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## KEY INVENTORY FACTORS: PACKAGING PRODUCTS IN THE BEVERAGE INDUSTRY PERSPECTIVE

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**Abstract:** The purpose of this paper is to assess the key factors that have the greatest impact on the inventory level, with a special emphasis on packaging products in the beverage industry in seven different countries. The research methodology includes: (1) Defining the pool of Key Inventory Factors, (2) Defining the final list of Key Inventory Factors, (3) Collecting data, (4) Analysis of the data (according to four different aspects) and recommendations. This study shows that these three factors: Holding costs, Information flow and Systems for order processing, inventory monitoring and inventory control (Systems for OPIMIC) have a significant correlation with the company's success. The paper offers additional analysis regarding the differences among them when it comes to their treatment in the Inventory Management Systems.

**Keywords:** key inventory factors; inventory management; company's success; packaging products; beverage industry

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### 1. INTRODUCTION

The race to create as much value as possible to the end- user, while reducing costs [25],[30] is intensifying. In doing so, companies face a constant increase in complexity of the products and production, pressure to reduce delivery time and increase productivity in order to be more competitive on the market. Gaining competitiveness can be defined as gaining an advantage over key elements of success (e.g. quality, time, flexibility, cost, and productivity). Inventories have more or less significant influence on all of them and so, are widely accepted as one of the most influential aspects for competitiveness improvement [4],[8]. In that direction, Inventory Management (IM) is one of the primary sources for reducing costs, generating income and increasing the company's earnings [29]. To reach the optimal level of inventory, and thus improve the overall performance of the company, it is necessary, first to understand the goals, problems and key influential factors on the inventory level.

One of the main challenges associated with inventory management is the large number of such factors that directly or indirectly affect the inventory level [14]. If their mutual connections are added, it is clear that the situation becomes quite complex. Because of this, there is a need to find the factors that have the biggest influence on the inventory level, and to highlight them when reaching the desired outcome. Although it is quite an investigated area [8],[9],[14], etc., the multitude of influential factors to consider when balancing inventory costs versus the benefits they generate to obtain an optimal level of inventory, make this a never ending story. Product type and geographical location (representing the state of the development of the economy in a country/region and the adopted ways of doing business) are just two of those factors that cloud the whole process. To convey more comprehensibility and to elucidate the whole process more deeply, one reasonable action is to individualize research for different products and geographical locations. Additionally, it has to be stressed that although the correlation of those factors with the success of the company may be a vital indicator of their importance, it is rarely investigated [11].

In that direction, this paper aims to evaluate the key factors that have the greatest impact on the inventory level in the area of packaging products in the beverage industry. This research covers seven different countries and also evaluates the perceived correlation between key factors and the companies' success. The utilized methodology in the research follows several basic steps:

- (1) defining the pool of Key Inventory Factors (KIFs),
- (2) defining the final list of Key Inventory Factors,
- (3) collecting data and
- (4) analysis of the data and recommendations.

The literature review is in the second section, followed by an explanation of the theoretical framework of the research and the research methodology in the third section. The data collection is explained in the fourth section and the analysis of the data is presented in Section 5. Finally, Section 6 contains the

recommendations regarding the treatment of the most noticeable KIFs and in the seventh section, the research conclusions are presented.

## 2. LITERATURE REVIEW

For the sake of the research, a thorough analysis of literature regarding the key influential factors (KIFs) specific to inventory level was performed. The literature review encompassed Emerald, Inderscience and Ebsco using these keywords: Inventory Management, Inventory Factors, Company's success, Packaging products, Beverage industry. Due to the space limitations, only the list of twenty-five key factors which were identified that influence the inventory level is given: (1) inventory policy, (2) size and shape of the product, (3) shelf life, (4) demand rates, (5) production time, (6) delivery time, (7) delivery reliability, (8) order costs, (9) holding costs, (10) minimum product order, (11) minimum production, (12) forecast accuracy, (13) location of sales centers/suppliers, (14) system for order processing, (15) system for inventory monitoring and control, (16) product portfolio, (17) transport utilization, (18) scrap, (19) production capacity, (20) line stoppages, (21) product and material returns, (22) warehouse capacity, (23) Information flow, (24) product and material price, (25) lead time. It is reported that each of these key factors has a certain impact on inventory quantities stored in companies' warehouses and depending on the type of company; the importance of the individual factors may have a greater or smaller relevance.

## 3. THEORETICAL FRAMEWORK OF THE RESEARCH

The theoretical model for this research is shown in Figure 1. It is based on the synthesis of the literature review outline above, which obtains the content validity to the model [15]. The theoretical model is aligned with the research goals of this paper – to evaluate the key factors that have the greatest impact on the inventory level (with a special emphasis on packaging products in the beverage industry in seven different countries).

The research faced several challenges. The most dominant ones are elaborated in the following text, together with the offered solutions.

### — Different aspects to determine the importance of KIFs

Relevant dilemma regarding the importance of the KIFs is whether the most important are those pointed out by the experts or those that generate the most problems in praxis or other aspects. Due to this dilemma, the research practically performed multi-layer insight through four different analyses of the KIFs according to four different aspects:

- (a) **Expert's favorites** – how important are the KIFs in determining the inventory level according to the experts,
- (b) **Companies' favorites** – the dedicated attention by the companies to the considered factors,
- (c) **Problematic KIFs** – factors that are generating the biggest issues regarding successful inventory management and
- (d) **KIFs for success** – KIFs that have the correlation between the dedicated attention and the success of the companies.

### — Different nature of the KIFs

Analysis of the KIFs displayed their different nature regarding the source of influence (KIFs that are arising from the company's operations – internal KIFs versus KIFs for monitoring and evaluating the supplier's performance – external KIFs) and the type of the material (raw materials versus finish goods). The primary interest of this research are the KIFs that are under the control of the company (internal KIFs) and those that are directed towards the finished goods i.e. products.

### — Different level of details of the KIFs and causal relationships among them

It is expected that the KIFs met in the literature have certain similarity among many of them (same essence but different name) and certain causal relationships. In order to prevail this challenge, several

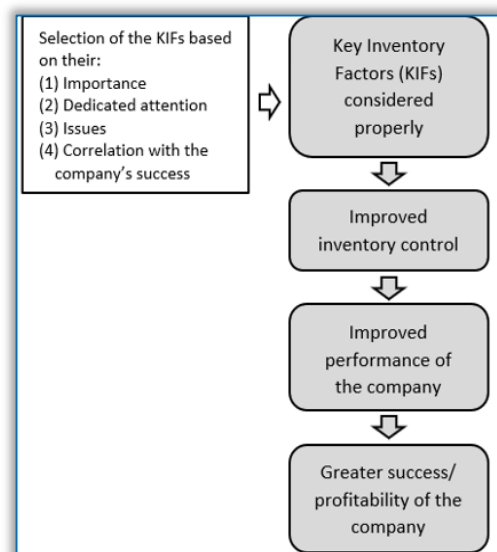


Figure 1. Theoretical model of the research

groupings and divisions were completed in order to select the most favorable factors and to achieve a more accurate picture of their connection and influence. For example, factors like production time and sales centers/suppliers location are included in the superior factor lead time.

— **Big number of KIFs**

It is clear that big number of KIFs may bring more damage than good if they are all treated (e.g. it can be expected that VIF factor in the Multiple Regression Analysis can very probably become a hurdle for further analysis). In that direction, several filtering processes were performed on the initial 25 KIFs detected in the literature, in accordance to previous text: (1) groupings, (2) focusing on the internal KIFs related to the products and (3) expert opinion, performed through the Delphi methodology. Due to the space limitation, only few details regarding the implementation of Delphi methodology will be given: 7 experts participated in the process (4 professionals and 3 academicians), 3 cycles were performed and the results were reached with 100% consensus of all 7 experts. This filtering process ended with the final 10 KIFs that were taken into consideration in the later research, shown in Table 1.

Table 1. Final 10 KIF's and their description

No.	Factors	Description
1.	Lead time	The total time required from order to delivery of the product to the required place.
2.	Delivery reliability	The deliveries done without error compared to the total deliveries made
3.	Products portfolio	Collection of all the products/ materials offered or owned by the company
4.	Demand rates	Demand for a certain volume of product for a given period of time.
5.	Forecast accuracy	Defined as the percentage difference between a forecast and actual sales.
6.	Systems for OPIMIC	The level of sophistication of the systems that the company uses to process orders, monitor and control supplies.
7.	Production systems	– Line breakdown – Discontinuity in production due to problems with equipment. – Production capacities – Volume of products that can be produced in production plants for a certain period of time, using the resources provided by the company.
8.	Holding costs	Total costs arising from the storage of products in stock.
9.	Ordering costs	Fixed costs arising from the execution of the ordered quantities.
10.	Information flow	Having the right information in (the right format), at the right time and in the right place.

The utilized methodology for this research is presented in Figure 2. In addition to the main steps of the methodology, the applied methods and specifics are also given.

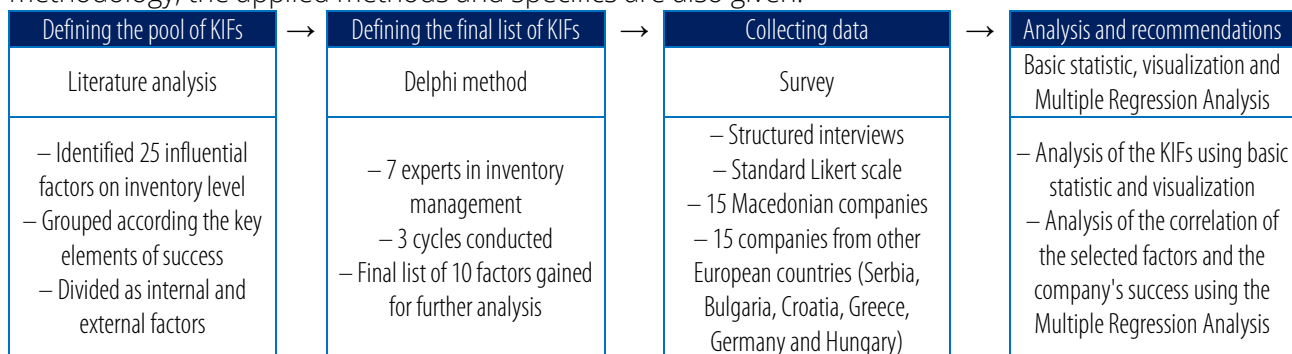


Figure 2. Research methodology

**4. DATA COLLECTION**

Structured interviews were performed to understand how companies treat the considered factors and to obtain the data for analyses of the second, third and fourth aspects of this research. Questionnaires are one of the most widely used means of collecting data and are typically used when collecting data from a relatively large number of people [24]. Namely, according to Dörnyei [12], the presence of an interviewer can ensure mutual understanding, allowing the interviewer to rephrase or simplify questions that were not understood by the interviewees. As a result, straightforward responses and improved data accuracy are expected. Taking into account that this research included companies from more than one country, interviews were completed using two styles – face-to-face interview and telephone interview. Both interview styles were structured and consisted of set of predetermined questions. The design of the questionnaire was in accordance to Neuman's methodology.

For the evaluation process, the standard Likert scale was utilized (from 1 – the worse situation/solution to 5 – the best situation/solution).

Thirty companies from seven different countries, for which final goods are packaging materials for the beverage industry, participated in this research. Fifteen were Macedonian companies (later referred as domestic companies) and the other 15 companies are located in Serbia, Croatia, Bulgaria, Greece, Hungary and Germany (later referred as foreign companies).

## 5. ANALYSIS OF THE DATA

### Expert's favorites – analyzing the importance of KIFs according to the experts

As previously discussed, this analysis was performed utilizing the Delphi method. Results given in Table 2.a show that four KPIs (*Lead time, Forecast accuracy, Holding costs and Ordering costs*) have the highest score of 4.71. Surprisingly Systems for order processing, inventory monitoring and inventory control (Systems for OPIMIC) received the lowest score of 4.00. The combination of the type of the industry (the low number of different products which decrease the need for complex and comprehensive systems), together with the fact that significant part of the companies that participated in the survey were small, may be the reasons for this outcome.

### Companies' favorites – analyzing the importance of KIFs according to the dedicated attention by the companies

This and the next aspect were analyzed utilizing survey. The data in Table 2.b shows that four KPIs (*Lead time, Delivery reliability, Forecast accuracy and Ordering costs*) have score over 4.00. Additionally, results in Table 2.b confirmed the importance of the regional aspect, since the scores for the domestic companies in some cases significantly differ from those for the foreign companies.

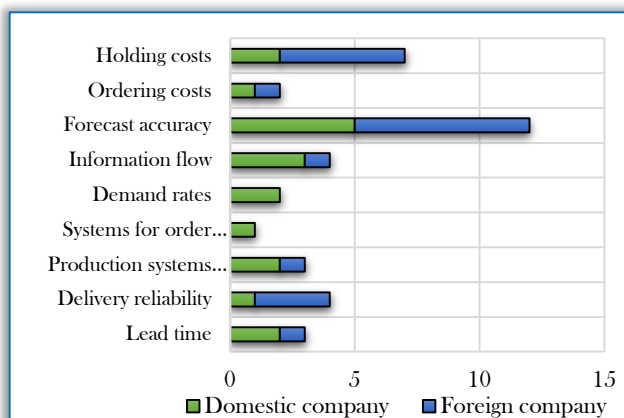
Another interesting conclusion can be that the experts gave on average higher scores compared to companies (the span between the highest and lowest mark is 4.71:4.00, whereas at the Companies' favorites this span is 4.43:3.17). One possible explanation is that experts (especially academicians) wanted to emphasize the importance of all KPIs.

Table 2. Summarized results for regarding the first 3 aspects

FACTORS	Evaluation of the KIFs' importance by the experts	Domestic companies	Foreign companies	Total
1. Lead time	4,71	4,73	4,13	4,43
2. Delivery reliability	4,43	4,07	4,20	4,13
3. Products portfolio	4,29	4,07	3,80	3,93
4. Demand rates	4,57	3,87	3,53	3,73
5. Forecast accuracy	4,71	3,93	4,13	4,03
6. Systems for OPIMIC	4,00	3,40	3,67	3,53
7. Production systems	4,43	3,27	4,13	3,70
8. Holding costs	4,71	2,53	3,80	3,17
9. Ordering costs	4,71	3,60	4,40	4,00
10. Information flow	4,57	3,40	3,60	3,53

a. Expert's favorites – KIFs selected by the experts considering their importance regarding the inventory level

b. Companies' favorites – KIFs with the most dedicated attention by the companies



KIFs	Explanation
Forecast accuracy	<ul style="list-style-type: none"> <li>• Low forecast accuracy</li> <li>• Not able to predict demand due to constant changes from the customer</li> <li>• The required flexibility is demanding new methods and appropriate people</li> </ul>
Holding costs	<ul style="list-style-type: none"> <li>• Delivery postponing</li> <li>• Bigger warehouse capacity needed</li> </ul>
Information flow	<ul style="list-style-type: none"> <li>• Communication is a huge problem</li> <li>• Late delivery of information due to poor communication inside and outside the company</li> </ul>
Delivery reliability	<ul style="list-style-type: none"> <li>• Bigger flexibility required from the market</li> </ul>

c. Problematic KIFs – the most problematic KIFs for managing inventories associated with brief explanation of the reasons

### Problematic KIFs – analyzing the importance of KIFs according to the generated issues regarding successful inventory management

When it comes to the problematic KIFs, probably as it could be expected, the most of the problems were reported regarding the *Forecast accuracy*, as stated in Table 2.c. Stochastic nature of this KPI and the

lack of appropriate knowledge and personnel to deal with it may be the dominant reasons for this situation.

■ KIFs for success – analyzing the correlation of dedicated attention to the KIFs with the success of the companies

The analysis of the correlation between the dedicated attention to the factors and the companies' success was completed using Multiple Regression Analysis (MRA).

For this purpose, two-way statistical hypotheses (the null hypothesis and alternative hypothesis) have been established. The scheme of those hypothesis as applied to all 10 KIFs is presented in the example of KIF *Lead time*:

- H0: The KIF *Lead time* does not have a significant influence on the company's success
- H1: The KIF *Lead time* has a significant influence on the company's success

The Correlation coefficients of the main variables are presented in Table 3.

Table 3. Correlation coefficients of the Main Variables

	Lead time	Delivery reliability	Products portfolio	Demand rates	Forecast accuracy	Systems for order processing	Production systems	Holding costs	Ordering costs
Delivery reliability	0.488								
Products portfolio	0.250	0.320							
Demand rates	0.535	0.331	0.434						
Forecast accuracy	0.170	0.465	0.348	0.259					
Systems for order processing	0.054	0.273	-0.041	0.082	0.155				
Production systems	0.084	0.425	-0.099	-0.148	0.365	0.500			
Holding costs	-0.417	0.048	0.013	-0.103	0.316	0.163	0.390		
Ordering costs	0.050	0.315	0.000	-0.045	0.222	-0.101	0.443	0.486	
Information flow	0.165	0.373	-0.286	-0.150	0.273	0.414	0.461	0.158	0.032

The first step was to check their reliability using Cronbach's Alpha coefficient. The reliability coefficient of 0.70 or higher is considered "acceptable" in most social science research situations [18], [27]. The alpha coefficient for all ten items is around 0.70, that indicates the satisfactory level of construct validity of all of these variables, Table 4.

Table 4. Reliability coefficient and Multicollinearity analysis of independent variables

Independent variables	Total Count	Mean	StDev	Cronbach's Alpha	Coef	SE Coef	T-Value	VIF
Constant					3.866	0.774	5	
1. Lead time	30	4.433	0.679	0.6882	-0.214	0.185	-1.15	2.79
2. Delivery reliability	30	4.133	0.86	0.6152	0.126	0.135	0.93	2.37
3. Products portfolio	30	3.933	0.785	0.7042	0.137	0.129	1.06	1.82
4. Demand rates	30	3.7	0.75	0.695	-0.181	0.149	-1.22	2.2
5. Forecast accuracy	30	4.033	0.765	0.6381	-0.117	0.13	-0.9	1.75
6. Systems for OPIMIC	30	3.533	1.008	0.6836	0.369	0.102	3.6	1.88
7. Production systems	30	3.7	1.149	0.6451	-0.007	0.107	-0.07	2.67
8. Holding costs	30	3.167	1.117	0.7001	0.243	0.109	2.23	2.6
9. Ordering costs	30	4	1.017	0.6874	-0.093	0.112	-0.83	2.29
10. Information flow	30	3.5	1.075	0.6859	-0.279	0.104	-2.68	2.21
Total	30	38.133	4.833	0.6986				

The VIF (Variance Inflation Factor) was calculated to quantify its severity in the model. Results from Table 4 (VIFs of all variables are between 1.82–2.79), shows that they have more than satisfactory values since values lower than 10 are considered to be acceptable for further analysis.

According to the coefficient of determination of the model (R<sup>2</sup>) it can be said that 72.78% of the variation in performance can be explained by this multiple regression model. The adjusted R<sup>2</sup> has a value of 58.45%, that indicates that 58.45% of the variance in the company's performance was explained by these inventory factors. Taking into account the F- and p- values (significance level of 0.05) in Table 5, we can conclude that alternative hypothesis for these three factors (1) *Systems for OPIMIC*, (2) *Holding costs* and (3) *Information flow* was accepted. For the rest of the KIFs, the null hypotheses were accepted meaning there is insufficient evidence to conclude that they have an effect on the dependent variable – company's success. This practically means that this research showed that aforementioned three factors have a significant positive influence on the company's success.

Table 5. Results of Multilinear Regression Analysis

Independent variables	DF	Dependent variable – Companies' success				
		Adj SS	Adj MS	F-Value	P-Value	RESULT
Constant	10	8.3450	0.83450	5.08	0.000	
1. Lead time	1	0.2191	0.21906	1.33	0.263	Insignificant
2. Delivery reliability	1	0.1427	0.14272	0.87	0.363	Insignificant
3. Products portfolio	1	0.1849	0.18495	1.13	0.302	Insignificant
4. Demand rates	1	0.2433	0.24330	1.48	0.239	Insignificant
5. Forecast accuracy	1	0.1336	0.13357	0.81	0.379	Insignificant
6. Systems for OPIMIC	1	2.1312	2.13121	12.97	0.002	Significant
7. Production systems	1	0.0007	0.00075	0.00	0.947	Insignificant
8. Holding costs	1	0.8194	0.81939	4.99	0.038	Significant
9. Ordering costs	1	0.1122	0.11216	0.68	0.419	Insignificant
10. Information flow	1	1.1798	1.17980	7.18	0.015	Significant
Error	19	3.1217	0.16430			
Total	29	11.4667				

## 6. RECOMMENDATIONS

According to the results of the four-layer analysis, Table 6 presents the factors that were clearly noticeable by some of the four aspects considered. Having in mind the diversity of the obtained results, according to the different aspects of analyses, an in-depth analysis of the most influential factors was performed, Figure 3.

Table 6. Overview of the outstanding KIFs according to the four aspects considered

KPIs	Expert's favorites	Companies' favorites	Problematic KIFs	KIFs for success
Lead time	✓	✓		
Information flow			✓	✓
Ordering costs	✓			
Delivery reliability		✓	✓	
Systems for OPIMIC				✓
Forecast accuracy	✓	✓	✓	
Ordering costs		✓		
Holding costs	✓		✓	✓

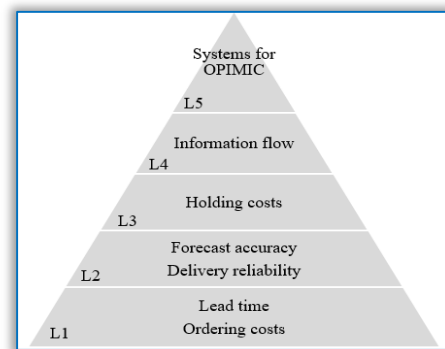


Figure 3. In-depth analysis of the outstanding KIFs

In Figure 3, the seven selected KIFs are divided into five levels, according to the suggestions on how they should be approached. A brief discussion regarding the five levels in Figure 3 is outlined below:

- Level 1 (*Lead time* and *Ordering costs*) – Contains basic factors that are (one of the) the building blocks for the foundation of IM. KIFs are relatively easy to calculate or obtained through historic data and problems with their management are not expected.
- Level 2 (*Forecast accuracy* and *Delivery reliability*) – Also contains basic factors which should be included in the basic levels of IM. Still, these KIFs have extreme stochastic nature, which makes them difficult to obtain with satisfactory reliability (with specific methods which are rarely known by the practitioners). This may lead to certain problems with their management.
- Level 3 (*Holding costs*) – An important factor that should be imbedded in the IM, although it is occasionally neglected by the companies. For this reason, companies occasionally face problems in the management of this KIF. As such, it may become a crucial factor that could create a competitive difference and lead to improved company performance.
- Level 4 (*Information flow*) – A factor that is not recognized as important and is usually not considered in IM. As a consequence, companies are facing problems in managing this factor. Similarly to *Holding costs*, it may be a crucial factor that could create a competitive advantage since this research showed it has a significant positive influence on the company's performance.
- Level 5 (*Systems for order processing, inventory monitoring and inventory control*) – As mentioned before, most of the companies (participating in the survey) are not considering this factor as important and are not aware of the potential problems regarding it. One reason may be the type of the industry –

the number of different products is low and hence the need for complex and comprehensive systems may be ignored. In addition to this, almost 50% of the companies that participated in the survey are small, which may also contribute to this situation. Still, the presented research showed that this KIF may have a significant positive influence on the company's performance.

## 7. CONCLUSION

Inventory management is a very complex area, influenced by numerous factors. Bearing in mind the influence on the overall performance of the company, the evaluation of the required level of inventory of the final product can be a demanding task.

This research performed a four-layer analysis of the influential factors according to (a) their importance from the experts' point of view, (b) the dedicated attention by the companies, (c) the problems generated in the management of the KIFs in the companies and (d) the correlation of the dedicated attention to the KIFs with the success of the companies.

The results pointed out seven KIFs that require deep consideration when managing inventories of packaging products in the beverage industry. These factors (*Lead time, Ordering costs, Forecast accuracy, Delivery reliability, Holding costs, Information flow and Systems for OPIMIC*) should be considered carefully by the staff responsible for IM, especially in case of the initial design of the IM. Furthermore, these seven KIFs were explained in more detail regarding their treatment in the IM. At the end, it will again be stressed that three factors (*Holding costs, Information flow and Systems for OPIMIC*) showed a significant correlation with the company's success.

Still, it must be emphasized that this kind of research may be quite sensitive to the industry, meaning that in certain other industries (e.g. where the shelf life of the product is very important or the number of different products is very large), other sets of KIFs may be detected.

## References

- [1] Arbós, L., Santos, J., López, P. & Sanchez, C.: Monitoring processes through inventory and manufacturing lead time. *Industrial Management & Data Systems*, 951–970, 2015.
- [2] Armstrong, D.: Sharpening Inventory Management. *Harvard Business Review*, November/December, 42–58, 1985.
- [3] Atkins, P.: IDV Inventory – A Question of Control. *International Journal of Physical Distribution & Logistics Management*, 20(7), 35–43, 1990.
- [4] Axsäter, S.: *Inventory control – Third edition*. Lund, Sweden: Springer, 2015.
- [5] Ballard, R.: Methods of inventory monitoring and measurement. *Logistics Information Management*, 11–18, 1996.
- [6] Bartholdi, J. & Hackman, S.: *Warehouse & distribution science*. s.l.:s.n., 2007.
- [7] Bhagwat, R. & Sharma, M. K.: Performance measurement of supply chain management: A balanced scorecard approach. *Computers & Industrial Engineering*, Issue 53, 43–62, 2007.
- [8] Chan, S. W.: Factors Influencing the Effectiveness of Inventory. *IOP Conference Series: Materials Science and Engineering*, 226, 2017.
- [9] Dahlin, H. & Pihl, M.: Factors that Impact Inventory Levels in a Supermarket System Supplying, Jönköping: s.n, 2014.
- [10] Dalkey, N. & Helmer, O.: *A experimental application of the delphi method to the use of experts*, California: Rand Corporation, 1962.
- [11] Dedunu, H.: The Effect of Inventory Management on Company Performance Reference to Listed Manufacturing Companies in Sri Lanka. *International Journal of Management Sciences and Business Research*, 7(7), 2018.
- [12] Dörnyei, Z.: Quantitative Qualitative, and Mixed Methodologies. *Research Methods in Applied Linguistics*, p. 143, 2007.
- [13] Doyle, E. S. & Izaryk, K.: Using the Delphi Technique to Explore Complex Concepts in Speech–Language Pathology: An Illustrative Example From Children's Social Communication. *American Journal of Speech Language Pathology*, 26(4), 1225–1235, 2017.
- [14] Ekstrand, H. & Karlsfred, A.: Parameters influencing the inventory level, Göteborg: s.n, 2012.
- [15] Feng, M., Terziovski, M. & Samson, D.: Relationship of ISO 9001: 2000 quality system certification with operational and business performance: A survey in Australia and New Zealand–based manufacturing and service companies. *Journal of Manufacturing Technology Management*, 19(1), 22–37, 2007.
- [16] Hornsby, J. S., Smith, B. N. & Gupta, J. N. D.: The impact of decision–making methodology on job evaluation outcomes: A look at three consensus approaches. *Group & Organization Management*, 19(1), 112–128, 1994.
- [17] Howard, K.: Inventory Management. *International Journal of Physical Distribution*, 81–116, 1974.
- [18] Kasim, A., *Proceedings of the International Conference on Science, Technology and Social Sciences (ICSTSS)*. Pahang: Springer, 2012.
- [19] Lancioni, A. R. & Howard, K.: Inventory Management Techniques. *Physical Distribution & Materials*, 385–428, 1978.
- [20] Lancioni, R. A. & Lex, F.: Inventory Models: An Alternative. *International Journal of Physical Distribution*, 22–27, 1975.

- [21] Miller, J.: Inventory Management and Control "For a Cause", Arkansas: ProQuest LLC, 2009.
- [22] Muckstadt, J. A. & Sapra, A.: Principles of Inventory Management. New York: Springer Science+Business Media, 2010.
- [23] Muller, M.: Essentials of Inventory Management.. 2nd ed. New York: AMACOM, 2011.
- [24] Rowley, J.: Designing and using research questionnaires. Management Research Review, 308–330, 2014.
- [25] Schmidt, J. G. & Lyle, . D.: Lean integration. Massachusetts: Addison Wesley, 2010.
- [26] Shingo, S.: Non–stock production : the Shingo system for continuous improvement. Cambridge : Productivity press, 1988.
- [27] Taber, K. S.: The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. Research in Science Education, 48(6), 1273–1296, 2018.
- [28] Wild, R.: Essentials of Operations Management. 5th ed. Padstow: Thomson, 2006.
- [29] Wild, T.: Best practice in inventory management. New York: John Wiley & Sons, 1977
- [30] Womack, J. P. & Jones, D. T.: Lean thinking. New York: Simon & Schuster, 2003



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