

APPLICATION OF THE SUPPLY CHAIN PRACTICE IN AGRO- FOOD COMPANIES

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ABSTRACT

Good supply chain practices are fundament for achievement of better competitive position and improvement the company performance. Good business practices enhance partner relationships with customers and suppliers. By building good partnership relationships companies get the necessary information from the customers which products they want from the suppliers what materials and raw materials are available to the company. In this way, companies through the supply chain practice improve their business.

This paper shows how the characteristics of companies in the field of the agro-food industry affect the supply chain practice. The Supply Chain Practices are measured by 16 statements that are factorized by factor analysis in four factors corresponding to the defined dimensions of supply chain practices. A total of 149 companies completed a survey questionnaire foreseen for this survey. The results of the hypothesis test using multivariate analysis of variance (MANOVA) showed that the number of employees, sales revenues and the possession of quality certificates significantly affect the supply chain practice. These results were confirmed by variance analysis (ANOVA) where the relationship between the enterprise and individual dimensions of supply chain variables was investigated.

Keywords: Supply Chain Practice, Basics of Company Characteristics, MANOVA, ANOVA.

JEL: Q11, C38, C39.

تطبيق ممارسة سلسلة التوريد في الشركات للزراعة والأغذية

ملخص

تعتبر ممارسات سلسلة التوريد الجيدة أساسية لتحقيق وضع تنافسي أفضل وتحسين أداء الشركة. تعزز ممارسات الأعمال الجيدة علاقات الشركاء مع العملاء والموردين. من خلال بناء شركات علاقات شراكة جيدة نحصل على المعلومات الضرورية من

العملاء عن المنتجات التي يريدونها من الموردين، وما هي المواد والمواد الأولية المتوفرة للشركة. وبهذه الطريقة، تعمل الشركات من خلال ممارسة سلسلة التوريد على تحسين أعمالها. تعرض هذه الورقة كيف خصائص الشركات في مجال صناعة الأغذية الزراعية تؤثر على ممارسة سلسلة التوريد. يتم قياس ممارسات سلسلة التوريد بـ 16 عبارة يتم تحليلها بواسطة تحليل العوامل في أربعة عوامل تقابل الأبعاد المحددة لممارسات سلسلة التوريد. أكملت 149 شركة استبيان المسح المتوقع لهذا المسح. أظهرت نتائج اختبار الفرضيات باستخدام تحليل التباين متعدد المتغيرات (MANOVA) أن عدد الموظفين وعائدات المبيعات وحياسة شهادات الجودة تؤثر بشكل كبير على ممارسة سلسلة التوريد. تم تأكيد هذه النتائج من خلال تحليل التباين (ANOVA) حيث تم التحقيق في العلاقة بين المؤسسة والأبعاد الفردية لمتغيرات سلسلة التوريد.

الكلمات الرئيسية: ممارسة سلسلة التوريد، أساسيات خصائص الشركة، MANOVA ، ANOVA

Introduction

In order for the company to maintain high competitiveness and performance while at the same time achieving sustainable profit growth ,it is necessary to build relationships with suppliers ,customers and other suppliers in the supply chain .This can be achieved by applying different practices in supply chain management) Kim.(2006 , Developing long-term partnerships with key participants in the supply chain enables the company to maintain and improve its competitiveness .It is important for companies to understand how the supply chain practice affects competitiveness .The supply chain's benefits have a dual purpose :improving company performance and improving supply chain performance) Wong ,et al.(1999 ,

Supply chain management companies must involve suppliers and customers in order to facilitate decision-making ,information sharing ,and return management .In this way ,information is provided to help the company adapt production and produce according to the market demands .Continuous adaptation to product and service market requirements enables companies to be better than competitors.

In order to apply enterprise supply chain practices ,it is necessary to integrate all the activities that help the company to efficiently manage business processes ,especially business processes within the supply chain .Companies thus have certain advantages over competitors .The application of supply chain practice has the effect of developing good business relationships with customers and suppliers through mutual integration .Companies from their customers get the information they want ,and with suppliers they customize the products according to their desires.

When we look at supply chain practices ,it is important to mention the social dimension .The social dimension is reflected by establishing partnerships with key partners within the supply chain .Through the social dimension

of supply chain practice ,it enables companies to improve their business by involving partners in the supply chain .There is no single pattern how the supply chain practice in companies should be applied .Each company needs to adapt business practices ,and it is possible to use different dimensions of supply chain practice.

2 .Literature review

Enterprises are under pressure from competition due to the globalization process.It needs to use innovative methods for cost reduction ,manage shorter product life cycles ,adapt to market demands and improve product quality and overall enterprise .Supply chain practices enable companies to compete in the market with a big competition(Singh ,et al.)2010 ,

For this reason ,there are various supply chain practices that depend on various factors such as :types of industry, company activities ,product type and level of integration with partners) Hsu ,et al .(2014 ,In this way ,the main supply chain objective is realized to develop intra and inter-organizational partnerships through information sharing and co-ordination in order to exploit the individual characteristics of partners within the supply chain.

Previously conducted studies have followed the supply chain practice with different dimensions .Ince ,et al. (2014)have taken the following dimensions to determine supply chain practice :strategic relationships with suppliers ,partnerships with customers ,and level of quality and sharing of information .Toyin (2012) has used the following dimensions of supply chain practice :partnerships with suppliers ,partnerships with customers ,level of information sharing ,and postponement.Sukati ,et al (2012) .used the following dimensions :partnerships with suppliers ,partnerships with customers ,and sharing of information .Jabbour ,et al (2011) .used the following dimensions :supply chain integration ,information sharing ,customer service management ,partnerships with customers ,partner relationships with suppliers ,and postponement .Miguel and Brito (2011) used the following dimensions :sharing information ,long-term partnerships ,collaboration and process integration.

Flynn ,et al (2010) .has used the following dimensions of supply chain practice :internal integration ,customer integration ,and integration with suppliers .Zhou ,et al (2014) .has observed the supply chain practice with the dimension :procurement and delivery practice .Mzoughi ,et al (2008) .and Li ,et al (2005 ,2006) .included the quality of information in the supply chain practice.

Mzoughi ,et al ,(2008) .besides the level of information quality ,also used the following dimensions of supply chain practice :partnerships with the supplier ,partnerships with customers ,and sharing of information .Li ,et al. (2006)used the following dimensions of supply chain practice :strategic partnerships with suppliers ,customer

relations ,information sharing level ,information sharing and postponement quality ,and in 2005 in addition to these dimensions ,the dimension of internal lean practice),Li ,et al .(2005 ,,Bayraktar ,et al(2009) .has used the following dimensions of supply chain practice :strategic collaboration and lean practice ,practice of choice of suppliers and procurement practices .Barman ,et al (2008) .have used the following dimensions :strategic partnerships with suppliers ,partnerships with customers ,level of information sharing ,quality of information sharing ,delay and internal lean practice.

As can be seen from the aforementioned papers ,different dimensions of supply chain practice have been used, which include strategic relationships through establishment of co-operation with suppliers and customers as well as operational relationships of internal practice and postponement .Through the establishment of strategic relationships with key vendors and customers ,the key level and quality of information sharing is high .Therefore ,in this paper ,as a dimension of supply chains practices ,we took :partnerships with suppliers ,customer relations ,internal integration and the level and quality of information sharing.

2.1 .Partnership with suppliers

When establishing co-operation with suppliers ,short-term co-operation should be initiated ,this can eventually lead to long-term cooperation .It is better for both companies to become partners and long-term cooperation should be based on partnerships .Building partnerships contributes to the supplier and the company .The supplier has a permanent customer and does not have to worry about product placement while the company gets a partner who can assist it in all supply chain processes.

Strategic relationships with suppliers are defined as long-term relationships between companies and suppliers(Prajogo ,et al .(2012 ,Establishing long-term relationships is important to the company ,as it helps to respond to the dynamic and unpredictable changes that arise in the business environment) Hoyt and Huq, .(2000Partner relations with suppliers help the company to leverage its strategic and operational capability and achieve cost reduction.Long-term partnerships between companies and suppliers improve mutual relationships ,sharing the risks and rewards resulting from this relationship .Through mutual planning and problem solving ,the business will be improved and the relationship will be held for a longer period of time) Chen ,et al, ,2004Li et al.(2007 ,.

The company's partner relationships with suppliers allow it to work efficiently with several key vendors who are willing to share responsibility for product success) Li et al .(2006 ,,Suppliers provide the best materials and

raw materials ,and provide technology that helps companies to design their products .This way ,suppliers are actively involved in product and service development.

Working with the supplier together ,the company can eliminate unnecessary costs and shorten the time for some operations to increase the performance of the supply chain .The development of partnerships with suppliers enables the company to improve the specifics of the business area.

The key responsibility of the procurement manager is to monitor and evaluate the effects of suppliers in order to establish long-term partnership relationships) Prajogo ,et al .(2012 ,Partnership-based on strategic partnerships should be built on mutual trust between partners.

When establishing partnerships ,it is necessary to build partner trust ,so that processes within the supply chain can work efficiently .Confidence arises when partners in a partnership share information about their interests, goals ,and identities.

2.2 .Partnership with the customers

Customer relations are an essential element of the supply chain) Tracey ,et al ,2005 ,Chavez et al .(2014 ,Customers are the basis for the business of each company .It is very important to build customer relationships with customers in order to improve the business of the company .Partner relations with customers are an essential element for establishing and maintaining links in the supply chain) Day ,2002 ,Tzokas ,et al.(2015 ,The level of trust between the company and the customer has an impact on the efficiency of joint planning ,which improves the functioning of the enterprise .The company ,through joint planning of certain products and/or services ,promotes a supply chain which positively affects the performance of the enterprise) Sukwadi ,et al.(2013 ,

Customer relationships include a whole range of practices that help employees build up long-term customer relationships ,while improving customer satisfaction) Claycomb ,et al .(1999 ,By establishing partner relationships ,the company gets information from" first hand "what customers want and what they need.So they can adapt their requirements and realize sales .Customers through this relationship receive products and/or services tailored to their requirements .This relationship is only possible with the exchange of information between the company and the customer .Establishing long-term customer cooperation improves business ,and customer relationships are important component of supply chain practice) Li ,et al.(2006 ,.

The quality of partnerships is influenced by the risks and uncertainties of the environment) Fynes ,et al.(2004 ,. If the company does not adapt to the external environment and does not reduce the risks and uncertainty in

business it can reduce or interrupt business cooperation. The company must adapt to the environment and apply business ethics and corporate responsibility in business, not only with customers but with other supply chain participants. Unexpected changes require the company to develop the ability to adapt to changing environments. Enterprises need to adapt and change strategies, as the changes in the environment are very frequent and fast) Srinivasan, et al. (2011, .

Customizing customer needs and personalizing services is crucial for survival in the market. In order to apply it, it is necessary to establish good business relationships with all members of the supply chain, including suppliers and customers, and in that way to achieve the successful implementation of the supply chain.

2.3. Internal Integration

Internal integration refers to the co-ordination and co-operation of all organizational parts of the enterprise and to the improvement of the movement of internal information and processes as well as the behavior of employees within the enterprise) Chang, et al. (2016, Internal integration is the degree to which companies forms their organizational strategies, practices and processes) Zhao, et al (2011, to meet customer requirements) Huo. (2012, .

The basic elements of internal integration according to Flynn, et al (2010) .are :exchange of information, joint planning, formation of cross-functional teams and collaborative work of employees. In this way, internal cohesion based on the collaboration of employees within the company will be achieved, what improve the supply chain performance. Earlier research) Follett, 1993, Morash, et al (1997, looked at internal integration through the function of achieving the lowest total costs. However, the goal of internal integration is not to reduce total costs but to establish co-operation and co-ordination with company employees in order to increase productivity and reduce costs. Reducing costs should not be the supply chain goal, but as a consequence of the implementation of good supply chain practice within internal integration.

Christopher and Gattorna (2005) say that internal integration enhances the efficiency of internal activities and processes of an enterprise, which aims to improve operational performance and reduce delivery time, and gets the company's cost advantages. In addition to reducing overall company costs, internal integration also facilitates decision-making processes) Schoenherr and Swink. (2012, .

Internal integrations need not be seen far from external integrations. Stevens (1990) points out those companies must first develop internal integrations, and then only expand these integrations to their business partners.

Internal integration is a prerequisite for the implementation of external integrations .First ,it is necessary to develop and establish internal integrations in the supply chain and to improve teamwork and co-operation between the inter-functional organizational structures of the enterprise ,and then expand cooperation with partners) Zhao ,et al .(2011 ,When establishing a system of internal integrations ,a positive atmosphere will be created in the company and social aspects and teamwork of employees will be developed ,which affects the development of further partnerships outside the enterprise.

2.4 .Level of Information sharing quality

Sharing information is an important dimension during the establishing cooperation in the supply chain and it is in the focus of all supply chain partners) Fawcett et al ,2007 ,Chen et al .(2011 ,Sharing information means distribution of proprietor's and necessary information to partners within the supply chain) Li ,et al.(2005 ,The information that is shared can range from everyday tactical information to strategic information that includes conditions of partner and market as well as .Information obtained from partners should be accurate ,complete and timely.

Ghosh and Fedorowicz (2008) say that information sharing is a relationship that helps build mutual confidence between companies and suppliers and customers over time .Efficient communication between partners allows a better understanding of the other side and contributes to a better partnership) Lee and Kim.(1999 , The exchange of information between partners helps build mutual trust ,thus reducing mutual communication conflicts .With the exchange of information in the supply chain ,trust is raised with partners .Greater exchange reduces risk and uncertainty and increases the level of trust in mutual relationships) Kwon and Suh,2005 , Nyaga ,et al.(2010 ,

The information being shared must be of high quality .Sharing information within the supply chain depends on what information is shared ,how it is shared and shared with whom) Chen ,et al .(2011 ,Information shared among partners must include some of the following aspects :accuracy ,timeliness ,adequacy ,reliability ,credibility and ease of use)Davis .(1989 ,When measuring information quality ,the degree to which information is exchanged between partners and level of information needs should be determined) Zhou ,et al.(2014 ,

If supply chain partners do not have timely information about product or service characteristics ,it is possible to increase transaction costs due to the complexity and uncertainty of information) Hallikas ,et al .(2002 ,The emergence of these complex and uncertain information conflicts with partner relationships within the supply

chain .That is why it is necessary to raise the trust of the partners within the supply chain to a higher level .Companies need to look at information as a strategic tool to ensure that materials and products within the supply chain are minimally late and should be in good condition) Li ,et al.(2006 ,

3. Research Methodology and Hypothesis

The research in this paper was conducted on the companies from the agricultural and food industry in Bosnia and Herzegovina, which represent a basic set of research. According to the Statistics Business Register from 30.06.2016., the total number of companies in the field of the agro-food industry was 1745. Based on the register of business entities, a basic set of companies has been formed and its names are listed in alphabetical order. Based on the list of companies, there was formation of a sample of half of the company (873 companies).

The sample was formed by a random system pattern by taking any odd company into consideration. If it was not possible for one of the companies to ascertain whether or not it was actually doing business and carrying out the activity, the first subsequent company or the first steam company was taken below. In this way a database of the sample of companies was formed. In order to increase the number of responses collected, a combination of different methods of collecting primary data was used: e-mail, telephone contact, personal contact, etc.

Based on the survey conducted between March and September 2016, the total number of online accesses was 509, while the total number of completed questionnaires was 149. Out of a sample of 873 enterprises, 149 completed questionnaires were collected, which is 17.07%, respectively 8.54% of the companies in the basic set. The basic characteristics of the surveyed companies are presented in Table 1.

Table 1. Collective data on basic company characteristics

	Company characteristics	Frequency	%
Size of company	1. micro	24	16.1
	2. small	65	43.6
	3. medium	43	28.9
	4. big	17	11.4
Number of employees	1. 1-9	47	31.5
	2. 10-49	53	35.6
	3. 50-99	19	12.8
	4. 100-199	16	10.7
	5. 200 and more	14	9.4
Age of the company	1. do 1970	15	10.1
	2. 1970-1989	16	10.7
	3. 1990-2010	96	64.4
	4. after 2010	22	14.8

Ownership of company	1. private ownership	145	97.3
	2. government ownership	0	0.0
	3. mixed ownership	4	2.7
Revenue in 2015 (KM)	1. up to 4 million	91	61.1
	2. 4-19 million	34	22.8
	3. 20-99 million	24	16.1
Quality certificates	1. One of mentioned	99	66.4
	ISO 9001	67	45.3
	ISO 14001	18	12.2
	HACCP	78	52.7
	Halal certificate	32	21.6
	Kosher certificate	2	1.4
	Other	17	11.5
	2. No certificate	50	33.6
Basic	1. Food production	61	40.9
	2. Milk and drinks production	25	16.8
	3. Agricultural production	44	29.5
Company Activity	4. Other production	19	12.8

The questionnaire used in the primary research consisted of two parts. In the first part questions are asked about the basic characteristics of the company. In the second part of the survey questionnaire, 16 sets of supply chain practices were set up, to which companies should respond in the range of «generally disagree» to «fully agree». The aim of this study is to find out how enterprise from food companies use supply chain practice and whether the core characteristics of these companies influence the implementation of supply chain practice. Islam, et al. (2011) has proven that a successful business is affected by the characteristics of a company. They have shown that companies that have a greater tradition achieve better results. By studying the characteristics of Ganyaupfu (2013), the Gauteng Province has found that the success of small and medium-sized enterprises is impacted by: age, size, business sector, location, etc. Cooper (1982) has shown that there is a difference between company successes compared to business sector. Kisengo and Kombo (2012) have demonstrated in the example of microcredit organizations in Kenya that the characteristics of companies have an impact on company performance.

There are no significant studies in the literature that study the influence of the company's characteristics on the supply chain practice. It is important to explore which features of an enterprise affect the supply chain practice and competitiveness. This paper will explore how the characteristics of companies in the field of the agro-food industry affect the performance of the supply chain. Since the basics of the company's characteristics have been observed on the basis of six characteristics: size, number of employees, company age, sales revenues, posses-

sion of quality certificates and primary business activities, six hypotheses are mentioned bellow:

- There is a significant statistical difference in the implementation of supply chain practice with the given the size of company.
- There is a significant statistical difference in the implementation of supply chain practice with the given the numbers of employees in company.
- There is a significant statistical difference in the implementation of supply chain practice with the given the age of the company.
- There is a significant statistical difference in the implementation of supply chain practice with respect to sales revenue realized in 2015.
- There is a significant statistical difference in the implementation of supply chain practice with regard to possession of quality certificates.
- There is a significant statistical difference in the implementation of supply chain practice with regard to the primary activity of the company.

Statistical analysis of the data obtained by this research was carried out using the SPSS 20 program tool. The hypothesis testing will be performed at the level of the inferential statistic of 0.05 ($p < 0.05$), meaning that if the significance level is lower than the set level, the hypothesis will be accepted, otherwise we will accept an alternative hypothesis.

The following steps will be used in this paper: Grouping claims through factor analysis, hypothesis testing using MANOVA analysis and analysis of the impact of some basic company characteristics on the application of supply chain practice through ANOVA analysis.

In order to examine the results of the factor analysis, Kaiser-Meyer-Olkin's (KMO) sample adequacy indicators and Bartlett's test of Sphericity will be used. The KMO value moves in a closed range from zero to one. If the value of it is less than 0.6, the correlation matrix is not acceptable for factor analysis. For Bartlett's test it is desirable that the significance level is less than 0.05 ($p < 0.05$). (Puška, et al., 2015). During performing factor analysis, varimax factor rotation and Kaiser's normalization will be used. The reliability of the metric scale of the data collected is examined using Cronbach's alpha coefficient whose results range from zero to one.

If the values of this indicator are close to zero then these data are unreliable, and if they are close to one then they are very reliable (Kozarević and Puška, 2015). To accept a factor, it is necessary that the values of Cronbach's

alpha should be greater than 0.7 (Tavakol and Dennick, 2011). MANOVA is a statistical test for comparing the arithmetic mean variances of several groups, as opposed to the ANOVA analysis that compares variance of the arithmetic meanings for only one group or factor. These analyzes are used to answer the question: Do changes in independent variables have significant effects on changes in dependent variables (Grbić and Puška 2015)? When conducting these analyzes, it will be examined how the basic characteristics of an enterprise influence the supply chain practice.

5. Research results

Before analyzing determined hypothesis, the analysis of the data collected through factor analysis and application of Cronbach's Alpha should be performed. The results of factor analysis (Table 2) have shown that the arguments related to variable supply chain practice are grouped into four statements corresponding to the defined dimensions.

Table 2. Factor analysis

Factors	1	2	3	4
Factor 1. Partnership relation with suppliers (POD) $\alpha = 0.833$, Average = 3.37, SD = 1.07, % Variance = (12.743 (Li, et al. 2006; Chavez, et al. 2014				
We use the supplier's help when solving business problems		825.		
We improve the quality of our products with the help of our suppliers		742.		
We include suppliers in developing new products and business processes in the enterprise		752.		
Together with our suppliers, we are working on improving our business operations		837.		
Factor 2. Partnership relation with customers (POK) $\alpha = 0.790$, Average= 4.19, SD = 0.78, % Variance = (10.378(Li, et al. 2006; Chavez, et al. 2014				
In interaction with customers, we are trying to improve reliability and accountability in business			739.	
With customers we have built a relationship based on mutual trust			634.	
We often measure the degree of satisfaction of our customers			787.	
We are trying to determine future customer expectations			761.	
Factor 3. Internal integration(IIN) $\alpha = 0.687$, Average= 4.14, SD = 0.74, % Variance = 7.192 (Braunscheidela, Suresh, 2009; Danese, et al. 2013)				
In the operation of the supply chain we use information systems				554.
Employees are asked for flexibility, teamwork and encouraging the mutual communication				736.

Different parts of the functional organization work together to improve the supply chain 780.

Coordination of activities is carried out in all plants to minimize unnecessary costs 526.

Factor 4. Level of information sharing quality (NKI) $\alpha = 0.885$, Average = 3.63, SD = 0.86, % Variance = 35.538 (Li, et al. 2006; Liao iKuo, 2014 and Yang, 2014)

Partners share with us the information needed to improve mutual cooperation 861.

Partners share with us key knowledge about the development of our business processes and products 849.

Together with partners, we share information that helps in planning future activities 844.

Communication with our partners is timely, accurate, complete, adequate and reliable 711.

Total variance explained: 65.851%, Kaiser-Meyer-Olkin Measure: 0.849, Bartlett's Test of Sphericity, sig = 0.000

With Factor 4. Level of information sharing quality ($\alpha = 0.885$, Mean = 3.63, SD = 0.86) has been explained the highest variance that is 35.53%, with factor 1. Partnership relation with suppliers ($\alpha = 0.833$, Mean = 3.37, SD = 1.07) has been explained 12.74% of variance, Factor 2. Partnership relation with customers ($\alpha = 0.790$, Mean = 4.19, SD = 0.78) has been explained 10.378% of variance, Factor 3. Internal integration ($\alpha = 0.687$, Mean = 4.14, SD = 0.74) has been explained 7.19% of variance. With these four factors it has been explained 65.85% variance of total sample. Results of KMO (0.849) and Bartlett's test of Sphericity ($p = 0.000$) show that the results obtained by factor analysis are significant. The results of the Cronbach alpha indicator in this paper are in the range of 0.687-0.885, which indicates that the measuring scale of the collected data is good and suitable for the statistics analysis.

In order to see the relationship between the dimensions of supply chain practice variables, the calculation of the Pearson coefficient of correlation was performed in this paper. The results obtained by this analysis are shown in Table 3. These results show that for all variables of research there is a positive and significant correlation at the level of less than 0.01. The most closely related dimensions are partnerships with customers and internal integration ($r = .496$, $p < 0.01$) while the least related dimensions of partnerships are the suppliers and partner relationships with customers ($r = .296$, $p < 0.01$).

Table 3. Correlation between the observed dimensions

	POD	POK	IIN	NKI
(Partnership relation with suppliers (POD				

(Partnership relation with customers (POK	**296.		
(Internal integration (IIN	**359.	**496.	
(Level of information sharing quality (NKI	**374.	**460.	**403.

Note: **. Correlation is significant at the 0.01 level (2-tailed).

After confirming the correlation of the claims for the dimensions of the research using the factor analysis and the examined relationship between dimensions, it is necessary to examine the hypothesis of the research. As the dependence of supply chain practice variables is examined in relation to the characteristics of enterprises related to attribute scales, the research will be done by MANOVA analysis.

The results obtained by the MANOVA analysis show that the three characteristics of the company significantly influence the implementation of supply chain practice: the number of employees (F-test = 1.979, $p = .013$), sales revenues (F-test = 2.464, $p = .014$), possession of quality certificate (F-test = 5.915, $p = .000$).

Table 4. MANOVA analysis of the influence of company characteristics on variable supply chain practice

Independent variable	Value	F-test	Relevance (p-value)	Status of hypothesis
Size of Company	889.	1.423	153.	Discarded
No of Employees	805.	1.979	013.	Accepted
Age of the company	871.	1.672	071.	Discarded
Sales Revenue	875.	2.464	014.	Accepted
Possession of QualityCertificate	858.	5.915	000.	Accepted
Company Activity	928.	891.	556.	Accepted

Other observed characteristics do not have a significant impact on the implementation of supply chain practice in companies in the field of agricultural and food industry. Based on these results, three hypotheses can be accepted by the fact that there is a significant statistical difference in the implementation of supply chain practice given the number of employees, sales revenues and the possession of quality certificates in the companies surveyed. Size, age, and business activity do not have a significant statistical impact on the implementation of supply chain practice, so the appropriate hypotheses formulated for these characteristics will be rejected.

The results of the ANOVA analysis (table 5) for the independent variable of the size of company show that this variable has a significant effect on the dimension of sharing and the quality of information (F-test = 2.709, $p = 0.047$), while for other dimensions there is no significant statistical dependence. The largest dispersion is in the

dimension of the partner relationship with the supplier ($V = 1,123$), while the smallest dispersion in the agreement with the dimension of internal integration ($V = .308$). The relationship between the elements that represent the arithmetic meanings for certain elements of the company characteristic show large enterprise apply practice supply chain while only the dimension of the partner relationship with the supplier is more applicable to medium-sized enterprises.

Table 5. ANOVA analysis of the influence of the company's characteristics on the variables dimension of supply chain practice

Independent Variable		Variance	F-test	Relevance (p-value)	Relationship of elements
Size of the company	Partnership relation with suppliers	1.123	2.416	.069	2<1<4<3
	Partnership relation with customers	.398	1.928	.128	2<1<3<4
	Internal integration	.308	2.601	.054	1<2<3<4
	Level of information sharing quality	.971	2.709	.047	1<2<3<4
Number of employees	Partnership relation with suppliers	1.534	3.420	.011	1<3<2<5<4
	Partnership relation with customers	.556	2.773	.029	2<1<3<4<5
	Internal integration	.359	3.097	.018	1<2<3<4<5
	Level of information sharing quality	.788	2.195	.072	2<1<3<5<4
Age of the company	Partnership relation with suppliers	.978	2.092	.104	4<3<2<1
	Partnership relation with customers	.461	2.245	.086	3<2<1<4
	Internal integration	.082	.669	.572	3<1<4<2
	Level of information sharing quality	.384	1.038	.378	3<2<4<1
Sales Revenue	Partnership relation with suppliers	2.348	5.191	.007	1<2<3
	Partnership relation with customers	.619	3.024	.052	1<2<3
	Internal integration	.495	4.218	.017	1<2<3
	Level of information sharing quality	2.315	6.727	.002	1<2<3
Possession of Quality Certificate	Partnership relation with suppliers	6.951	16.210	.000	2<1
	Partnership relation with customers	.926	4.533	.035	2<1
	Internal integration	1.621	14.626	.000	2<1
	Level of information sharing quality	1.811	5.070	.026	2<1
Company Activity	Partnership relation with suppliers	.200	.414	.743	4<1<2<3
	Partnership relation with customers	.390	1.889	.134	4<1<2<3
	Internal integration	.262	2.190	.092	4<1<3<2
	Level of information sharing quality	.413	1.116	.345	4<1<3<2

Micro and small companies use at least the supply chain practice. Looking at the number of employees as independent variables, the results show that there is a significant static dependence on the three dimensions of this

variable, namely: partner relationships with suppliers (F-test = 3.420, $p = .011$), customer relationships (F-test = 2.773, $p = .029$) and internal integrations (F-test = 3.097, $p = .018$), while on the dimension Level of information sharing quality has no significant statistical influence. The largest dispersion in response is in the dimension of the partner relationship with the supplier ($V = 1.534$), while the smallest dispersion in the dimension of internal integration ($V = .359$). The relationship between the elements shows that company with over 100 employees mostly apply the chain of supply chains while the companies who employ less than 50 employees use it less.

By observing the results of the independent variables of the company's age on the dimensions of supply chain variables, it is concluded that there is no significant statistical influence on a single dimension. The largest dispersion is in the dimension of the partner relationship with the supplier ($V = .978$), while the smallest dispersion in the dimension of internal integration ($V = .082$). The results of the relationship between the elements show that the least applies to three dimensions of enterprises, belongs to companies established between 1990 and 2010, while the dimension of partnerships with suppliers is least applied to companies that were established after 2010.

Looking at independent variable in the observed sales revenues in 2015, obtained results show that this variable has a significant statistical effect on the three dimensions of supply chain practice variables, namely partner relationships with the supplier (F-test = 5.191, $p = .007$), internal integration (F-test = 4.218, $p = .017$) and sharing and quality of information (F-test = 6.727, $p = .002$), while there is no impact on the dimension of partnerships with customers.

The largest dispersion in the responses is in the dimension of partner relations with suppliers ($V = 2.348$), while the smallest dispersion in the dimension of internal integration ($V = .495$). The ratio of elements is the same for all dimensions most applied to the chain of supply chain enterprises that have annual revenue of more than KM 20 million in 2015, while it is less applied at the companies with annual revenue of less than 4 million KM. The results of the independent variables possession of quality certificate on the supply chain practice dimension have shown that there is a significant statistical effect in all dimensions: partnerships with the supplier (F-test = 16.210, $p = .000$), customer relations (F-test = 4.533, $p = .035$), internal integration (F-test = 14.626, $p = .000$) and sharing and quality of information (F-test = 5.070, $p = .026$). The largest dispersion is in the dimension of partner relations with suppliers ($V = 6.951$), while the smallest dispersion in the responses is the dimension of partnerships with customers ($V = .926$). Observing the relationship between elements, it can be concluded

that companies that possess some of the quality certificates use more the dimension of supply chain practice. By observing the influence of independent variables that is business activity on dimension of the supply chain practice, it can be concluded that neither one dimension has significant statistical dependence on this independent variables. The largest dispersion in responses is in the dimension Level of information sharing quality ($V = .413$), while the smallest dispersion is in the dimension of partnerships with suppliers ($V = .200$). The relationship between the elements shows that the least used is the dimension of supply chain practice in companies engaged in other production and food production, most of which is used in the production of beverages and milk and in agricultural production.

4. Discussion

The research for this work was carried out on companies in the field of agricultural and food industry in Bosnia. It was explored how far the supply chain practice is used in these companies. For the purposes of measuring the supply chain practice, we used unprofessional and qualitative approaches. With 16 statements, the supply chain practice was measured. By using factor analysis, the grouping of these claims was done into four factors corresponding to the baseline research dimensions. A similar approach was also used in Chavez, et al. (2014), Li, et al. (2006), Danese, et al. (2013), Yang (2014) and other papers. Factor analysis has affirmed the affiliation of all claims to certain dimensions.

The limitation of this research is that they have not taken all the dimensions of supply chain practice that have been used in other research. However, due to the breadth of questions that contained the survey questionnaire, those dimensions that were most frequently used in other research were selected, and claims were formed based on other approaches to measure supply chain practice.

The results of relationship among dimensions showed that there is a significant level of interconnectedness ($p < .01$). Similar results were obtained in other papers e.g. Chavez, et al. (2014) and Yang (2014). For Li, Li et al. (2006) the extent of delay is not significantly related to other dimensions of supply chain practice. The results of the MANOVA analysis have shown that the number of employees, sales revenues and the possession of quality certificates have a significant impact on the implementation of supply chain practice. Companies with more than 100 employees realized sales revenues in excess of KM 20 million in 2015 and having a certain quality certificate, most frequently use the supply chain practice. Also, these results have shown that the size, age, and business activity of the company does not significantly affect the implementation of the supply chain. The

influence of the number of employees on the implementation of the supply chain practice was confirmed by the authors Vijayvargy, et al. (2017) who investigated the influence of the size of the company on the application of green supply chain practice in India. However, only the number of employees was taken as the size of the company. The limitation of this approach is that the impact of company characteristics on application of supply chain practice has not been done in other papers, so it is not possible to compare the results obtained with the results obtained in other researches. In order to compare these results with previous researches it is therefore necessary to carry out similar surveys and to include more features of the enterprise and companies from other industrial branches.

Results of the ANOVA analysis showed that the dimensions of partnerships with the supplier, internal integration and partnerships with customers depend on the three observed company characteristics while the least dependent dimension is partner relationship with customers. The possession of quality certificates most influences the implementation of supply chain practice dimensions, followed by the number of employees and sales revenues, which confirms the results of the MANOVA analysis. The obtained results have shown that different companies use differently the supply chain practice. This research can help companies in the field of the agro-food industry to improve their business since it has been proven that the supply chain practice has a significant impact on the competitiveness and performance of the company.

5. Conclusion

The basic data set for this work was made by companies in the field of the agro-food industry. A total of 149 companies completed a survey questionnaire which is 8.54% of the basic set. By Factor analysis claims to measure supply chain practice were grouped in four factors corresponding to the defined dimensions. The basic aim of the research was done through six hypotheses. Hypothesis testing was performed using MANOVA analysis. This analysis has shown that there is a significant statistical difference in the implementation of supply chain practice with regard to the number of employees, sales revenues and the possession of quality certificates. Partial analysis using the ANOVA analysis showed that the dimension of sales revenues realized in 2015 and the possession of quality certificates significantly affect the individual dimensions of the chain of supply chain variables. By proving the hypothesis set up, the research has shown that the application of supply chain practice is decisive for achieving better financial results. The results have shown that the supply chain practices depend on sales revenue, since companies that realize higher sales revenues have a better use of supply chain practice.

Also, this paper shows that the number of employees and the possession of quality certificates affect the implementation of supply chain practices.

It is therefore necessary for the companies with fewer employees and without quality certification to improve supply chain practices in order to improve competitive position and performance. Based on this, it was important to investigate how certain characteristics of an enterprise affect the implementation of supply chain practice in order to improve the business operations of the agricultural and food industry in Bosnia and Herzegovina.

To confirm the results of this research, future good research needs to include good supply chain practices and include companies from other industries. Only in this way we will have a complete picture on how the supply chain practice affects the achievement of a better competitive position on the market and better performance of the company. It is also necessary to examine how the characteristics of an enterprise affect the supply chain practice in other industries.

6. Literature

1. Barman, D., Kushwaha G. S., Des, D. (2008). Impact of Supply Chain Quality Management on Competitive Advantage and Organizational Performance. *Global Logistics Management: Sustainability, Quality, Risks*, 9, 171-185.
2. Bayraktar, E., Demirbag, M. Lenny Koh, S.C., Tatoglu, E., Zaim, H. (2009). A causal analysis of the impact of information systems and supply chain management practices on operational performance: Evidence from manufacturing SMEs in Turkey. *International Journal of Production Economics*, 122, 133-149.
3. Braunscheidela, M. J, Suresh, N. C. (2009). The organizational antecedents of a firm's supply chain agility for risk mitigation and response. *Journal of Operations Management*, 27, 119-140.
4. Chang, W., Ellinger, A. E., Kim, K., Franke, G. R. (2016). Supply chain integration and firm financial performance: A meta-analysis of positional advantage mediation and moderating factors. *European Management Journal*, 34(3), 282-295.
5. Chavez, R., Yu, W., Jacobs, M., Fynes, B., Wiengarten, F., Lecuna, A. (2014). Internal lean practices and performance: The role of technological turbulence, *International Journal of Production Economics*, 160, 157-171.
6. Chen, I. J., Paulraj, A., Lado, A. A. (2004). Strategic purchasing, supply management and firm performance. *Journal of Operations Management*, 22 (5), 505-523.

7. Chen, J. V., Yen, D. C., Rajkumar, T.M. Tomochko, N. A. (2011). The antecedent factors on trust and commitment in supply chain relationships. *Computer Standards & Interfaces*, 33(3), 262-270.
8. Christopher, M., Gattorna, J. (2005). Supply chain cost management and value based pricing. *Industrial Marketing Management*, 34(2), 115-121.
9. Claycomb, C., Droge, C., Germain, R. (1999). The effect of justin-time with customers on organizational design and performance. *International Journal of Logistics Management*, 10(1), 37-58.
10. Cooper, R. G. (1982). New Product Success in Industrial Firms. *Industrial Marketing Management*, 11(3), 215-223.
11. Danese, P., Romano, P., Formentini, M. (2013). The impact of supply chain integration on responsiveness: The moderating effect of using an international supplier network. *Transportation Research Part E: Logistics and Transportation Review*, 49(1), 125-140.
12. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 318-340.
13. Day, G. (2002). Creating a superior customer relating capability. *MIT Sloan Management Review*, 44(3), 77-82.
14. Fawcett, S. E., Osterhaus, P., Magnan, G. M., Brau, J. C., McCarter, M. W. (2007). Information sharing and supply chain performance: the role of connectivity and willingness. *Supply Chain Management: An International Journal*, 12(5), 358-368.
15. Flynn, B. B., Huo, B., Zhao, X. (2010). The impact of supply chain integration on performance: A contingency and configuration approach. *Journal of Operations Management*, 28(1), 58-71.
16. Follett, M. P. (1993). *Freedom and Coordination Lectures in Business Organization 1933—1968*. New York: Garland Publishing.
17. Fynes, B., de Burca, S., Marshall, D. (2004). Environmental uncertainty, supply chain relationship quality and performance. *Journal of Purchasing and Supply Management*, 10(4), 179-190.
18. Ganyaupfu, E. M. (2013). Entrepreneur and Firm Characteristics Affecting Success of Small and Medium Enterprises (SMEs) in Gauteng Province. *International journal of Innovative Research in Management*, 2(9), 1-8.
19. Ghosh, A., Fedorowicz, J. (2008). The role of trust in supply chain governance. *Business Process Management Journal*, 14(4), 453-470.

20. Grbić, N., Puška A. (2015). Utjecaj etnocentrizma na kupovno ponašanje potrošača na području Brčko distrikta BiH. Zbornik Ekonomskog fakulteta u Zagrebu. 13(2), pp. 103-120.
21. Hallikas, J., Virolainen, V.-M., Tuominen, M. (2002). Risk analysis and assessment in network environments: a dyadic case study. International Journal of Production Economics, 78(1), 45-55.
22. Hoyt, J., Huq, F. (2000). From arms-length to collaborative relationships in supply chain. International Journal of Physical Distribution & Logistics, 30(9), 750-764.
23. Hsu, C-C., Tan, K. C., Laosirihongthong, T. (2014). Antecedents of SCM practices in ASEAN automotive industry. The International Journal of Logistics Management, 25(2), 334-357.
24. Ince, H., Imamoglu, S. Z., Keskin, H., Akgun, A., Efe, M. N. (2014). The Impact of ERP Systems and Supply Chain Management Practices on Firm Performance: Case of Turkish Companies. Procedia - Social and Behavioral Sciences, 99, 1124-1133.
25. Islam, A., Khan, M. A., Obaidullah, A. Z. M., Alam, S. M. (2011). Effect of Entrepreneur and Firm Characteristics on the Business Success of Small and Medium Enterprises (SMEs) in Bangladesh. International Journal of Business and Management, 6(3), 289-299.
26. Jabbour, A. B. S. d L., Filhob, A. G. A., Vianac, A. B. N., Jabboura C. J. C. (2011). Factors affecting the adoption of supply chain management practices, Evidence from the Brazilian electro-electronic sector. IIMB Management Review, 23(4), 208-222.
27. Kim, S. W. (2006). Effects of supply chain management practices, integration and competition capability on performance. Supply Chain Management: An International Journal, 11(3), 241-248.
28. Kisengo, Z. M., Kombo, H. (2012). Effect of Firm Characteristics on Performance of the Microfinance Sector in Nakuru, Kenya. International Journal of Science and Research, 3(10), 1791-1799.
29. Koh, S. S., Demirbag, M., Bayraktar, E., Tatoglu, E., Zaim, S. (2007). The impact of supply chain management practices on performance of SMEs. Industrial Management & Data Systems, 107(1), 103-124.
30. Kozarević, S., Puška, A. (2015). Povezanost primjena lanca opskrbe, partnerskih odnosa i konkurentnosti. Ekonomski misao i praksa, 24(2), 579-596.
31. Kwon, I.-W.G., Suh, T. (2005). Trust, commitment and relationships in supply chain management; a path analysis. Supply Chain Management, 10(1) 26-33.
32. Lee, J. N., Kim, Y. G. (1999). The effect of partnership quality on its outsourcing success: conceptual

- framework and empirical validation. *Journal of Management Information Systems*, 15(4), 29–61.
33. Li, S., Ragu-Nathan, B., Ragu-Nathan, T.S., SubbaRao, S. (2006). The Impact of Supply chain Management Practices on Competitive Advantage and Organizational Performance. *Omega*, 34(2), 107-124.
34. Li, S., Rao, S., Ragu-Nathan T. S., & Ragu-Nathan, B. (2005). Development and validation of a measurement instrument for studying supply chain management practices. *Journal of Operations Management*, 23(6), 618-641.
35. Li, W., Humphreys, P. K., Yeung, A. C. L., Cheng, E. T. C. (2007). The impact of specific supplier development efforts on buyer competitive advantage: an empirical model. *International Journal of Production Economics*, 106 (1), 230–247.
36. Liao S. H., Kuo F. I. (2014). The study of relationships between the collaboration for supply chain, supply chain capabilities and firm performance: A case of the Taiwan's TFT-LCD industry. *International Journal of Production Economics*, 156, 295-304.
37. Miguel, P. L. S., Brito, L. A. L. (2011). Supply Chain Management measurement and its influence on Operational Performance. *Journal of Operations and Supply Chain Management*, 4(2), 56-70.
38. Morash, E. A., Droge, C., Vickery, S. (1997). Boundary-spanning interfaces between logistics, production, marketing and new product development. *International Journal of Physical Distribution & Logistics Management*, 27 (5/6), 350–369.
39. Mzoughi, N., Bahri, N., Ghachem, M. S. (2008). Impact of Supply Chain Management and ERP on organizational performance and competitive advantage: Case of Tunisian companies. *Journal of Global Information Technology Management*, 11(3), 24-46.
40. Nyaga, G., Whipple, J., Lynch, D. (2010). Examining supply chain relationships: do buyer and supplier perspectives on collaborative relationships differ? *Journal of Operations Management*, 28(2), 101-114.
41. Prajogo, D., Chowdhury, M., Yeung, A.C.L., Cheng, T.C.E. (2012). The relationship between supplier management and firm's operational performance: A multi-dimensional perspective. *International Journal of Production Economics*, 136(1), 123-130.
42. Puška, A., Maksimović A., Fazlić S. (2015). Utjecaj kvaliteta zadovoljstva i lojalnosti studenata. *Poslovna izvrsnost*, 9(2), 101-119.
43. Schoenherr, T., Swink, M. (2012). Revisiting the arcs of integration: cross-validation and extensions.

Journal of Operations Management, 30 (1/2), 99-115.

44. Singh, R., Sandhu, H.S., Metri, B.A., Kaur, R. (2010). Relating Organised Retail Supply Chain Management Practices, Competitive Advantage and Organisational Performance. The Journal of Business Perspective, 14(3), 173-190.
45. Srinivasan, M., Mukherjee, D., Gaur, A. S. (2011). Buyer—supplier partnership quality and supply chain performance: Moderating role of risks, and environmental uncertainty. European Management Journal, 29(4), 260-271.
46. Stevens, G. C. (1990). Successful supply-chain management. Management Decision, 28(8), 25-30.
47. Sukati, I., Hamid A. B., Baharun, R., Yusoff R. M. (2012). The Study of Supply Chain Management Strategy and Practices on Supply Chain Performance. Procedia - Social and Behavioral Sciences, 40, 225-233.
48. Sukwadi, R., Wee, H-M., Yang C-C. (2013). Supply Chain Performance Based on the Lean—Agile Operations and Supplier—Firm Partnership: An Empirical Study on the Garment Industry in Indonesia. Journal of Small Business Management, 51(2), 297-311.
49. Tavakol, M., Dennick, R. (2011). Making sense of Cronbach's alpha. International Journal of Medical Education. 2, 53-55.
50. Toyin, A.I. (2012). Supply Chain Management (SCM) Practices in Nigeria Today: Impact on SCM Performance. European Journal of Business and Social Sciences, 1(6), 107-115.
51. Tracey, M., Lim, J., Vonderembse, M. (2005). The impact of supply-chain management capabilities on business performance. Supply Chain Management: An International Journal, 10(3), 179-191.
52. Tzokas N., Kimb, Y. Ah., Akbar H., Al-Dajan, H. (2015). Absorptive capacity and performance: The role of customer relationship and technological capabilities in high-tech SMEs. Industrial Marketing Management, 47, 134—142.
53. Vijayvargy, L., Thakkar, J., Agarwal G., (2017). Green supply chain management practices and performance: The role of firm-size for emerging economies. Journal of Manufacturing Technology Management, 28(3), 299-323.
54. Wong, A., Tjosvold, D.W., Wong, Y.L., Liu, C.K. (1999). Relationships for Quality Improvement in the Hong Kong-China Supply Chain. International Journal of Quality & Reliability Management, 16(1), 24-41.
55. Wong, C. Y., Arlbjorn, J. S., Johansen, J. (2005). Supply chain management practices in toy supply chain.

Supply Chain Management: An International Journal, 10(5), 367-378.

56. Yang, J. (2014). Supply chain agility: Securing performance for Chinese manufacturers. International Journal of Production Economics, 150, 104-113.

57. Zhao, X., Huo, B., Selen, W., Yeung, J.H.Y. (2011). The impact of internal integration and relationship commitment on external integration. Journal of Operations Management 29(1-2), 17-32.

58. Zhou, H., Shou, Y., Zhai, X., Li, L., Wood, C., Wu, X. (2014). Supply chain practice and information quality: A supply chain strategy study. International Journal of Production Economics, 147, 624–633.