expected level by less than 0.04.

Comparing the correlations between the constructs and the average variance extracted for the members of each correlation shows that the discriminant validity of the SEM is established. All the standardized residuals fall between -1.820 and $+1.929$, thus none of them are out of the range of \pm two standard deviations.

4.4 The Structural Model

We have built a composite scale model by introducing the scale means instead of the individual observed variables. To do this, we have calculated the factor loadings and the error variances for each scale. According to the test results, the model fits well: CMIN = 6.190 ($df = 9$, $p = 0.721$), GFI = 0.971, NFI = 0.920, CFI = 1.000, RMSEA = 0.000. Standardized residuals fall between -0.525 and $+1.565$, thus the model seems to estimate accurately.

However, only three of the regression lines out of nine are significant at the 5% level (and two more at the 10% level), thus we can conclude that the theoretical model cannot be supported by our dataset. On the other hand, our SEM model was still able to support some of the findings from the previous (rank correlation, linear regression) tests, as we found that the integration between logistics and HR, as well as between logistics and external suppliers can positively influence profitability. We have also identified a positive significant impact of the integration of logistics and external suppliers on the integration of logistics and external customers. The positive effects of the integration with accounting and finance on the integration with suppliers, and the integration with the sales function on the integration with consumers are also on the borderline of being significant. Figure 2 presents the structural model (constructs only) with the significant regression coefficients.

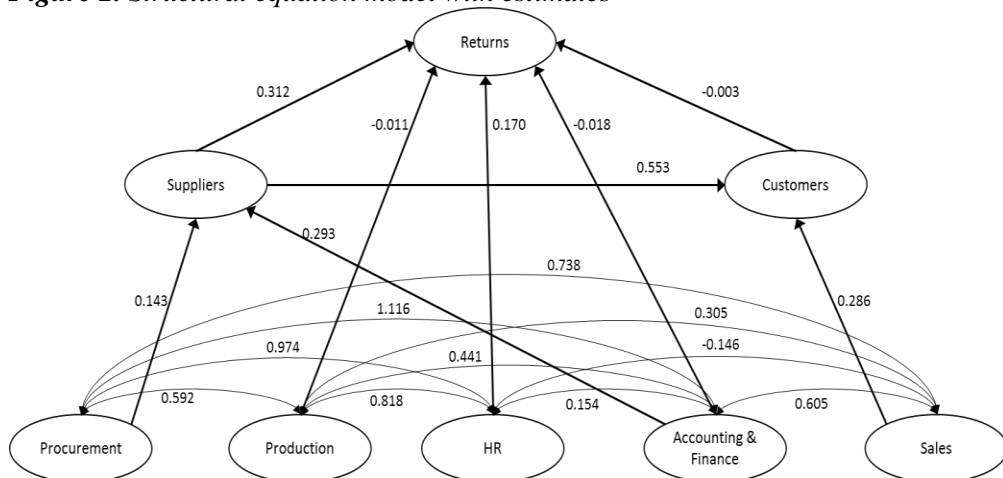
4. Discussion

The integration of the logistics function with procurement, sales, accounting and finance, HR, external suppliers, and external customers showed a significant positive rank correlation with one or more profitability ratios on the scale level (the scale value was computed as the mean of the scale items). The integration with accounting and finance, HR, and external suppliers showed the greatest number of the relationship mentioned.

When employing factors instead of means of items, the integration with HR, accounting and finance, and external suppliers showed a positive significant linear correlation with one or more profitability measures, while integration with

production showed a negative one. Rank correlation was also calculated in the same context. Here, the integration with HR, accounting & finance, and external customers was positively linked to profitability ratios.

Figure 2. Structural equation model with estimates



Source: Authors' own composition.

With regression analysis, where all the integration factors were involved in the same three models, only the integration with HR and external suppliers showed negative and positive effects (respectively) on profitability (ROS), and integration with external customers seemed to have a positive impact on ROE.

The most complex analysis, SEM, proved to be unsuccessful in supporting the theoretical model. However, it still produced useful insights into the connections between the constructs. The positive contributions of integrating logistics and HR, as well as logistics and external suppliers were significant. Above this, a positive effect of the integration between logistics and suppliers on the integration between logistics and customers was also found to be significant. In addition, we found some significant relationships between the integration of logistics with production and HR, accounting and finance and procurement, HR and procurement, and accounting & finance and HR (all are positive).

5. Conclusions and Future Research

In many cases, the research did not reveal any significant correlation between the variables, so we could only partially justify our preliminary examination assumptions. This may be due to the relatively low sample size. By studying the literature, we can conclude that SEM analysis is usually performed on a larger sample. In our case, the low sample size is attributable to the small base population, because there are few production companies in the area that are large enough to be organized into independent functions. Another reason may be the willingness of

logistics managers to devote enough time and effort to answering questions. As leaders receive several questionnaires from different organizations, they are not motivated to collaborate in surveys.

To have a better research result and to deepen the understanding of the importance of integration in supply chains and logistics the following questions may be significant in future investigations.

- What are the most relevant questions when integration is researched?
- How can the correctness of the answers of our interviewees in logistics and SCM research be increased?
- In this study, financial performance indicators, ROS, ROE and ROA were used to test the integration of functions. Might other indicators measure the level of integration in business organizations more appropriately?

Funding: The project was funded under the program of the Minister of Science and Higher Education titled “Regional Initiative of Excellence” in 2019–2022, project number 018/RID/2018/19, the amount of funding PLN 10 788 423,16.

References:

- Adolfo C.M., Bianchi, C., Gupta, J. 2004. Operational and financial effectiveness of e-collaboration tools in supply chain integration. *European Journal of Operational Research*, 159(2), 348-363.
- Alan, M.W., Robinson, L.J., Bernardes, E., Webb, G.S. 2014. The relationship between strategic supply chain integration and performance: a meta-analytic evaluation and implications for supply chain management research. *Journal of Business Logistics*, 35(1), 71-96.
- Alexandre, M.R., Stank, P.T., Lynch, F.D. 2004. Linking strategy, structure, process, and performance in integrated logistics. *Journal of Business Logistics*, 25, 65-94.
- Antonio, L.K.W., Tang, E.C.M., Yam, R. 2010. Effects of supplier and customer integration on product innovation and performance: empirical evidence in Hong Kong manufacturers. *Journal of Product Innovation Management*, 27 (5), 761-777.
- Arash, A. 2011. Benefiting from supplier operational innovativeness: the influence of supplier evaluations and absorptive capacity. *Journal of Supply Chain Management*, 47(2), 49-64.
- Baranyai, Z.S., Vasa, L., Gyuricza, C.S. 2012. Moral hazard problem and cooperation willingness: some experiences from Hungary. *Actual Problems of Economics*, 138 (12), 301-310.
- Boonitt, S., Chee, Y.W. 2011. The moderating effects of technological and demand uncertainties on the relationship between supply chain integration and customer delivery performance. *International Journal of Physical Distribution Logistics Management*, 41(3), 253-276.
- Boonitt, S., Himangshu, P. 2005. Measuring Supply Chain Integration-Using the Q-Sort Technique. *Research methodologies in supply chain management*, 47-58, Physica-Verlag HD.

- Bryan, A., Maltz, A. 2017. Purchasing-logistics integration and supplier performance: An information-processing view. *The International Journal of Logistics Management*, 28(2), 379-397.
- Bryan, A., Terpend, R. 2010. The purchasing-logistics interface: A “scope of responsibility taxonomy. *Journal of Business Logistics*, 31(2), 177-194.
- Colin B.G., Agnihotri, R., Moberg, R.C. 2014. Collaborative communication between sales and logistics and its impact on business process effectiveness: A theoretical approach. *Journal of Marketing Channels*, 21(4), 242-253.
- Contreras, H.H., Nuno, P., Porras, E., Zeleya, E. 2013. Strategically simulating proper distribution. *Industrial Management*, 55(4), 22-27.
- Cousins, P.D., Bulent, M. 2006. The implications of socialization and integration in supply chain management. *Journal of Operations Management*, 24(5), 604-620.
- Dabija, Dan-Cristian, Cătălin Postelnicu, Vasile Dinu, Alin Mihăilă. 2017. Stakeholders’ perception of sustainability orientation within a major Romanian University. *International Journal of Sustainability in Higher Education*, 18(4), 533-553.
- Dmitriy, R.S. 2018. A process model of a logistics system as a basis for optimisation programme implementation. *International Journal of Logistics Research and Applications*, 21(1), 72-93.
- Donald, B., Closs, D.J.P., Stank, T. 1999. 21st century logistics: making supply chain integration a reality. United States: Council of Logistics Management, Oak Brook, IL.
- Douglas M.L., García-Dastugue, J.S., Croxton, L.K. 2008. The role of logistics managers in the cross-functional implementation of supply chain management. *Journal of Business Logistics*, 29(1), 113-132.
- Dunay, A., Lehotá, J., Mácsai, É., Illés, B.C.S. 2018. Short Supply Chain: Goals, Objectives and Attitudes of Producers *Acta Polytechnica Hungarica*, 15(6), 199-217.
- Enz, M.G., Douglas, L. 2015. Measuring the financial benefits of cross-functional integration influences management's behavior. *Journal of Business Logistics*, 36(1), 25-48.
- Finley, F., Sanjay, S. 2005. 7 imperatives for successful collaboration. *Supply Chain Management Review*, 9(1), <https://www.library.northwestern.edu/find-borrow-request/requests-interlibrary-loan/lending-institutions.html>.
- Flynn, B.B., Baofeng, H., Xiande, Z. 2010. The impact of supply chain integration on performance: a contingency and configuration approach. *Journal of Operations Management*, 28(1), 58-71.
- Gary L.R., Handfield, B.R., Petersen, K.J. 2002. Benefits associated with supplier integration into new product development under conditions of technology uncertainty. *Journal of Business Research*, 55(5), 389-400.
- Gligor, D.M. 2014. A cross-disciplinary examination of firm orientations’ performance outcomes: the role of supply chain flexibility. *Journal of Business Logistics*, 35(4), 281-298.
- Gonzalez-Zapatero, C., Gonzalez-Benito, J., Lannelongue, G. 2017. Understanding how the functional integration of purchasing and marketing accelerates new product development. *International Journal of Production Economics*, 193, 770-780.
- Homburg, C., Ruth M.S. 2004. The link between salespeople’s job satisfaction and customer satisfaction in a business-to-business context: a dyadic analysis. *Journal of the Academy of Marketing Science*, 32(2), 144.
- Jay, G.R. 1974. Organization design: An information processing view. *Interfaces*, 4(3), 28-36.

- Jesus, M.S., Revilla, E., Knoppen, D. 2014. Absorptive capacity in buyer–supplier relationships: empirical evidence of its mediating role. *Journal of Supply Chain Management*, 50(2), 18-40.
- Joanna, C., Sroka, W. 2017. Coopetition disadvantages: The case of the high tech companies. *Engineering Economics*, 28(5), 494-504.
- Joanna, C., Sroka, W., Solesvik, M., Dębowska, K. 2018. Benefits and drawbacks of coopetition: The roles of scope and durability in coopetitive relationships. *Sustainability*, 10(8), 2688.
- Jung, H., Bongju, J. 2005. Decentralised production-distribution planning system using collaborative agents in supply chain network. *The International Journal of Advanced Manufacturing Technology*, 25(1-2), 167-173.
- Kliestik, T., Kovacova, T., Podhorska, I., Kliestikova, J. 2018. Searching for key sources of goodwill creation as new global managerial challenge. *Polish Journal of Management Studies*, 17, 144-154.
- Kliestik, T., Misankova, M., Valaskova, K., Svabova, L. 2018. Bankruptcy prevention: new effort to reflect on legal and social changes. *Science and Engineering Ethics*, 1-13.
- Kovács, G.Y., Kot, S. 2017. Economic and social effects of novel supply chain concepts and virtual enterprises. *Journal of International Studies*, 10(1), 237-254.
- Kozma, T. 2017. Cooperation in the supply chain network. *Forum Scientiae Oeconomia*.
- Li, Q.Z., Fan, X.W., Huang, W.J., Kwangseek, C. 2017. Collaborative supply model and case simulation in a two-level assemble-to-order system in the context of global purchasing. *International Journal of Simulation Modelling*, 16(3), 471-483.
- Lim, Seok Jin, Suk Jae Jeong, Kyung Sup Kim, Myon Woong Park. 2006. A simulation approach for production-distribution planning with consideration given to replenishment policies. *The International Journal of Advanced Manufacturing Technology*, 27(5-6), 593-603.
- Oflaç, B.S, Sullivan, U.Y., Baltacıoğlu, T. 2012. An attribution approach to consumer evaluations in logistics customer service failure situations. *Journal of Supply Chain Management*, 48(4), 51-71.
- Oláh, J., Karmazin, G.Y., Farkasné Fekete, M., Popp, J. 2017. An examination of trust as a strategic factor of success in logistical firms. *Business: Theory and Practice*, 18, 171-177.
- Oláh, J., Karmazin, Gy., Pető, K., Popp, J. 2018. Information technology developments of logistics service providers in Hungary. *International Journal of Logistics Research and Applications*, 21(3), 332-344.
- Promise, O.A., Madichie, O.N. 2017. Accounting-marketing integration dimensions and antecedents: insights from a frontier market. *Journal of Business Industrial Marketing*, 32(8), 1144-1158.
- Ravi, S., Swink, M. 2015. Leveraging supply chain integration through planning comprehensiveness: An organizational information processing theory perspective. *Decision Sciences*, 46(5), 823-861.
- Rudolf, L.M., Lambert, D. 2016. Establishing logistics service strategies that increase sales. *Journal of Business Logistics*, 37(3), 247-270.
- Rudolf, L.M., Lambert, D., Knemeyer, A.M. 2012. Logistics performance, customer satisfaction, and share of business: a comparison of primary and secondary suppliers. *Journal of Business Logistics*, 33(3), 210-226.
- Rudolf, L., Rogers, D.L., Charvet, F.F. 2013. A meta-analysis of supply chain integration and firm performance. *Journal of Supply Chain Management*, 49(2), 34-57.

- Scott, J.G., Daugherty, J.P., Dant, P.R. 2012. Logistics service providers and their customers: gaining commitment through organizational implants. *Journal of Business Logistics*, 33(1), 50-63.
- Scott, J.G., Daugherty, J.P., Ralston, P.M. 2015. Enhancing dyadic performance through boundary spanners and innovation: An assessment of service provider–customer relationships. *Journal of Business Logistics*, 36(1), 88-101.
- Shawnee, V.K., Jayaram, J., Droge, C., Calantone, R. 2003. The effects of an integrative supply chain strategy on customer service and financial performance: an analysis of direct versus indirect relationships. *Journal of Operations Management*, 21(5), 523-539.
- Slusarczyk, B.K., Smolag, S.K. 2016. The supply chain of a tourism product. *Actual Problems of Economics*, 179(5), 197-207.
- Soo Wook, K. 2009. An investigation on the direct and indirect effect of supply chain integration on firm performance. *International Journal of Production Economics*, 119(2), 328-346.
- Sriram, N., Jayaraman, V., Luo, Y., Swaminathan, J.M. 2011. The antecedents of process integration in business process outsourcing and its effect on firm performance. *Journal of Operations Management*, 29(1-2), 3-16.
- Szegedi, Z., Illés, B.C.S. 2007. Logistics and Supply Chain Management for Hungarian Mid-Size Companies: Effect on Competitiveness. In: Jayachandran, C, Okachi, K. (eds.) *Creativity and Innovation: Imperatives for Global Business and Development: Proceedings of the 10th International Conference of the Society for Global Business and Economic Development*. Center for International Business, School of Business, Montclair State University, 2518-2530.
- Theodore, S.P., Keller, B.S., Closs, D.J. 2001. Performance benefits of supply chain logistical integration. *Transportation Journal*, 41(2), 32-46.
- Tiron-Tudor, A., Nistor, C.S., Ștefănescu, C.A. 2018. The Role of Universities in Consolidating Intellectual Capital and Generating New Knowledge for a Sustainable Bio-Economy. *Amfiteatru Economic*, 20(49), 599-615.
- Tobias, S., Swink, M. 2012. Revisiting the arcs of integration: Cross-validations and extensions. *Journal of Operations Management*, 30(1-2), 99-115.
- Vasa, L., Baranyai, Z.S., Kovacs, Z., Szabó, G.G. 2014. Drivers of trust: some experiences from Hungarian agricultural cooperatives. *Journal of International Food Agribusiness Marketing*, 26(4), 286-297.
- Verdonck, L., Caris, N.A., Ramaekers, K., Janssens, K.G. 2013. Collaborative logistics from the perspective of road transportation companies. *Transport Reviews*, 33(6), 700-719.
- Wesley, B.S., Mundy, R.A. 2017. Practice or lip service: exploring collaboration perspectives in purchasing. *IMP Journal*, 11(3), 452-467.
- Wong, C., Yew, S., Boonitt, S., Wong, C. 2011. The contingency effects of environmental uncertainty on the relationship between supply chain integration and operational performance. *Journal of Operations Management*, 29(6), 604-615.
- Xenophon, K., Vonderembse, M., Jayaram, J. 2005. Internal and external integration for product development: the contingency effects of uncertainty, equivocality, and platform strategy. *Decision Sciences*, 36(1), 97-133.
- Xiande, Z., Huo, B., Flynn, B.B.J., Hoi, Y.Y. 2008. The impact of power and relationship commitment on the integration between manufacturers and customers in a supply chain. *Journal of Operations Management*, 26(3), 368-388.